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BAJO CALIMA Y BAHÍA MÁLAGA (BCBM) REDD+ PROJECT DESCRIPTION

Subcontract no. EPP-I-06-00013-00-EcoPartners-01

With Ecological Carbon Offset Partners LLC

April 10, 2015

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BAJO CALIMA Y BAHÍA MÁLAGA (BCBM) REDD+ PROJECT

Project Title	Bajo Calima y Bahía Málaga (BCBM) REDD+ Project
Project Location	Department of Valle de Cauca, Colombia
Project Proponent	Consejo Comunitario de Bajo Calima. Contact: Sebastián Moreno, +57 315 658 6550, Legal Representative. Consejo Comunitario de La Plata-Bahía Málaga. Contact: Hoovert Eladio Carabali, +57 317 657 8219, Legal Representative, abacua1969@hotmail.com
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Auditor	Rainforest Alliance. Contact: Janice O'Brien, +1-647-899-7214, jobrien@ra.org
Project Start Date	26 August 2013
GHG Crediting Period and Project Lifetime	26 August 2013 – 25 August 2043
Project Implementation Period and GHG Monitoring Period	Not applicable for validation.
Validation Status	Seeking full validation
CCB Status History	Undergoing initial validation
Standards Used	VCS v3.0, VCS Methodology VM0006 v2.1, CCB v3.0
CCB Benefits Summary	The project objectives are threefold: (i) to mitigate climate change by reducing deforestation and forest degradation, and natural recuperation of already degraded forest lands; (ii) contribute to biodiversity conservation including High Conservation Values, and, (iii) foster sustainable development of local communities.

Gold Level Criteria	Community – The project will work to enhance the livelihoods of particularly vulnerable groups within communities and the communities themselves.
Date of PDD Completion	10 April 2015
PDD Version Number	5.14
Expected Verification Schedule	January, 2016 and annually thereafter

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Annex B	Right of Use	Yes	INCODER-INCORA resolutions for Bahia Malaga La Plata
Annex C	Baseline Scenario		Socioeconomic study
Annex D	Project Scenario		Theory of change model
Annex E	Project Scenario	Yes	Business plan
Annex F	REDD+ Implementation Plan and Budget	Yes	Financial plan
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Annex I	Right of Use	Yes	Demonstrated legal compliance
Annex J	Project Scenario	Yes	Letters establishing project start date
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Annex	Thematic Group	Confidential	Description
Annex S	Technical		Community monitoring protocol
Annex T	Technical		Biodiversity monitoring protocol
Annex U	Technical		Duplicate of GeoEcoMap Remote Sensing Reports
Annex V	Technical		Detailed carbon accounting model
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Annex X	Baseline Scenario		Timber study
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Annex Z	Project Scenario		Duplicate of GeoEcoMap Remote Sensing Reports
Annex AA	Technical		Duplicate of GeoEcoMap Remote Sensing Reports
Annex AB	Technical		Duplicate of GeoEcoMap Remote Sensing Reports
Annex AC	Technical		Duplicate of GeoEcoMap Remote Sensing Reports
Annex AD	Attributes		Endangered species list for birds
Annex AE	Attributes		Endangered species list for mammals
Annex AF	Attributes		Endangered species list for amphibians
Annex AG	Attributes		Endangered species list for reptiles
Annex AH	Attributes		Endemic species reference
Annex AI	Attributes		List of megadiverse countries
Annex AJ	Attributes		Paper on general diversity in region
Annex AK	Attributes		HCV guidelines
Annex AL	Attributes		RAMSAR documentation
Annex AM	Attributes		SBIA guidelines
Annex AN	Project Scenario	Yes	Duplicate letters establishing project start date
Annex AO	Attributes		Ecological mapping documentation
Annex AP	Attributes		Biodiversity study
Annex AQ	Attributes		Report on state of natural resources
Annex AR	Baseline Scenario		Duplicate of socioeconomic study
Annex AS	Technical		Comparison of native forest types between project area and reference area
Annex AT	Technical		Reference area delineation and historical reference data
Annex AU	Project		Non-Permanence Risk Assessment

Annex	Thematic Group	Confidential	Description
	Scenario		
Annex AV	Legal	Yes	Framework Agreement between Community Councils and FONDO ACCION (draft)
Annex AY	Technical	Yes	BioREDD+ Bajo Calima y Bahía Málaga (BC-BM) REDD+Project´s occupational risks assessment and mitigation measures
Annex AX	Project Scenario	Yes	Documentation supporting the justification for the project start date
Annex BA	Attributes		Responsible Fishing Practices and Commercialization
Annex BB	Technical		Duplicate of GeoEcoMap Remote Sensing Reports
Annex BC	Attributes		Instituto Geografico Agustin Codazzi (IGAC) soil classification, mapping studies, and soil classification calculations
Annex BD	Technical		Duplicate of Instituto Geografico Agustin Codazzi (IGAC) soil classification, mapping studies, and soil classification calculations
Annex BE	Attributes		Illegal Crops in Colombia
Annex BF	Technical		Spatial Modeling Report
Annex BG	Technical		Methodology for determining the Leakage Area

1 GENERAL

1.1 SUMMARY DESCRIPTION OF THE PROJECT

Project Name: Bajo Calima y La Plata-Bahía Málaga (BCBM) REDD+ Project

1.1.1 PROJECT DESCRIPTION

This project is an Agriculture, Forestry and Other Land Use (AFOLU) project under the Reducing Emissions from Deforestation and Degradation (REDD) project category. Specifically, the project is of the "Avoided Unplanned Deforestation & Degradation" (AUDD) project category.

The project is estimated to generate approximately 13,031,611 VCUs over 30 years. The project area is located in the collective territories of Bajo Calima and La Plata-Bahía Málaga in the Pacific coastal municipality of Buenaventura, in the Department of Valle de Cauca. Belonging to the biologically diverse Chocó-Darién bioregion, forests in the project area are important nationally and internationally for the ecosystem services they provide. The project area forests, however, have experienced a continued reduction in biomass due largely to illegal logging. These forests have historically been an important source of income for local families, who periodically harvest timber when the economic needs arise.

Changes to Colombian constitutional law in 1991 resulted in the recognition of the ancestral presence and possession of lands by communities of African descent on the Pacific coast. Subsequent legislation detailed in Section **1.3.5**granted land title to these communities. A component of this legislation, Law 70, also gave these communities the right to self-administration including rights of use of the natural resources present in their territories under the legal dispositions of Colombia.

Illegal timber extraction is historically an important source of income within the project zone and is the major focus of the REDD+ project. Following from the gradual degradation of forests caused by continual timber extraction, many forest areas are ultimately converted to agriculture and pasture. The project aims to alleviate these pressures on the forests through the support of governance capacity (including individual property titling, land-use planning and conservation zone demarcation), the generation of alternative economic activities and income sources, and through capacity building in administration and management. These project activities, beyond protecting local forests and biodiversity, contribute to social and economic development in one of the poorest areas of Colombia. The effectiveness of these activities is partially dependent on their long-term economic success and wide-spread adoption.

Since the project's inception, local communities have been actively participating in the project's formulation and implementation. The early involvement of participating communities has created awareness among community members and readiness for project implementation. Community support has culminated in the project's endorsement by the legal representatives of communities and the communities' General Assembly. These endorsements demonstrate the communities' long-term commitment to emissions reductions from avoided logging and deforestation.

1.1.2 PROJECT OBJECTIVES

The project objectives are threefold: (i) to mitigate climate change by reducing deforestation and forest degradation, and recuperation of already degraded forest lands; (ii) contribute to biodiversity conservation including High Conservation Values, and, (iii) foster sustainable development of local communities. Following is a more detailed description of each objective.

1.1.3 CLIMATE OBJECTIVES

The project's climate objectives are to mitigate climate change through measures to alleviate the drivers of deforestation and forest degradation. The resultant decrease in illegal logging, the recovery of already degraded forests, and the reduction of forest conversion to other land uses is expected to decrease emissions and enhance forest carbon stocks over time.

1.1.4 COMMUNITY OBJECTIVES

The project's community objectives are to strengthen livelihood capitals as defined by the Basic Sustainable Livelihoods Framework (SLF) (Richards 2011). These are: (i) strengthening local governance through improvements to land-use planning and implementation; (ii) supporting the development of sustainable economic and livelihoods alternatives through training and technical assistance in agriculture and fisheries, harvesting equipment, processing plants, and value chains; (iii) social investments in development planning, water treatment and health care; (iv) enhancing local administrative, leadership capacity and environmental awareness through training activities which intentionally include women from the communities; (v) contributing resource and salary associated funding for REDD+ project implementation; (vi) enhancing social capital through the creation or strengthening of institutions (corporations, associations, cooperatives).

1.1.5 BIODIVERSITY OBJECTIVES

To contribute to biodiversity conservation through long-term improvements to the extent and connectivity of intact natural forest cover and associated structural, compositional, functional and High Conservation Value attributes, as compared to baseline scenario conditions.

1.2 PROJECT LOCATION

1.2.1 OWNERSHIP AND CONTROL

The Project Proponents are the communities of Bajo Calima y La Plata-Bahía Málaga: The entire project area lies within the areas awarded to these communities through executive resolution (Section **1.3.5**). The communities are organized as Community Councils (Consejos Comunitarios, or CC), to which the property rights have been allocated. These land rights are protected by Constitutional Law, and by Law 70/93. These lands cannot be expropriated nor have liens set on them. The Right of Use is exclusively placed on the local communities belonging to the same Afro-descendant ethnic group.

1.2.2 PROJECT'S GEOGRAPHIC BOUNDARIES

The territories belonging to Bajo Calima and La Plata-Bahía Málaga (BCBM) are located in the Pacific coastal municipality of Buenaventura, in the Department of Valle de Cauca. The project's boundaries are identified in Figure1 below. Spatial boundaries and coordinates for the project area are provided in Section **1.2.5.2**.

Figure 1. The project's geographic boundaries.

1.2.3 PROJECT PHYSICAL PARAMETERS

The Colombia Pacific Region in which the project is situated is composed of three physiographic divisions: the Occidental Cordillera flanking the east boundary and the Aguila Mountains to the north; the Baudó and Darién Mountains to the north; and the Pacific Sedimentary Basin to the west. The Occidental Cordillera, Aguila, Baudó and Darién Mountains result from geologic processes including the uplift of marine sediments, whereas the Pacific Sedimentary Basin consists largely of sediments originating from these same mountain ranges (see **Annex AO**).

As a result of these processes the region is characterized by a mosaic of varied terrain from low lying fluvial marine and relatively young, dynamic alluvial plains and steep valleys (See **Annex AP**) accompanied by the mountainous terrain of the Occidental Cordillera reaching elevations of up to 4,000 meters to the east and the previously mentioned Aguila, Baudó and Darién Mountains further north. Various rivers drain over a relatively short distance from the Occidental Cordillera to the Pacific, including the San Juan, Atrato, San Jorge, Cauca-Nechi and Magdalena.

1.2.3.1 Soil

Soils in the project area and project zone originate from geologic and geomorphic processes important to the Colombia Pacific Region as a whole. These include fluvial-gravitational processes delivering sediment from plutonic and volcanic, metamorphic and sedimentary rock of the Occidental cordillera (see Section **1.2.3.2** on Topography below), as well as sandstone and limestone ridges and hills, and calcareous materials from the Baudó range to the north.

Alluvial and colluvial deposition occurs in the valleys originating from the Occidental cordillera and along rivers of the Baudó range (**Annex AO**). Alluvial plains occur on a significant proportion, close to 10% of the Pacific region, on sloping to flat terrain, deposited by the several large rivers which confluence at the Pacific Ocean. Even greater in proportion, at close to 15% of the regions, are the meandering alluvial plains, terraces, flood plains, swamp and marshy depressions resulting from processes of deposition and erosion by the region’s largest rivers joining the Pacific, including the Atrato River flowing through Quibdo. Marine and mixed fluvial marine deposits account for various formations along the coast including marshes, estuaries, marine terraces and deltas.

The soil formations arising from these, as well as climatic processes over time, are complex. A soil class/landform map for the Pacific coastal region of Colombia was developed by Saatchi (2014) to help with the stratification of the landscape. The soil class data for the entire study area have been derived from the Soil and Terrain Database for Latin America and Caribbean (SOTERLAC, version 2) released in 2005 at 1:5 million scale (Dijkshoorn et al. 2005). The assignment of soil classes was based on matching the descriptions of the map units and comparing with the landforms and geographical description provided by Sombroek (2000).

Main soil types in the region include: heavily leached white sand soils (spodosols and spodic psamments) which predominate in the upper Rio Negro region and include arenosols, regosols, and podzols; less infertile lowland soils (ultisols and entisols, which are predominant in the western Amazonian lowlands and some parts of Brazil; more fertile lowland soils; alluvial deposits including very recent deposition; contemporary alluvial soils including acrisols with plinthic and gleyic content, gleysols, luvisols and histosols; young, submontane soils, perhaps fertilized by volcano-aeolian deposition; and, other soil types with less information (most likely histosols). Figure 2 depicts soil types of the region the project zone in particular).

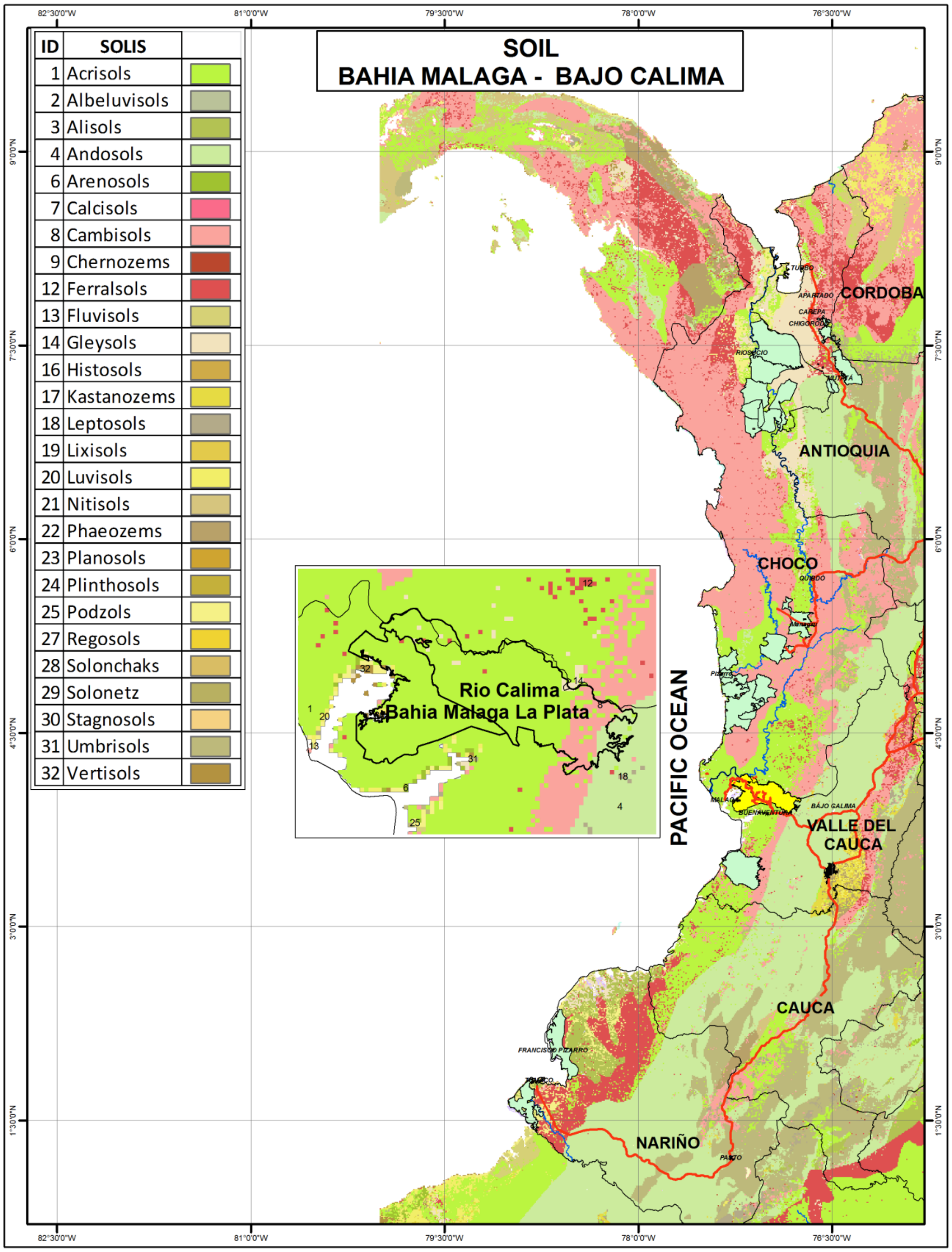


Figure 2. Main soil types. Source: Terrain Database for Latin America and Caribbean (SOTERLAC, version 2).

Within the Pacific Coast the Instituto Geografico Agustin Codazzi (IGAC) carried out a classification and mapping exercise of soils in the Rio Anchicaya and Rio Calima watersheds which cover the area of BCBM. For each watershed soil regions were classified by a number of variables including previous soil studies by IGAC, climatic conditions, geomorphology, geology, and Holdridge ecological zones (for full studies see Annex BC). Using this data a classification was constructed using geostatiscal methods of Kriging and reference data that was collected through transects to confirm soil taxonomy that covered ~5% of each department. Hardcopies of the soil maps have been provided by IGAC that can be found in Annex BC.

Physical and chemical data were also collected using soil pits within the sampled transects at a sampling rate of two per every 100 hectares using IGAC's Manual de Métodos y Especificaciones para los Estudios de Suelos.[1] Data collected in soil pits included clay-sand-silt content, pH, soil organic carbon (SOC), and detailed chemical information. The data collected for each soil pit was assigned to a soil class based on the classification effort described above, giving a spatial dimension to the detailed soil analyses. To determine the SOC content across the Rio Anchicaya and Rio Calima watersheds for each sample taken a weighted average by depth was taken and then summed for each sample. Where multiple samples were taken in the same soil class the average was used. Table 1 shows a summary of the SOC and soil organic matter (SOM)[2] for soil classes found in the Rio Anchicaya and Rio Calima watersheds with a range SOM from 1.2% to 10.6% (See Annex BC for detailed calculations).

Soil Class	SOC (%)	SOM (%)
FA	4.33	7.46
PB	4.01	6.91
AN	1.72	2.96
QE	1.80	3.11
LC	0.79	1.37
EM	1.02	1.76
AG	0.79	1.37
CO	0.71	1.23
BU	0.94	1.62
LB	4.11	7.08
BO	0.76	1.32
CA	1.37	2.36
TC	1.17	2.02
ZA	1.62	2.79
AJ	6.13	10.56

[1]INSTITUTO GEOGRÁFICO AGUSTÍN CODAZZI. (IGAC). Métodos y especificaciones para los estudios de suelos. Subdirección de Agrología. Bogotá, 1998. 35 p.

[2] A conversion factor from SOC to SOM of 1.724 was used.

ME	2.51	4.32
PI	0.86	1.47

Table 1: Summary of IGAC soil classes and their soil organic content (SOC) and matter (SOM).

1.2.3.1.1 Mangroves

The project area consists of mangrove systems that are considered to be important carbon sinks, especially for their soil which can have high concentrations of organic matter. In similar mangrove systems in the north of Cartagena de Indias the soil organic matter (SOM) was found to be between 10-30% at a one meter depth for 83% of the samples with no samples exceeding 50%.[3] Another study of mangroves within the Departamento de Atlantico finds the SOM across 10 different sites to range from 2 - 36%[4] demonstrating the climatic importance of these areas.

1.2.3.2 Topography

Digital elevation data at 100-meter resolution was used to distinguish classes separating coastal areas from inland elevation gradients including the Andean foothills. These classes are 1-100 m, 101-600 m, and >600 m elevation. SRTM digital elevation data at 30-meter (1 arcsec) resolution was also used in the analysis of radar data and the land cover classification.

[3] Lentino, C., et al. 2010. Mangles de Cartegena de Indias: Patrimonio Biologico y Fuente de Bioversidad. Fundacion Universeritaria Tecnologico Comfenalco

[4] Fhyr, J. 2007. A study of mangrove forests in Departmento de Atlantico, Colombia. Committee of Tropical Ecology, Uppsala University.

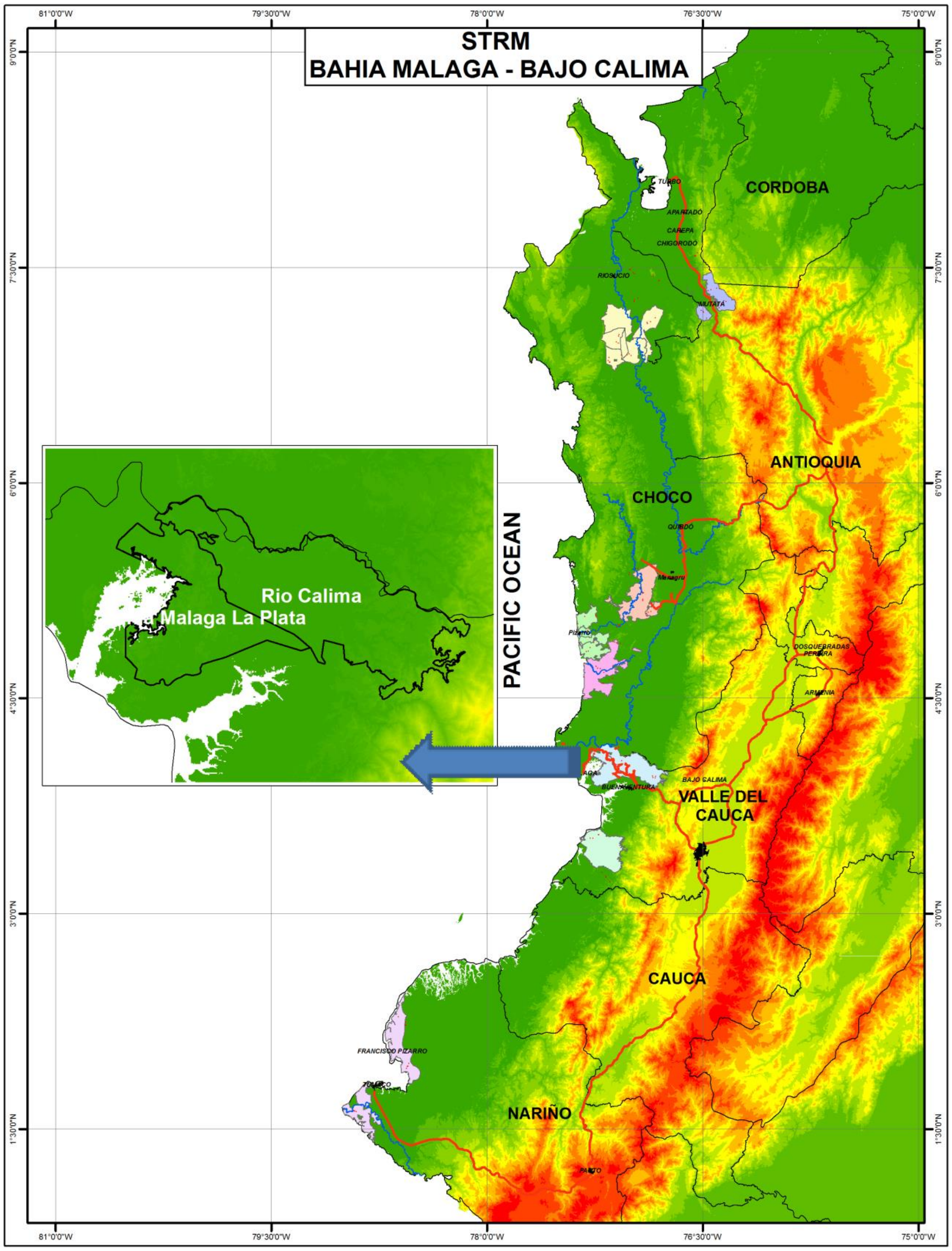


Figure 3. Digital elevation map from STRM (90 m resolution).

1.2.3.3 Climate

The majority of the Colombian Pacific Region, at lower elevations west of the Occidental Cordillera and bordering the coast, is subject to mean annual temperatures > 25 degrees Celsius, generally increasing from south to north at elevations below 1200m where the majority of the BioREDD project sites are located. At elevations greater than 2000m to the east in the Occidental Cordillera mean annual temperatures drop to as low as 7 to 15 degrees. Moisture classifications in the region range from humid, to humid and perhumid, and superhumid (**Annex AO**). Precipitation ranges from 3000mm per year and ranges up to 13,000mm (**Informe del estado del medio ambiente y los** recursos naturales) generally increasing from south to north, making the region among those with the most precipitation globally.

Analysis for the BioREDD program took climate metrics on rainfall and precipitation from WorldClim, including 11 temperature and 8 precipitation levels at 1 km resolution (see **Annex P** for data sources). Three distinct classes of drier, medium-wet, and wet, were separated to allow stratification of the region based on climate driven impact on forest cover and its dynamics. The categories are broad but provide distinct zoning significant to forest structure and diversity. Although rainfall in the Chocó bioregion surpasses 8000 mm in some areas there is a large variability along the latitudinal and elevation gradients. Three categories were used to distinguish rainfall levels within the driest sub-regional areas: < 300 mm, 300-600 mm, and >600 mm.

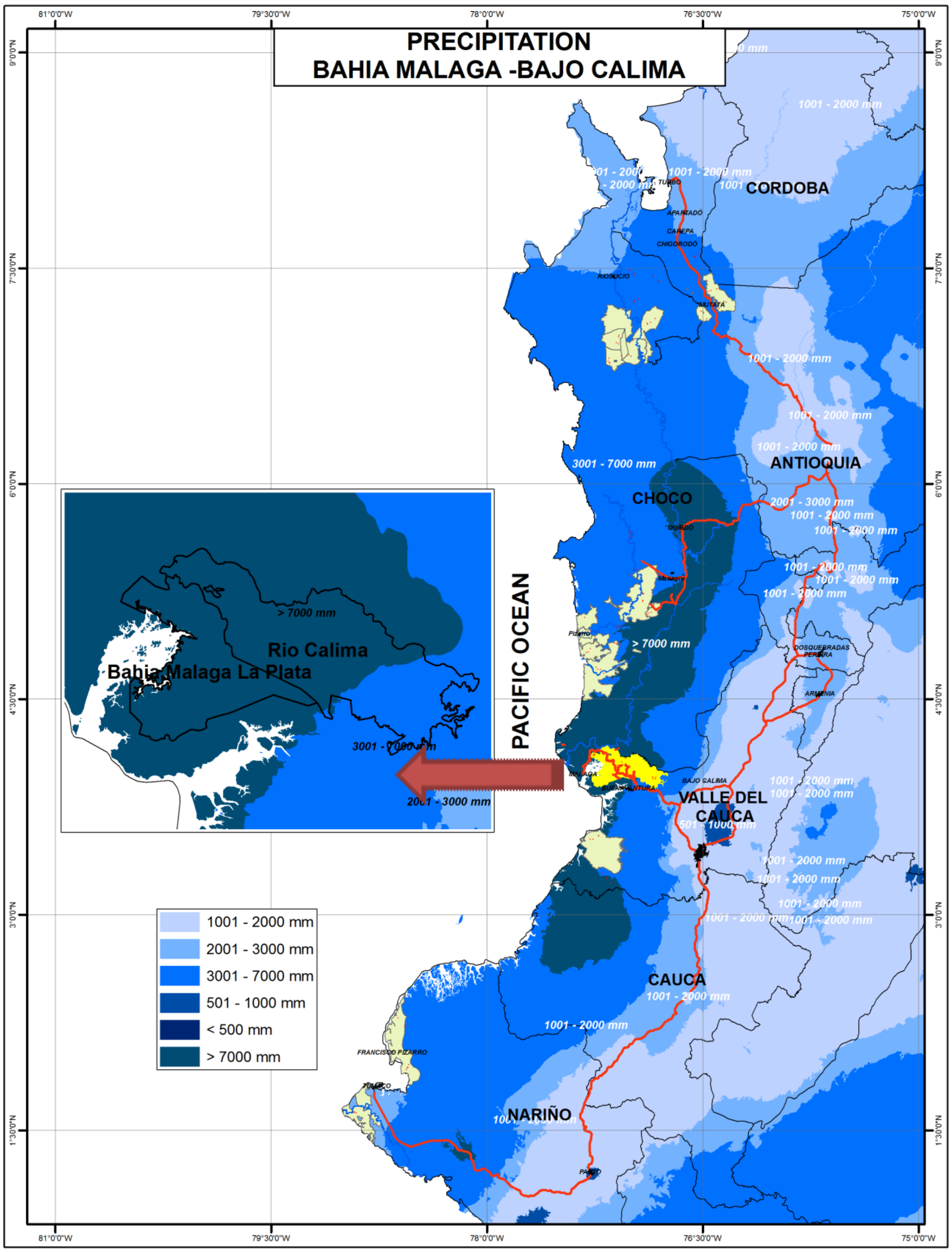


Figure 4. Precipitation levels map (IDEAM 2008).

1.2.4 PROJECT ZONE

The REDD+ project zone is defined as the entire territory of the communities. Together these comprise the area within which REDD+ project activities that directly affect land and associated resources will be implemented.

1.2.4.1 Project Zone Map

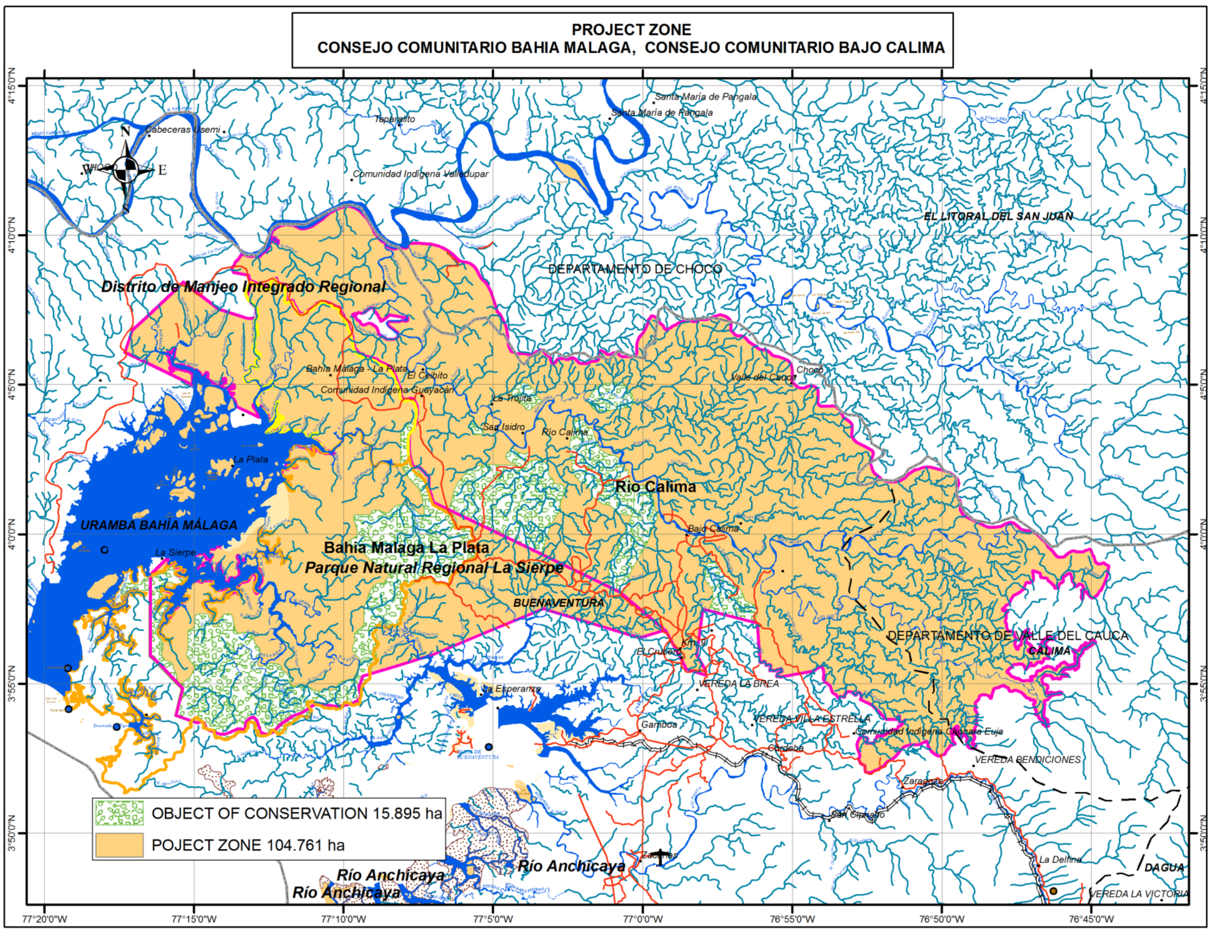


Figure 5. Project zone map.

1.2.5 PROJECT AREA

The project area corresponds to an area of 83, 452 hectares of forested community land influenced by project activities. Areas of commercial extraction under Forestry Management Plans are excluded from the project area may be harvested in the future.

1.2.5.1 Project Area Map

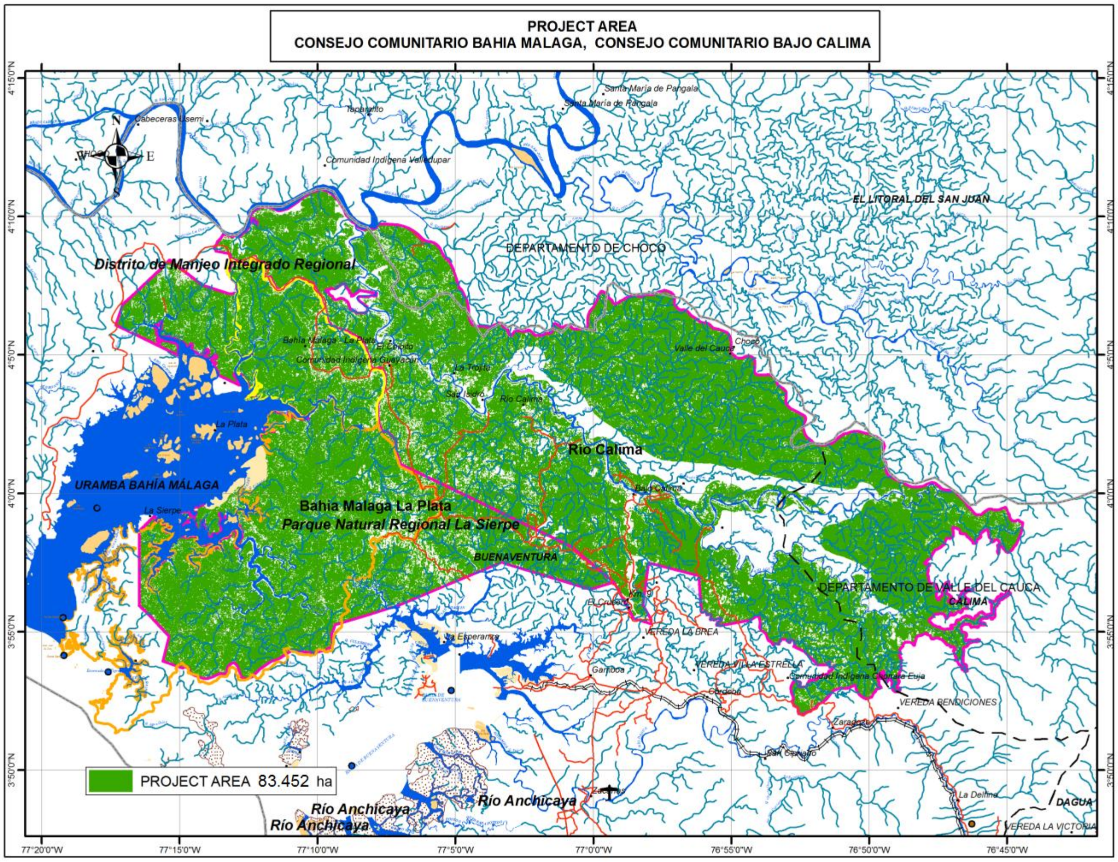


Figure 6. Project area map.

1.2.5.2 Spatial Boundaries

Community Council	Area (ha)	Center point Coordinates (Lat, Long)	
Bajo Calima	51,100	77˚09'35" W	4˚00'19" N
La Plata-Bahía Málaga	32,352	76˚58'39" W	4˚02'04" N
Total	**83,452**		

Table 2. Spatial boundaries of the project area.

1.2.5.3 Multiple Parcels

The project consists of two discrete parcels.

1.2.5.4 Project Area and Reference Region

The reference area corresponds to an area of 255,913 hectares, presenting the same geographical, and deforestation and degradation conditions as the project area, as required by VM0006 and as described in Section **5.3.1.1**. The reference area includes the Afro-descendant ethnic community of ACADESAN and the municipality of Sipi. A map of the reference area can be found in Section **5.3.1**.

1.2.5.5 Vector-Based Files

A Keyhole Markup Language (KLM) file is provided separately in **Annex K**.

1.2.6 SURROUNDING AREA MAP

Surrounding areas potentially impacted by project activities are identified by the maps in Section **1.2.4.1** and Section **5.2**(project zone and leakage management area). Figure 1 shows the project location and surrounding area.

1.3 CONDITIONS PRIOR TO PROJECT INITIATION

1.3.1 ELIGIBILITY

The project activities have been designed as part of the REDD+ project with the intention of reducing CO2 emissions from deforestation and degradation compared to baseline levels. As required by VM006, the land in the project area is forested, meeting the definition of forest as defined by the Government of Colombia[5]. These areas were forests for a minimum of 10 years before the project start date as evidenced by historical LULC analysis (see Section **5.3.2.3**). The project area would be degraded or deforested in the absence of the REDD project activity and the deforested and degraded areas must be mosaic in nature. Drivers of deforestation and forest degradation include:

- Logging of timber for commercial sale
- Conversion of forestland to cropland for subsistence farming
- Conversion of forest land to settlements

For the determination of the drivers of deforestation and degradation, see Section **4.5.3.2**.

1.3.2 VEGETATION AND FOREST TYPE

A notable diversity of forest vegetation types occur in the Colombian Pacific Region. Distinctions between vegetation types arise from many of the climate and soil related variation described in Section **1.2.3**. In their year 2000 report on ecological zoning with the Colombian Pacific Region, the Colombian Ministry of Environment and Instituto Geographico Agustin Codazzi describe vegetation cover types based on methodologies developed by UNESCO(**Annex AO**). These include five categories of Andean, Sub-Andean, and Shrub Forest growing at higher elevations in the Pacific region. While many vegetation type distinctions correspond to elevation, others are azonal distinctions due to extremes in localized factors such as soil types and moisture regimes.

[5]Areas with canopy coverage over 30% and with tree heights over 5 m. FAO sets the minimum canopy coverage at 10%.

At lower elevations, in proximity to the coast and immediately relevant to the BioREDD project areas are another eight forest types. These include Low Altitude and Low Mountain Forests within which four distinctions occur based on species and structural characteristics. Also present are Mangrove Forest and Shrub Mangrove, occurring in tidal area along coastal inlets and shorelines sheltered from waves and where only halophytic shrubs and trees grow due to periodic salt water flooding; Alluvial Forests exposed to flooding and tending to form the important cativale associations, for example along the Atrato River; Alluvial forests with the presence of palms and heavy undergrowth; and, Alluvial Forests within marshland along the Atrato River. There are several non-forest, shrub and herbaceous vegetation types present in the region.

There are approximately 88,853 ha of intact, terra firma (non-flooded) forest in the project area (Figure 8), followed in magnitude by degraded forest at 35,331 ha. Other vegetation cover types include secondary forest as well as pasture and cropland, mangrove and other wetland forests.

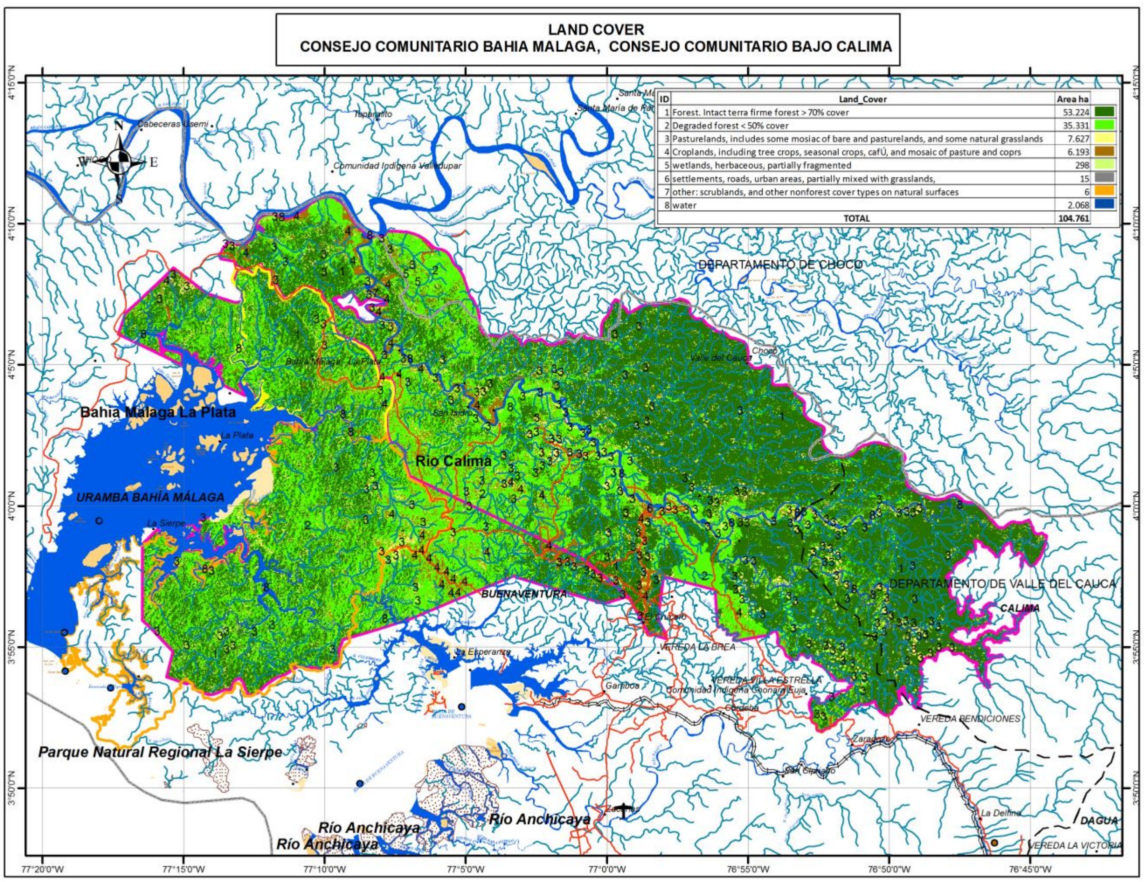


Figure 7. Vegetation cover.

Plant species are incredibly diverse as reflected by Colombia's ranking in second place globally for biodiversity, and the 5,125 plant species documented to occur in the Colombian Pacific Region (**Annex AJ**). While inventory and documentation of vegetation in the project zone is far from exhaustive to date, biodiversity plots currently being established by the Humboldt Institute for the BioREDD program will greatly increase knowledge of plant species relevant to the project zone and the Colombian Coastal Region. Some commonly encountered plant species in the area as documented in forest management plans for the project area are listed in Table 3. Further documentation of plant species in the project area is kept on file and will continue to expand as a component of the project activities, and additional species are listed in Section 1.8, High Conservation Values.

Common Name	Scientific Name	Common Name	Scientific Name
Common primary forest species		**Some commonly utilized plant species**	
Aceite maría	*Calophyllum mariae*	Bejuco Zaragosa	*Aristolochia sp.*
Aceitillo	*Marila sp.*	Aceite, Mario	*Calophylum mariae*
Aguacatillo	*Persea sp.*	Ají	*Erythroxylum sp.*
Aguamiel	*Terminalia sp.*	Algarrobo	*Hymenaea sp.*
Ají	*Andira inermes*	Aliso	*Belotia cf. Panamensis P.*
Algarrobo	*Hymenaea courbaril*	Amargo andres	*Sin identificar*
Algodoncillo	*Hampea sp.*	**Examples of palms**	
Amargo	*Welfia sp.*	*Attalea spp.*	Taparín, Táparo
Anime	*Protium colombianum*	*Phytelephas sp.*	Palma tagua
Anime blanco	*Dacryodes colombianum*	*Manicaria saccifera*	Jícara
Anime corocillo	*Dacryodes sp.*	*Welfia georgii*	Palma amargo
Arenillo	*Basiloxylon excelsum*	*Jessenia polycarpa*	Sin nombre

Table 3. Common Plant Species in the Project Zone.

Deforestation and forest degradation resulting primarily from commercial timber harvest over a period of more than 60 years has led to structural conditions dominated by young forests with small diameter trees in varied successional states. Despite these pressures the resilience of these ecosystems is evidenced through an abundance of natural regeneration, however, unsustainable exploitation has continued to severely affect structural attributes (e.g. age, and height, diameter and density, crown closure, etc.) and deforestation reduces connectivity between existing forest patches. It is estimated that, left to recover naturally, these forests are able to return to a state approximating natural conditions within 15 years.

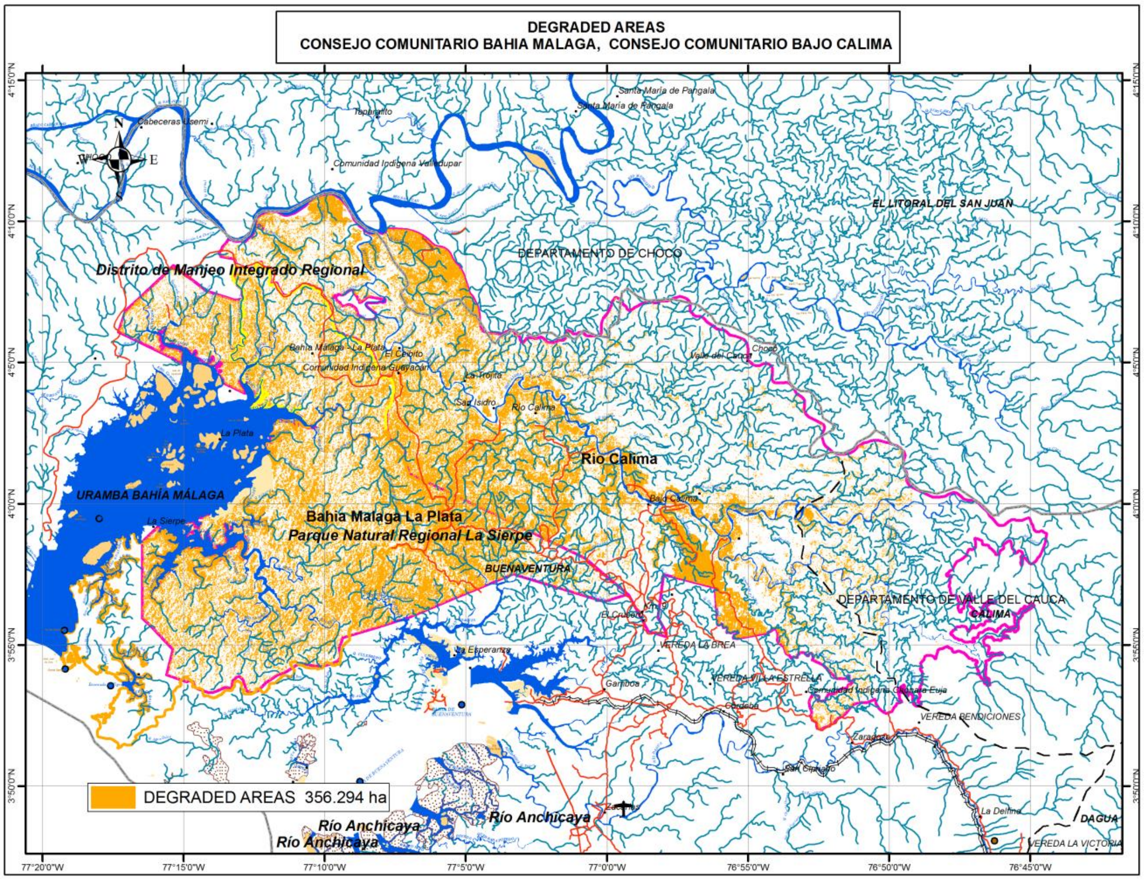


Figure 8. Forest degradation map.

A Land Use and Land Use Change (LULC) analysis undertaken for the Project, described in Section **4.5.3.4** employed SRTM data were used to help separate vegetation types over landscapes at different elevations for the project area and zone. Both 50 and 100 m resolutions were used in the analysis. For the project area itself, the data was resampled to 25 m to match the ALOS PALSAR and GeoSAR data for detailed landscape variations of vegetation cover. The data were also used to create general categories of vegetation over the elevation by separating the landscapes over 300 m, 600m, and 1800 m elevation, to separate the coastal vegetation from sub- montane, montane, and potential cloud forests along the Andes. Current forest types based on structural conditions distinguished as a result of the LULC analysis are shown in Figure 9 below

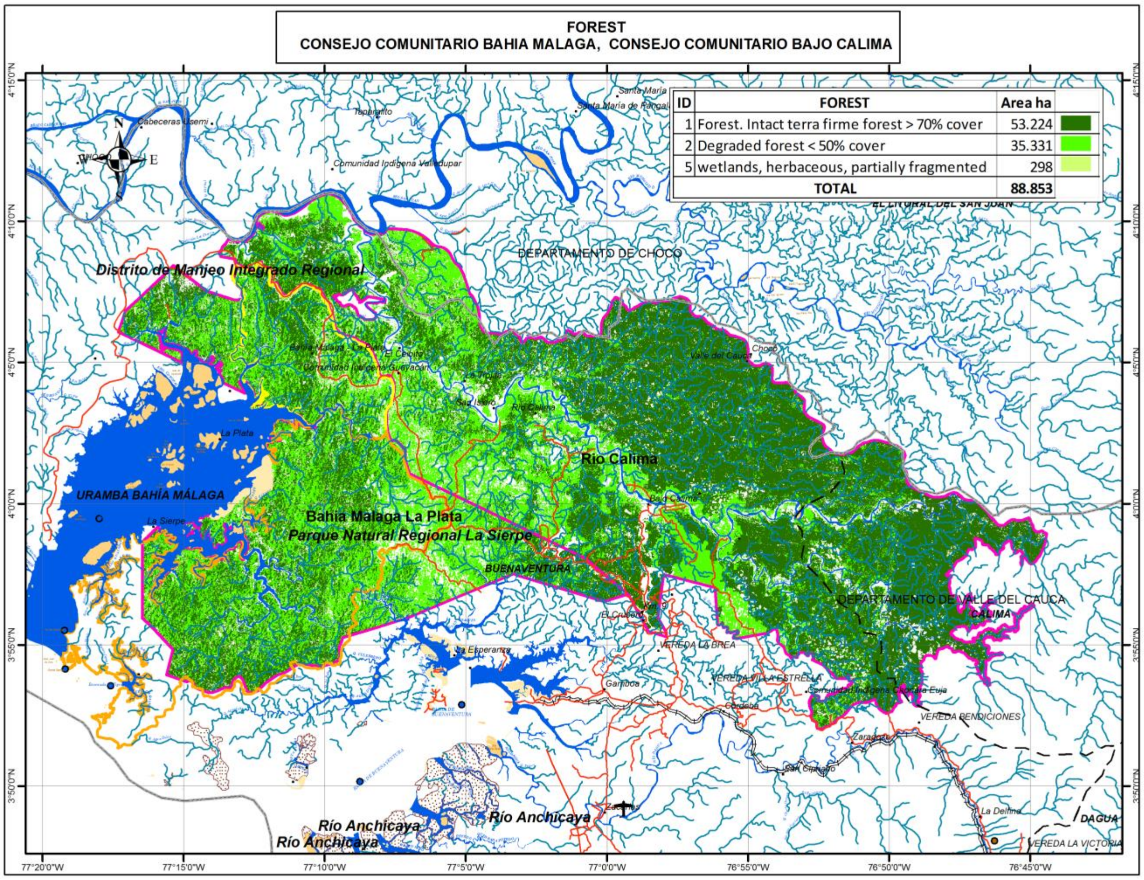


Figure 9. Forest types by structural attributes.

1.3.3 CARBON STOCKS

Carbon stocks are present in the form of existing forest carbon pools associated with the forest types described in Sections 1.3.2 and 5. See Section 4.4 for more information on included carbon pools and Section 5.3.4.3 for sources and detailed estimates of carbon stocks. The carbon stocks in the project area are summarized below by carbon pool in Table 4 and Figure 10. Carbon stock estimates provided in Table 4 are calculated in Annex V. Detailed estimates and standard errors by LULC class are also provided in Section 5.3.4.1.

Carbon Pool	Carbon Stocks (tC/ha)
AGT (tC/ha)	112.60
AGNT (tC/ha)	3.00

BG (tC/ha)	32.34
LDW (tC/ha)	14.80
SDW (tC/ha)	4.71
DTS (tC/ha)	2.40
Total (tC/ha)	169.86

Table 4. Carbon stock estimates (see VM0006 for pool designations).

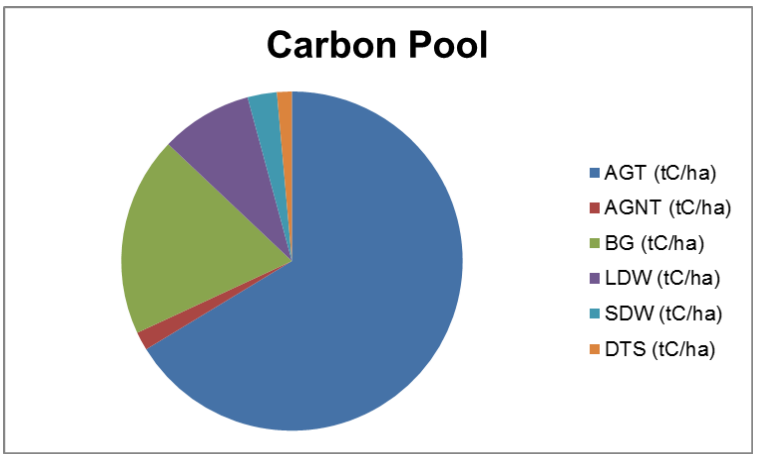


Figure 10. Chart showing breakdown of carbon stocks by carbon pool.

1.3.4 LAND USE

There are two distinct classes of land use: traditional, and land under resource and legally-sanctioned forest management. Although legal titles are community based, each family has certain rights to the property surrounding their dwelling to undertake productive activities including crop cultivation. This is what is known as traditional land use. Families also have rights to exploit the forests beyond their property. These areas, being further out, are considered communal property in the sense of a commons resource and are accessed by community members for selective logging. Most community members with traditional, dwelling-associated property combine logging with different economic activities (mostly agriculture and fisheries). Mangroves are protected by law, and cannot be harvested. However, some community members use them for local timber production and trading. It is important to note the distinction between logging in traditional use and legally-sanctioned forest management areas; only those areas approved by the Regional Environmental Authority for timber production are legally-sanctioned while those traditional use areas are not legally-sanctioned. From this perspective, logging in traditional use or communal areas not recognized for forest management by the Regional Environmental Authority is considered illegal despite community-granted rights.

While forest logging concessions took place up to the enactment of Law 70 in 1993, present agriculture activities are mainly associated more with subsistence crops. Areas adjacent to rivers are preferred for subsistence cultivation, leaving the majority of the project area in forest cover albeit in various states of degradation due to timber extraction. In addition to timber extraction, foreigners (e.g. from Tumaco) illegally cut trees for charcoal production and consumption outside the project area. In some cases of extreme degradation, forestland is ultimately converted to non-forest by these logging practices.

For more information on the agents and drivers of deforestation, please see Section **4.5.3** below.

1.3.5 PROPERTY RIGHTS

The land in the project areas belongs to the communities. In 1991 the Constitutional Law of Colombia recognized the ancestral presence and possession of lands by communities of African descent on the Pacific coast. As a result, Law 70 was issued in 1993, which gave these communities rights to title and natural resources. Subsequent executive acts, called "resolutions", provided official titles to the communities organized as Community Councils, and set the specific boundaries. In the case of Bajo Calima, 66,724 ha were awarded by means of the Resolution INCODER 2244, 4 December, 2002 from INCORA (Instituto Colombiano de la Reforma Agraria, Colombian Institute for the Agricultural Reform), available as **Annex A**. La Plata-Bahía Málaga was awarded 38,037 ha, through INCORA´s Resolution 2802, 13 December, 2012 (see **Annex B**).

The community councils are organized for self-government, and have administrative bodies mainly consisting of a general assembly, formed by all community members; townships where a representative is elected; and a governing board, elected by the assembly. The board elects a Legal Representative. Although land title is community-based, there is internal recognition of traditional or ancestral private possession over family lands. There are also communal pieces of land kept aside as provision for potentially new community members or family successions. Each family dwelling has rights to the lands they have occupied for generations, including not only the dwelling and housing area, but the neighboring crop areas and back forests. On average, each family possesses 3-10 hectares, which they directly manage. Most families live along the river low-lands, where the trees have already been cleared and the land is more fertile. Lands outside of general family access are considered community lands, and are used for timbering, hunting, and non-timber forest product harvesting (e.g., fruits, barks, lianas, understory medicinal plants).

Currently, there are no disputes over the above-mentioned territories. Based on Law 70 provisions, the Afro-Colombian communities request that their land is titled to INCORA. Any existing disputes are resolved during this process, which results in the issuance of a Resolution granting explicit title to the communities.

1.3.6 COMMUNITIES

Bajo Calima has a population of 3500 inhabitants among 1045 families, and located in 10 villages. Plata-Bahía Malaga has 650 inhabitants in 5 communities. In Bajo Calima the majority (33%) of the population is between 20 and 44 years of age, followed by the 10 to 19 year age range (23.6%). Forty percent of the population is economically active. Gender distribution is generally equal (**Annex C**). In Bahía Malaga men represent 52% and women 48% of the population between 31 and 45 years of age. Fifty-nine percent of the population is between 10 and 44 years old, while just 3% are over 60. For a map of BCBM territories, see figure 12 below.

Figure 11. Age distribution in La Plata-Bahía Malaga

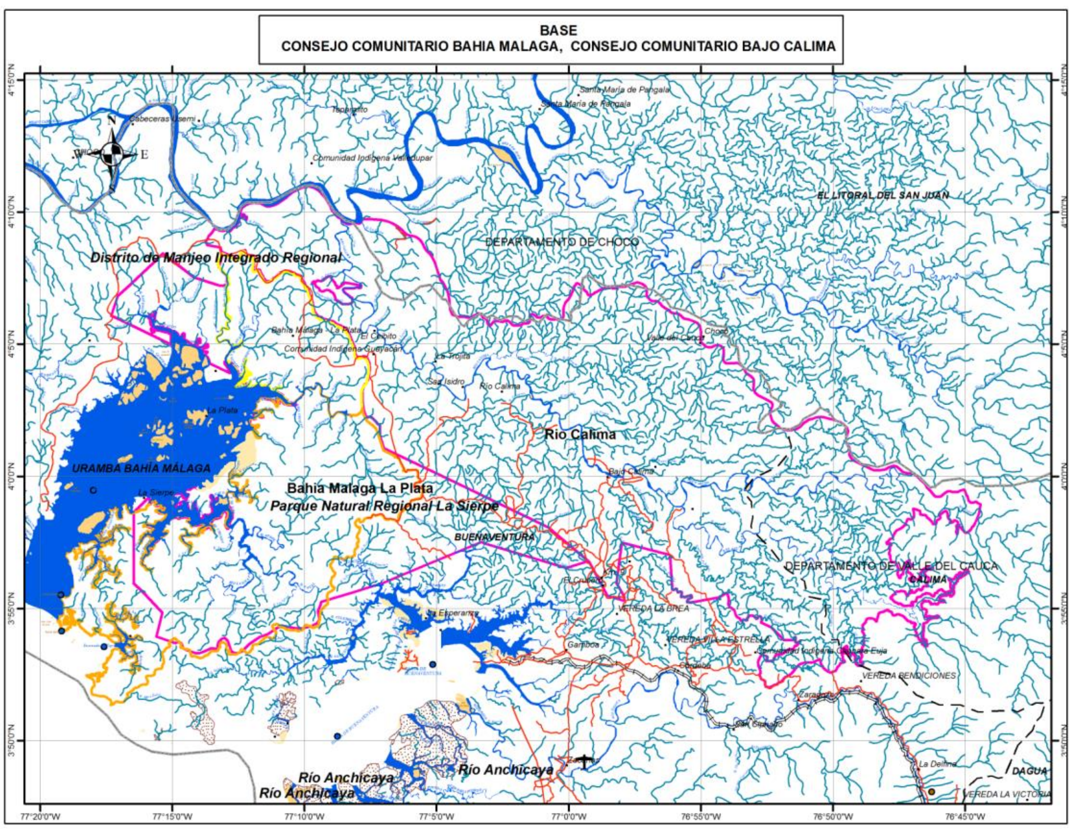


Figure 12. Boundaries of community territories.

1.3.6.1 Main Settlements

Bajo Calima

Village	Population (families)	Primary Economic Occupation
Guadual	32	Madera, pollos, pesca y agricultura
Ceibito	17	Madera, pesca y agricultura
Trojita	22	Madera, pesca y agricultura
La Nueva Esperanza	93	Agricultura, madera, pesca
San Isidro	23	Pesca y madera
El Crucero	82	Madera, minería, pesca y agricultura
La Estrella	27	Madera, minería, pesca y agricultura
Las Brisas	21	Madera
Villa Estela	137	Madera, minería, pesca y agricultura
La Colonia o Bajo Calima	591	Madera, minería, pesca y agricultura

Table 5. Political division of BC.

Bahia Malaga

Vereda/community	Population (families)	Primary Economic Occupation
Mangaña	24	Madera y Piangua
Miramar	43	Madera y Piangua
La Plata	43	Madera, Piangua y Ecoturismo
La Sierpe	42	Madera, Piangua y Ecoturismo

Table 6. Political division of BM.

1.3.6.2 Current Land Use

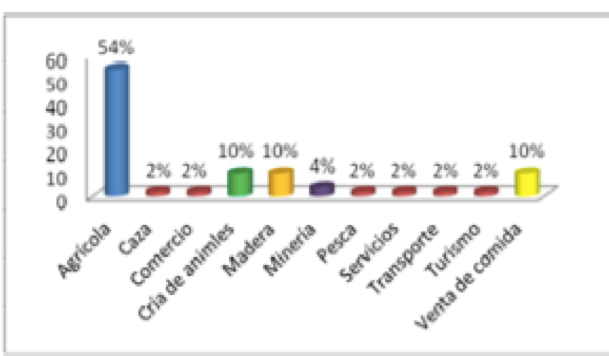
For a description of current land use in the project zone, see Section **1.3.4**.

1.3.6.3 Economic Activities

Main Sources of Income

Timber extraction is an important economic activity for most families in the project zone, along with other income sources. The inhabitants of BM mainly derive their income from commercial activities (30%), followed by fishing (23.3%), and tourism (16.7%), and logging (14.4%). The main crops are cassava and plantains produced to meet family needs. They also cultivate other products such as cocoa, bread tree, rice, borojó, peach palm, sugarcane, coconut, lemon, corn, papachina, and papaya. In general, these territories import most of the food they need, and export oil palm, coconut and cocoa to the rest of the country. The extraction of shellfish is important, especially piangua production, and the fishing of barbinche, croaker, peeled, shortnose, snapper, and toyo. Some mammals are hunted for meat such as bus (Agouti pacca), the tatabro (Tayassu peccary), armadillo (Dasypus novecintus), and the anteater (Tamandua sp.), and birds such as turkey (Penelope montagnii) and partridge (Notocercus boapartei). The main timber species harvested are nato, otobo, sajo, sande and tallow.

The majority of household expenditure is devoted to food (34%), clothing and footwear (24.18%), and transportation (13.24%). Health care is poor, without the presence of centers in la Plata, so community members must go to Ladrilleros, Juanchaco, or the naval base in case of emergencies and deliveries. The houses are in poor condition, and sanitary conditions are practically nonexistent, even for tourists. There are no water purification services, and energy is only present for hours with small diesel plants. There are high levels of illiteracy due to lack of teachers and classrooms, dropouts, and the distance to schools. The satellite telephone service is limited and intermittent. The main priorities expressed in BM are health (17%) and transport (17%), followed by housing (15%)



and business orientation (14%).

Figure 13. Economic activities in Bajo Calima.

In BC, the main source of income is agriculture (54%), followed by animal husbandry (10%), timber (10%), sale of food (10%), and mining (4%). Agricultural activities are aimed at generating livelihoods and major products marketed are banana, peach palm, papachina, cassava, yams, corn, and borojó fruit. Villages with agricultural vocations are Ceibito, Trojita, La Esperanza and La Colonia. Some animals are hunted for meat such as bus (Agouti pacca), the tatabro (Tayassu peccary), armadillo (Dasypus novecintus), deer (Mazama sp), turtles, iguanas and alligators. Birds such as guan (Penelope montagnii), partridge (Notocercus boapartei) and bit (Ramphastos brevis) are also hunted.

Animal husbandry is concentrated on poultry, pigs and fish (tilapia). Cattle operations are carried out by two families with an estimated 240 head of cattle. The logging is done by the majority of the population, from 12 to 65, and is concentrated in the production of sticks, stumps, and poles. Trees aged 4-5 years from species such as chaquiro, guaiac, balsa, sande, blackberry and otobo are primarily harvested. Most household spending goes to food (45%), followed by education (20%), health services, and housing (10% each).

The condition of housing is fair or poor. There is a lack of water and sanitation. The health service is poor, with a few unfilled positions and ill-equipped health promoters who serve a limited number of villages. The community uses traditional medicine to treat the majority of illnesses. The funding for education is poor resulting in insufficient classrooms in bad conditions. In addition, the distance and difficulty of access for students, coupled with child labor in the field, results in high absenteeism and dropout rates. Water is collected and consumed without being purified. Electrical power is available in 4 villages, but only 20% of the population subscribes because of the costs. Communication is limited, as only half of the villages have access to mobile phones. The priority of social investment is concentrated on health (26%), followed by water supply (18%), and business support needs (19%).

1.3.6.4 Ethnic Groups

Indigenous groups originally populating the larger region included Tumas, Iscuandés, Nulpes, Guapis, Sindagüas y Barbacoas (**Annex AR**). With Spanish colonial activities these groups were eventually displaced to mountainous areas inland, generally from about 1600 to 1650. Between 1700 and 1850, escaped and freed slaves of African descent, moved from mining centers and plantations, gradually settling in coastal areas and along rivers and streams abandoned by the indigenous population. These settlers included people of Bantu descent from the Congo, as well as Akanes, Fantis-Ashantis, Ibos and Ewé-Fones from central Africa (Maya 1997, as cited in **Annex AR**). The abolition of slavery in 1851 sped up this migration, and Afro-Colombian communities settled along the Calima, and San Juan rivers and on the Malaga Bay.

Therefore, the project communities are primarily of African descent and have been living in the area as early in the 18th century. Intermarriage with other ethnic groups has been restricted, and ethnic character has been maintained over the centuries.

1.3.6.5 Migration

Migration into the project area and project zone is limited due to social and legal controls; specifically only Afro-Colombians can become part of a community.

1.3.6.6 Social Diversity

Communities have retained their ancestral customs and ways of living, slowly giving way to some modern practices. Their festivities, beliefs, and forms of self-governance have long subsisted, and are now backed by law.

Houses are mostly made of wood and set on or by the water for easy access to the marine resources and for transportation, as rivers and water bodies constitute their main transport and mobility means. Location or lack of access to transportation results in a greater degree of isolation for some community members, whom have a greater level of difficulty participating in community meetings. This is also the case for those who are not able to leave their daily subsistence activities.

Women and community members living in remote locations experience somewhat different social conditions. Women take on more responsibilities in taking care of the household, children, and collection of molluscs in the mangrove areas. Remotely located community members have a greater degree of transportation related issues relative to those near community centers. There are some schools and health care centers in some of the township areas, while most of the other activities such as hospital care, higher education, banking, clothing and entertainment activities are done in the Buenaventura urban area.

1.3.6.7 Economic Diversity

Linked to the cultural and social diversity characteristics present in the project zone, communities have long maintained a dependence on the fruits and products locally obtained. The vast majority, if not the entire community population exists below the defined poverty line. Gradually, imports of basic staples such as rice, paper, clothing, milk, grain, and bread are becoming more important as trade links develop with other parts of the country and beyond. There are commercial activities related to shops and restaurants. Tumaco is the second largest port on the Pacific area and is mostly used for oil and palm oil shipping.

Notwithstanding, most communities living in the inner, more isolated areas of the community territory still live on subsistence crops, livestock, the gathering of fruits, fishing, and hunting. Logging has become one of the few options they have to generate income that can be used when faced with educational needs and economic development projects (e.g. expanding crops, house improvements).

1.3.6.8 Cultural Diversity

Although the communities have adopted most of the modern western culture present in Colombia, they have kept some important traditions, especially related to music, religion, festivities, and traditional medicine. Historically the concept of family has been very important, and influential; functional family ties extend beyond the immediate family to cousins, aunts and uncles, grandparents, godparents and community elders who play an important role in child rearing. Strong parental and family bonds, as well community myths and legends carrying implications for the management and use of natural resources, have traditionally formed important components of the local authoritative framework.

1.3.7 BIODIVERSITY

Colombia, and particularly the region within which the project is situated, is renowned for its richness in biodiversity. While a wealth of knowledge exists with respect to its unique diversity including the many endemic species in depth knowledge of species dynamics and ecosystem function at landscape scales is still limited, as is detailed information on biodiversity at local scales, in many cases. An important objective of the project, particularly informed through the Humboldt study, is to increase the level of knowledge about local diversity in the region. It is very likely that additional species and ecosystem characteristics will become better known as a result of the project.

Regional studies provide information related to known ecosystem classifications and attributes including forest structural attributes, species richness, and levels of endemism in the broader Chocó Darién bioregion. Data which are specific to the project zone have been identified to the best degree possible through local knowledge and reports. Some functional attributes of biodiversity such as nutrient cycling and water purification are addressed in Section **1.3.8.1** as they relate to ecosystem services, HCVs, and climate.

Owing to a number of factors including its equatorial position, great geographic variation from coasts to cordillera to the Amazon basin, Colombia has been declared as megadiverse, along with 16 other countries globally, for containing what has been estimated to be 70% of global biodiversity (UNEP-World Conservation Monitoring Center). Historical isolation from the Amazon due to the Andes Mountains resulted in the evolution of new species (see **Annex T** and **Annex AQ**). In the late Pliocene approximately 3 million years ago, the Great American Interchange occurred when volcanic activity caused the emergence of Panamanian isthmus, connecting of South and North America. This has also contributed substantially to Colombian biodiversity due to the migration and related interchange of species (see **Annex AP**).

Colombia is ranked second in the world in terms of the commonly considered gene, species and ecosystem levels of biodiversity organization. Accounting for an estimated 10% of the world's floral and faunal species, Colombia is one of only 12 countries globally that are considered megadiverse (See **Annex AI**). High rainfall, tropical conditions and isolation (topographical separation of the Amazon basin) contribute to the notably high biodiversity within the Chocó-Darien Bioregion Colombian Pacific Region. The Pacific Region within which the project is situated is considered to have 831 bird species, 195 amphibians, 167 mammals, 210 reptiles and 5,124 plant species (see **Annex AJ**).

Terrestrial Ecosystems at the Project Level

The project zone is located in the Tropical Moist Forest Grand Biome, and within the Chocó-Darién Moist Forests bioregion (Figure 6), a series of ecosystems which are located along the length of the Colombian Pacific coast, south east Panama and a segment of the Colombian Caribbean Coast, and a segment of northwestern Ecuador. Ecosystems found with the Chocó-Darien bioregion include mangroves, swamps (ciénagas), flooded forest, as well as dry, wet and cloud forests and paramo at elevation. Details with respect to vegetation cover types in the project zone are located in Section **1.3.2**.

Species at the Project Level

Due to its remoteness and limited resources at the local level, only a small fraction of the more than 6,500 species known to occur in the Colombian Pacific Region have been documented as occurring on the project site or in the project zone. Species documented in the Pacific Region include 831 bird species, 195 amphibians, 167 mammals, 210 reptiles and 5,124 plants (see **Annex AJ**). In addition to data available at the regional level, the World Wildlife Fund (Walschburger, Hurtado Guerra, Romero Ruiz, Rosas Foschi, Suárez, Sánchez & Gómez 2008. **PDD Literature from Chemonics**) compiled data on species richness (e.g. p. 146, 153) and endemism per forest types in the Chocó-Darién Bioregion with which the project is situated, for plants, butterflies, amphibians, birds and mammals. These are listed in Table 7 for forest types specific to the Colombian component of the Chocó-Darién Bioregion. The data provides insight into the very significant levels of species richness and endemism likely to be present to a large degree in the project zone.

Criteria	Forest Type			
	Mangrove	**Humid lowland forests: subject and not subject to flooding**	**Humid pre-montane: Darién + ***	**Humid pre-montane: Baudó + ****
% original forest remaining	73	41	57	
Richness: plant species	563	3068	426	166
Endemism: plants	11	508	13	
Richness: butterfly species		279	180	
Endemism: butterflies		21	8	5
Richness: amphibians	11	153	61	96
Endemism: amphibians	5	71	8	29
Richness: birds	108	704	476	313
Endemism: birds	5	63	24	
Richness: mammals	134	211	162	182
Endemism: mammals	6	11	6	8

Table 7. Species richness and endemism per forest types in the Chocó-Darién Bioregion

***Darién Range including Tacarcuna. **Sapo, Pirre, Saltos and Baudó RangesRecompiled from WWW (2008)**

The Humboldt Institute biodiversity plots being implemented, as a part of the larger BioREDD+ program in Colombia will increase the current knowledge of species richness, abundance, and ecosystem function along the Colombian Pacific coast in areas similar to those of the project. In the meantime a substantial number of species known to occur in the project zone are documented in territorial and forest management plans. Examples of individual species from these lists are located in Section 1.3.8, High Conservation Values. The project will keep a register of flora and vertebrate fauna species found to occur onsite as additional information becomes available over time through local knowledge and investigations including the Humboldt Study.

Threats to Biodiversity

Threats to biodiversity are linked directly to the deforestation and forest degradation drivers outlined in Sections **1.3** and **5.3.3**. Illegal commercial logging is the most important driver, followed by forestland conversion to cropland for subsistence farming. These factors negatively impact the composition and structure of project area forest ecosystems through the reduction of total intact forest area, fragmentation of intact forest ecosystems, the degradation of forest structural attributes (e.g. density, height, canopy closure, vertical structure and habitats), disruption of natural species composition and thereby ecosystem function and the ability to maintain natural levels of biodiversity. Rather than a species by species approach, the project, with its focus toward reducing threats at the level of broader forest ecosystem integrity, also views biodiversity threats (and corresponding project interventions) as most relevant to the project at the level of the deforestation and forest degradation drivers described. In this regard, land-use change analysis has estimated annual deforestation rates from the year 2000 to the year 2011 to have averaged 549 ha per year in the project area. Forest degradation rates averaged 1519 ha/year over the same period. More discussion about deforestation and forest degradation trends, and their implication for biodiversity in the baseline scenario can be found in Section 4.5.

1.3.8 HIGH CONSERVATION VALUES

HCV Resource Network guidance (See **Annex AK**) for HCV assessment was consulted for the identification of project HCVs. This guidance recommends that the intensity of HCV assessment reflect the nature of the project. For projects presenting a lower risk of negative impacts to HCVs, i.e. conservation oriented projects such as REDD+ a lower intensity of assessment is appropriate versus that for resource extraction oriented projects. With a focus on reducing threats to the degradation of natural forest structural attributes and landscape connectivity, this project presents a low risk to biodiversity HCVs.

A stepped approach was used, which first considers reference scale information available at the national level for Colombia, the Colombian Pacific Region, and the Chocó - Darién Bioregion. At these levels as noted previously there is ample documentation available with respect to the very high significance of the region in a global context with respect to species richness as well as threatened and endemic species.

At the project level, field identification of species presence is significant but nowhere near complete. Information from territorial and forest management plans has been utilized to help with determining species related HCVs,and Humboldt biodiversity plots established for the BioREDD program in four locations along the Pacific Region will serve to further expand HCV information relevant to the project and the coastal region. This information will be supplemented over time through monitoring plan activities and continued consultation with local communities. Given the incomplete nature of information available, HCV identification has been undertaken with consideration of the precautionary principle. That is, where there is a lack of complete information but reference scale data suggests a strong probability of the existence of high conservation value, HCV is assumed to occur.

Globally, regionally or nationally significant concentrations of biodiversity values:

1.3.8.1 Protected Areas

La Sierpe regional nature park (Figure 14), was declared a protected area under resolution 055 and 056 in 2007. With an area of 25,182 ha, this park overlaps the collective territory of La Plata-Bahía Málaga. Within the park's conservation zone of about 10,000 ha is a mountainous region constituting the origin of water sources and serving as important corridors for mammals including tigers, lions, and others (tatabro, zaino). For this reason, protected areas are considered a high conservation value.

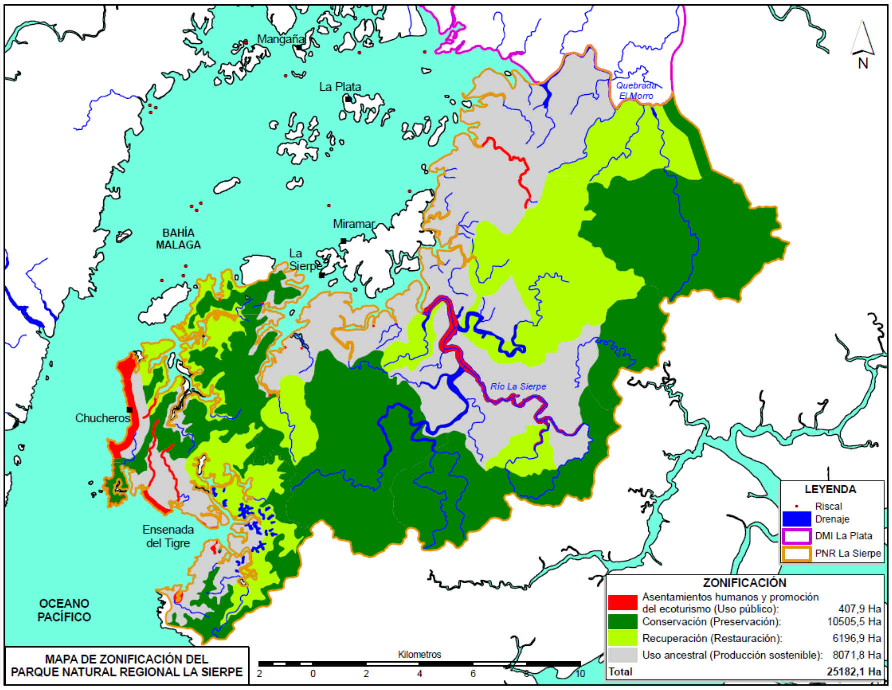


Figure 14. Sierpe regional nature park.

An additional conservation zone, though not nationally designated, occurs for similar reasons within an integrated management district of La Plata-Bahía Málaga (Figure 15).

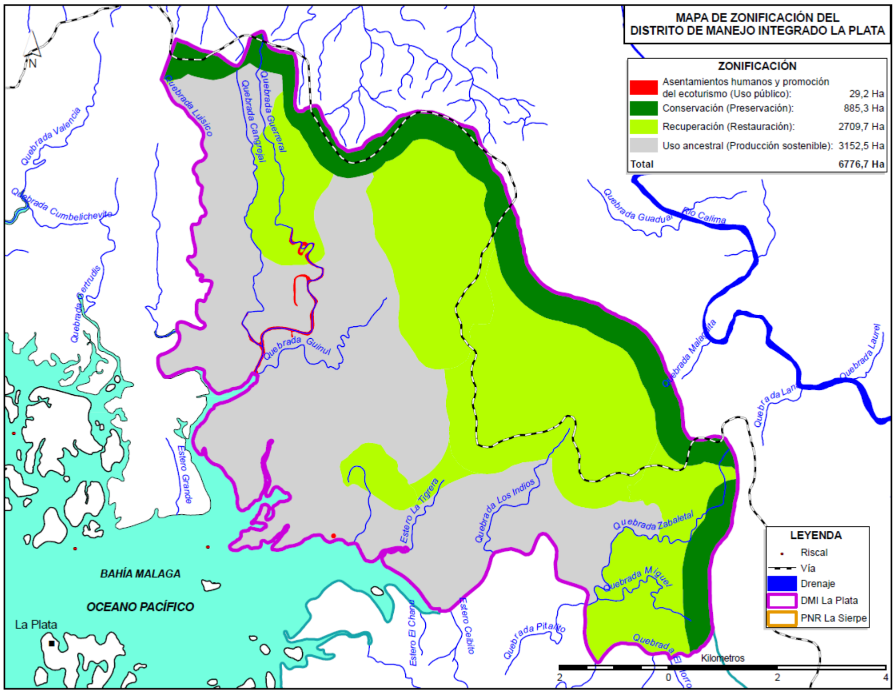


Figure 15. Integrated management zone within La Plata-Bahía Málaga.

1.3.8.2 Threatened Species

Rare, threatened or endangered (RTE) species relevant to the project were considered via consultation with IUCN Critically Endangered (CR), Endangered (EN) or Vulnerable (VU) listings. Broadly, there 245 plants, 54 mammals, 106 birds, 22 reptiles, and 216 amphibian species listed in these categories for Colombia at the national level (IUCN 2014). In the Chocó-Magdalena biodiversity hotspot, covering the Colombian Pacific coastal region within which the project is located and similar ecosystems to the north in Panama and south in Ecuador there are 34 birds (Renjifo, Franco-Maya, Amaya-Espinel, Kattan & López-Lanús, eds., 2002 **Annex AD**), 18 mammals (Rodriguez, 1998 **Annex AE**), 9 amphibians (Rueda, 1998 **Annex AF**), and 5 reptiles (Castaño-Mora, eds., 2002 **Annex AG**) known to fall within these same RTE categories.

Based on this information, threatened species is a high conservation value for the project.

1.3.8.3 Endemic Species

The information presented in Section 1.3.7 Table 7 indicates a very significant degree of endemism in the region, a noteworthy portion of which would reasonably be assumed to be relevant to the project zone. For example, humid lowland forest vegetation types are home to more than 500 endemic plants, 21 endemic butterflies, 71 endemic amphibians, 63 endemic birds, and 11 endemic mammals. In addition, the study by Palacios et al. (2008 **Annex AH**) identified 46 endemic plants, 8 birds, 6 amphibians, 1 reptile and 2 mammals specific to the northern Colombian Pacific region within which the project is located. Therefore, while data collection and compilation related to endemism will continue to occur over the project lifetime, there is sufficient data currently to declare distinguish endemism as a HCV for the project.

1.3.8.4 Areas that Support Significant Concentrations of a Species During Any Time in Their Lifecycle.

Discussions with the Humboldt Institute in 2013 indicate that to date there has been insufficient study and synthesis of information to make conclusions about species dynamics in the Choco-Darien Bioregion. However, mangrove ecosystems are known for their importance in providing critical reproduction, rearing, and breeding habitat, as documented, for example, in the Baudó Delta Ramsar site located elsewhere on the coast (see **Annex AL**). Mangroves are highly utilized by a rich variety of bird species including heron and geese, for forage, nesting and rest between periods of foraging. They also offer critical reproduction habitat for many species of fish and invertebrates, as well as vertebrates including turtle, crocodiles, primates and felines. Due to these factors and the significant proportion of the project area composed of mangrove forest, mangroves are considered to be a high conservation value for the project under these criteria.

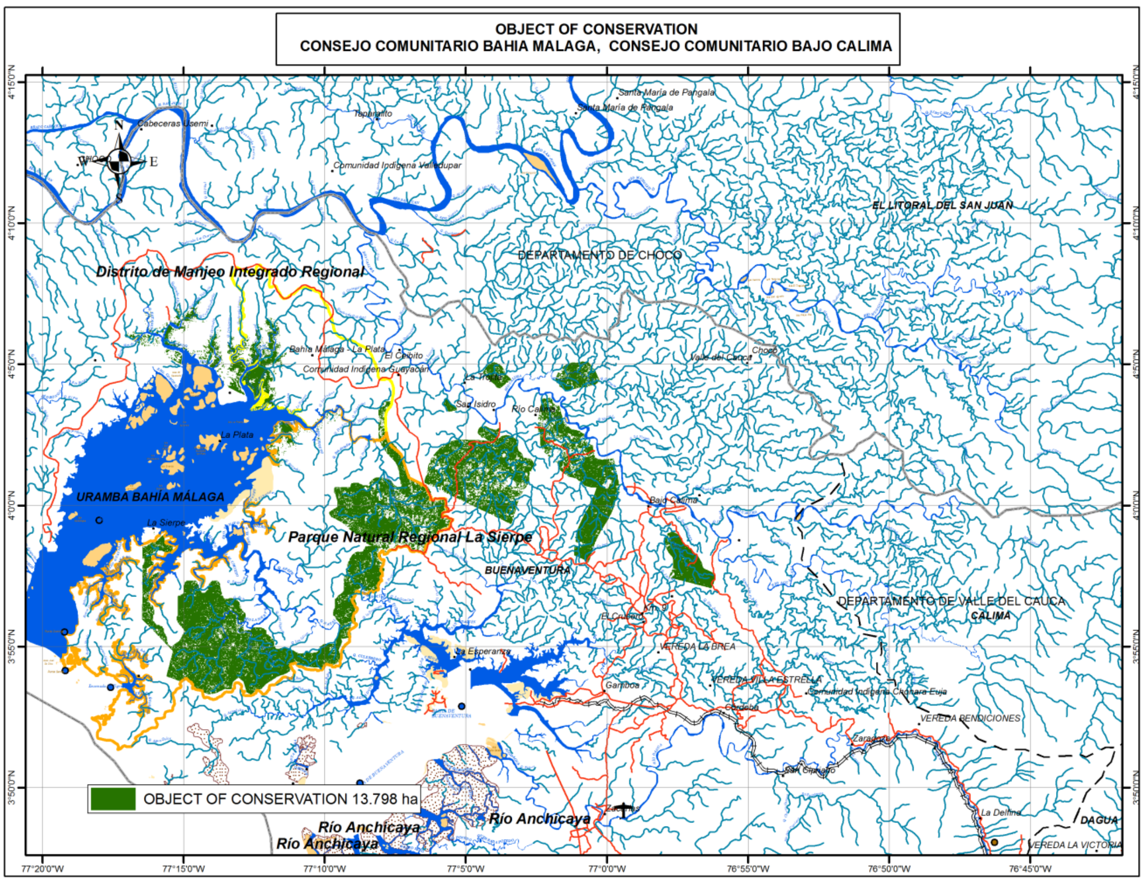


Figure 16. Mangrove forest in the project zone.

1.3.8.5 Landscape Level Biodiversity

The project area, at more than 90,000 hectares in size more than meets the generally accepted threshold of 50,000 ha considered relevant for this HCV (see **Annex AK**). In addition, while human impact has been significant, natural forest tree species and forest canopy at varied levels of natural function remain throughout most of the project area. Therefore, while it is known that a significant number of species are at risk, it is quite possible that most naturally occurring species still exist in natural patterns of distribution and abundance. In keeping with the precautionary principle, viable populations at the landscape level are a HCV until new information in the future indicates otherwise.

1.3.8.6 Threatened or Rare Ecosystems

Mangrove ecosystems are naturally rare due to their dependence on very localized hydrological conditions and associated soil types. Within the Colombian Pacific Region there are 230,541 ha of mangrove forest. The project contains close to 3,627 ha of these. In addition to their natural rarity, existing and past anthropological pressures in the project zone as caused by the identified deforestation and degradation drivers have resulted in significant ecological decline of mangrove forests in the project zone. The Mangrove Ecological Reserve Cayapas Mataje in Ecuador, and the Baudo RAMSAR site (see **Annex AL**)on the Colombian Pacific coast, further signify the perceived regional threat to mangrove forests and the need for their protection. While the IUCN ecosystem red list is still in development, the above factors are enough to signify the High Conservation Value of mangrove forests for the project.

1.3.8.7 Areas that Provide Critical Ecosystem Services

Mangroves provide basic ecosystem services in critical situations, including the protection of water catchments and control of erosion of vulnerable soils and slopes. Mangrove forests help to provide clean water through trapping sediments. They also help to treat effluents by adsorbing excess nitrates and phosphates. While this factor alone may not fully qualify mangroves as an HCV in this category, mangroves also control erosion by reducing the effect of wave action, along the coast, and form a buffer against the impact of storms and hurricanes. Especially considering the location of the communities and their dwellings in close proximity to the coast line, mangroves are considered a HCV for this category.

1.3.8.8 Fundamental Community Needs

This criterion pertains to sites and resources fundamental for satisfying the basic necessities of local communities or indigenous peoples (for example for livelihoods, health, nutrition, water), identified through engagement with these communities or indigenous peoples. An indicator of high conservation value in this category pertains to a site or resource being irreplaceable in the sense that alternatives are not readily accessible or affordable, and its loss or damage would cause serious suffering to communities who depend on it for their well-being.

Local communities derive most of their food, housing, traditional medicine, and fuels from the forests: mangroves are used for hunting and fishing; medicines; fuel wood for cooking; construction material for homes and fishing boats. These elements are fundamental to the communities due to their isolation from mainstream market supply of these resources and the high poverty levels which make the acquisition of food, combustibles, medicines and building supplies not readily accessible or affordable. This category then qualifies as an HCV for the project zone.

1.3.8.9 Cultural Identity

This category pertains to sites, resources, habitats and landscapes of global or national cultural, archaeological, or historical significance, and/or of critical cultural, ecological, economic or religious/sacred importance for the traditional cultures of local communities or indigenous peoples as identified through engagement with these local communities or indigenous peoples.

Consultation with the communities indicates the presence of ancestral practices related to the management and conservation of biodiversity, as well as the knowledge and use of medicinal and artisanal plants. Furthermore, the availability of these forest products is integral to the conservation of important oral and musical cultural practices.

For these reasons, cultural identity is considered a High Conservation Value for the project zone. Some examples of species important in a socio-cultural context include: guagua (*Agouti paca*), guatín (*Dasyprocta punctata*), tatabro (*Tayasu sp*.), armadillo (*Dasypus sp*.), perico (*Bradipus variegatus*, *Choloepus hoffmanii*), pava (*Penélope purpurascens*, *Penélope ortoni*), pavón (*Crax rubra*) and perdiz (*Tinamus major*).

1.4 PROJECT PROPONENT

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Title	Legal Representative
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Telephone	(+57) 317 657 82 19
Email	Abacua1969@hotmail.com

Communities of BC and BM

The communities of BC and BM are the right owners of the territories where the project will take place. Also, their community members will be the main implementers of all conservation commitments and execution of project activities in the future. All croplands to be improved and associated with the alternative livelihood activities are located in their territories and belong to community members, who will take care of planting, maintenance, and enhancement of existing agricultural plots to be part of the project activities. Community members will also participate in the logistic chain needed to deliver their produce to the processing plants and for commercialization.

Activities associated with enabling the regeneration of degraded forest lands are to be implemented by community members who are currently engaged in selective logging. Patrolling and surveillance activities will also involve loggers from the communities. Governance activities are to be managed by the Governing Board members, and monitoring will also involve on local community members. Benefit distribution will be an important task to be led by the Governing Boards, and aided by Fondo Acción, as this will effectively ensure community support behind conservation and sustainable growth efforts.

To ensure implementation of the project activities, the Governing Boards will appoint a group of community members, who will comprise the REDD+ Implementation Teams, and who will be in charge of:

- Keeping track of project activity implementation
- Keeping records and MRV data for preparing Verification Reports
- Interacting with Fondo Acción on all activities to be contracted, and on the benefit distribution mechanism
- Managing the grievance and conflict management mechanism
- Managing the socialization processes related to the project implementation
- Interacting with environmental authorities and police regarding enforcement of conservation commitments

Fondo para la Acción Ambiental y la Niñez (environmental action and children's fund – Fondo Acción)

The communities of BCBM have approved Fondo Acción as a Project Implementation Agent. Fondo para la Accion Ambiental y la (Fondo Acción) is a Colombian non-profit private foundation. The Fund was established in 2000 under a framework agreement between the governments of Colombia and the United States of America. The Fund's Board of Directors is composed of eight members: the private sector and civil society (environmental and childhood NGOs, academia and community development organizations), with five seats and the right to preside the Board; the Colombian government, represented by the National Planning Ministry and the Ministry of the Environment; and the US government, represented by the USAID Mission in Colombia. Fondo Acción has a solid track record in financial administration, program management and conservation finance, which includes the creation and management of endowments, sinking and revolving funds and the design of innovative financial mechanisms for conservation. The Fund is a second - tier organization that provides grants to NGOs, community based organizations and other non - governmental organizations that implement projects throughout the country. Grantees receive technical and administrative backstopping from Fondo Acción, and on - the - ground institutional strengthening capacities required to ensure project success (see experience and track record below).

The Fund works through the use of trust accounts, which are regularly open to manage each of the beneficiaries or clients´ projects.

The Fund currently manages sinking accounts ($15 million) and endowments ($44 million), created with funds contributed by the US Government (debt‐for‐nature swaps under the Enterprise for the Americas Initiative and the Tropical Forest Conservation Act), The Nature Conservancy, WWF, Conservation International, The Global Environment Facility, the Forest Carbon Partnership Fund, The Gordon and Betty Moore Foundation, the MacArthur Foundation and the corporate sector.

The Fondo Acción team has proven capacity as part of the implementation team for another Gold certified CCBA and VCS registered project in Colombia. In a similar setting, on the Colombian Bio-geographical Choco Region, and with community owned lands, Fondo Acción has been leading the community engagement, coaching and socialization processes. With enough financial and administrative capacity, the Fund has the required institutional and human resources to perform as a financial mechanism for the BCBM REDD+ project. Its strengths are related to community engagement, governance strengthening and institutional development, for which Fondo Acción has a good group of qualified staff, and ISO certified procedures and protocols.

Fondo Acción's specific role will be to: manage all investments and proceeds from carbon and productive activities; act as procurement and contracting agent; distribute cash flow to the beneficiaries and investors in an efficient and transparent manner; set up the Special Purpose Vehicles (SPVs) for all larger-scale commercial activities and for procuring required equipment, materials, works and personnel; and establish trust accounts for each REDD+ project, each governed by a board composed of representatives from the local communities, an investor, and USAID. Finally, Fondo Acción will train and contract a leader from each community to lead and manage the day-to-day operations of the project. That person will be the manager on the ground and their role would include but no be limited to: ensuring implementation of activities, coordinating with team and contractors on the ground, taking corrective actions (when and if necessary) and reporting to the community and to Fondo Acción, serving as a permanent liaison.

Fondo Acción will be dully authorized by the Project Owners through framework agreements (Annex AV) to:

- Administer all investments, resources and proceeds from carbon and productive activities. This may include subcontracting the necessary and adequate partners to implement the required activities and provide technical assistance (e.g. implementation partners).
- Capacity building and training in all topics that are within its expertise, including the training of leader from each community to lead and manage the day-to-day operations of the project. That person will be the Manager on the ground and their role would include but no be limited to: ensuring implementation of activities, coordinating with team and contractors on the ground, taking corrective actions (when and if necessary) and reporting to the community and to Fondo Acción serving as a permanent liaison. This person will be under contract with Fondo Acción.
- Elaborate a benefit sharing and grievance mechanism. Distribute cash flow to the beneficiaries and investors in an efficient and transparent manner over the first crediting period (including the eight years of the investor´s investment time frame). Fondo Acción has a proven record of working with REDD+ communities, and its strength lies on the interaction with the communities to ensure participation and governance capacity.
- Implementation and follow up the investment plans for the social and governance investments.

- This organization would also be in charge of setting up the Special Purpose Vehicles (SPVs) for all larger-scale commercial activities, and for procuring required equipment, materials, works and personnel. A general base fee of 4-10% depending on the final role agreed with the communities will be levied on all funds managed, rising to reflect additional responsibilities assumed.

Special Purpose Vehicles for productive activities:

It is proposed that all investments in cash-generating activities are eventually managed through Special Purpose Vehicles (SPVs) set up for each of the selected productive activities. Companies are to be created for each of the regional productive projects (i.e. one for cocoa liquor, one for freeze dried naidi pulp, and one for coconut virgin oil), all to be set in the urban area and port adjacent Tumaco. However, companies will only be started as business plans and feasibility assessments are finalized. To help trigger these investments, at the onset an organization like Fondo Acción could provide the financial and administrative mechanism to support studies, licenses, staff recruiting and investments oriented to establish the productive activities described above.

Communities sharing the same regional and logistics area will share the industrial facilities, to benefit from economies of scale and avoid unnecessary competition. To keep investments in each REDD+ project separate, Fondo Acción will establish trust accounts for each REDD+ project, each governed by a board composed of representatives from the local communities, REDD+ investors, and USAID.

Special Purpose Vehicles (SPVs) would gradually take on the role of managing the productive activities, social oriented investments, and financial resource management. For each of the productive activities (e.g., cocoa, acai, annatto, etc.), SPV companies would be properly staffed with technical and administration personnel. At the project's start-up, Fondo Acción will have the role of contracting personnel, civil works, and materials acquisition.

1.4.1 MULTIPLE PROJECT PROPONENTS

There are multiple project proponents (see Section **1.4** above).

1.5 OTHER ENTITIES INVOLVED IN THE PROJECT

The following table presents the main organizations and individuals currently providing services to the communities as contractors to BioREDD+. BioREDD+ is the program funded by USAID to establish this project (see description below).

Company	Brief Description of Organization and Roles	Key Contact
Fondo Acción	Socialization and capacity building	Jose Luís Gómez
Araújo Ibarra	Business Plan Development (Field Work, Technical specs, and Markets)	Carolina Ibarra
Q&A	Business Development (Financial and Equity Structuring)	Federico Molina
Dinamo	Annatto business development	Alberto Angulo
Nancy Vallejo	Quality certifications and access to market requirements	Nancy Vallejo
EcoGeoMap	Carbon and biomass mapping	Sassan Saatchi
CONIF	Ground data inventory plot setting	Enrique Vega
CONIF	Allometric function development	Juan Saldarriaga
Universidad Nacional de Medellín	Quality advisor on ground plots and allometry	Alvaro Duque
Carbono & Bosques	Spatial Modeling	William Laguado
Terra Global Capital	Methodology Development (tool on remote sensing)	Leslie Duschinger
Humboldt Institute on Biodiversity	Biodiversity Assessment	Hernando García
EcoPartners, Offsetters, Clear Sky Solutions	Project design and PD drafting	Kyle Holland
Fundación Laurel	Social and economic assessment	Jairo Suárez

Table 8. Other entities involved in the project.

The U.S. Agency for International Development (USAID) was established in 1961 with the goal of providing foreign aid and promoting social and economic development in the developing world. Fostering alliances between the public and private sectors is a key characteristic of its programs. As part of its Environment and Global Climate Change strategy, the Agency helps communities better manage and benefit from their natural resources; protects biodiversity and functional ecosystems; supports land tenure policies so that people have rights to own and manage natural resources responsibly; fights deforestation through improved agricultural productivity and economic growth and better forest management, and helps mitigate and adapt to the effects of climate change. In Colombia, USAID has a strong sustainable development and environmental program, which includes biodiversity protection, climate change mitigation and adaptation, and renewable energy. BIOREDD+ is a flagship initiative of the USAID-Colombia Program.

Contact Person: Daniel Lopez

BIOREDD+ (Bona fide project developer) (2011-2015) is a US$ 27.9 million USAID program designed to strengthen Colombian capacity to mitigate and adapt to climate change, protect biodiversity and reduce the environmental and social impact of informal gold mining. The development of REDD+ projects is a key part of the program that seeks to promote sustainable development and improved environmental management of poor, isolated pacific coast communities, through avoiding deforestation and fostering the regeneration of already degraded forests. The strategy is premised on the belief that selective logging and more aggressive land use change in and around forests can be prevented through the strengthening of environmental governance, the improvement of livelihoods and social conditions, and the adoption of profitable productive activities.

Contact Person: Peter Doyle

Chemonics (subcontracted by USAID- implementer) is an international consultancy company with global presence. It is currently implementing 84 projects/programs in 61 countries with an average annual portfolio value of US$ 450 million. In Colombia, Chemonics is implementing three initiatives for USAID: (i) a Program to promote Consolidation and Enhanced Livelihoods (CELI) of communities affected by conflict and illicit crop cultivation; (ii) the Colombia Human Rights Program (HRP) that seeks to strengthen the protection of human rights through capacity building activities with both government and civil society partners, and (iii) the BIOREDD+ Program, focused on climate change mitigation and adaptation, biodiversity conservation and, more recently, the mitigation of the environmental and social impact of informal mining.

Contact person: Peter Doyle

OPTIM(subcontracted by Chemonics- implementer) is a Colombian environmental consulting company with experience in the development of projects designed to mitigate and adapt to climate change, including REDD+ development. OPTIM performs due diligence assessments for companies and funds interested in complying with the Environmental and Social Safeguards Policies applied by the World Bank Group, the Inter-American Development Bank, and the Equator Principles. OPTIM has partnered with Chemonics to develop and implement the BIOREDD+ program in Colombia.

Contact person: Juan Andres Lopez

1.5.1 IMPLEMENTATION PARTNER

Fondo para la Acción Ambiental y la Ninez (Fondo Acción) is a Colombian non-profit private foundation. The Fund was established in 2000 under a framework agreement between the governments of Colombia and the United States of America. The Fund's Board of Directors is composed of eight members: the private sector and civil society (environmental and childhood NGOs, academia and community development organizations), with five seats and the right to preside the Board; the Colombian government, represented by the National Planning Ministry and the Ministry of the Environment; and the US government, represented by the USAID Mission in Colombia.

Fondo Acción has a solid track record in financial administration, program management and conservation finance, which includes the creation and management of endowments, sinking and revolving funds and the design of innovative financial mechanisms for conservation.

The Fund is a second-tier organization that provides grants to NGOs, community based organizations and other non-governmental organizations that implement projects throughout the country. Grantees receive technical and administrative backstopping from Fondo Acción, and on-the-ground institutional strengthening capacities required to ensure project success (see experience and track record below). The Fund works through the use of trust accounts, which are regularly open to manage each of the beneficiaries or clients´ projects. (See also Section 1.4 above)

The Fund currently manages sinking accounts ($15 million) and endowments ($44 million), created with funds contributed by the US Government (debt-for-nature swaps under the Enterprise for the Americas Initiative and the Tropical Forest Conservation Act), The Nature Conservancy, WWF, Conservation International, The Global Environment Facility, the Forest Carbon Partnership Fund, The Gordon and Betty Moore Foundation, the MacArthur Foundation and the corporate sector.

The Forest Carbon Capacity Building Program was designed and developed by Fondo Acción and several international and local partners. The majority of Colombia´s tropical forests are under communal forms of ownership such as reserves of indigenous ethnic communities and Afro Colombian communal lands. The Program was therefore originally conceived for indigenous and afro descendent community leaders and communities from the Amazon region and the Biogeographic Chocó region. Due to growing demand, it was adapted to include participants from regional and local public environmental authorities and professionals interested in climate change, ecosystem services, and payment for environmental services (PES) and REDD/REDD+ issues. Grassroots organizations participate in a three step program: the first level introduces basic technical, legal and policy contents; the second level supports internships and exchanges between organizations; and the third level develops a practical exercise geared at strengthening their understanding of PES/REDD+ projects. For both local authorities and regional professionals, a technical training on climate change, PES and REDD/REDD+ was designed and developed. The Program has reported the following results:

- 45 community leaders and representatives from 13 indigenous organizations have been trained. They constitute a core group of individuals and local organizations that understand the potential benefits and risks of REDD/REDD+ projects and that are able to make informed decisions in this regard. Nine (9) replicas of the original training course have been supported by the Program and carried out by community members that participated in the Program; in these replicas they have shared their experience and knowledge with more than three hundred (300) community members.

- A communication tool and training manual have been validated and are available for use by trainers and communities to explain climate change, ecosystem services and REDD/REDD+.
- A formal, University-level course has been designed and is currently being implemented.
- The experience, process and main lessons learned have been systematized.

Fondo Acción was selected by ARD to systematize and communicate the community forest management model implemented by four local grassroots organizations in the Chocó Biogeographic region of Colombia. This model has laid the groundwork for the development of REDD+ projects.

Fondo Acción has implemented a capacity building program for the community based organization COCOMASUR of Acandí, Chocó. COCOMASUR, an afrocolombian local organization, owns and manages the "Chocó-Darién Conservation Corridor Project", the first VCS-validated REDD+ project in a communal territory in Colombia. In collaboration with COCOMASUR and Anthrotect, Fondo Acción designed and implemented a financial mechanism to facilitate fund administration in the "Chocó-Darién Project".

Fondo Acción has successfully managed a grant from the Forest Carbon Partnership Fund (FCPF) for the formulation of the first phase of the Readiness Preparation Proposal (R-PP) for Colombia. In order to become eligible for this task, Fondo Acción was carefully screened by the World Bank, FCPF Administrator. The World Bank and the Colombian Ministry of the Environment have ratified Fondo Acción as manager of the second phase of the R-PP ($3.4 million), which is scheduled to start by mid-2014.

The Fund is an active stakeholder of the REDD National Roundtable, a national forum created by NGOs with the purpose of carrying out joint actions and stimulating policy dialogue with the national public authorities. The Forest Carbon Capacity Building Program is an example of an initiative implemented under the REDD Roundtable framework.

Organization name	Fondo Accion Ambiental y la Niñez (Fondo Acción)
Contact person	*Jose Luis Gomez Rodriguez, Executive Director* *Natalia Arango, Technical Director* *Carla Rey, Legal Director* *Germán Botero, Financial Director*
Title	
Address	
Telephone	
Email	joselgomez@accionambiental.org

1.5.2 TECHNICAL SKILLS AND CAPACITY

The Fondo Acción team has proven capacity as part of the implementation team for another Gold certified CCBA and VCS registered project in Colombia. In a similar setting, on the Colombian Bio-geographical Choco Region, and with community owned lands, Fondo Acción has been leading the community engagement, coaching and socialization processes. With enough financial and administrative capacity, the Fund has the required institutional and human resources to perform as a financial mechanism for the BCBM REDD+ project. Its strengths are related to community engagement, governance strengthening and institutional development, for which Fondo Acción has a good group of qualified staff, and ISO certified procedures and protocols.

Carbon monitoring and biodiversity assessment will be done through outsourced contracts with fully capable institutions based in Colombia. Fondo Acción has already been involved in the first assessments related to the first verification in the other REDD+ project in Colombia.

1.5.3 REGULATORS

Currently there are no government regulatory bodies for voluntary REDD projects in Colombia. The project is fully compliant with VCS and CCB standards, to be regulated by a third party verification body.

1.5.4 GHG PROGRAMME ADMINISTRATORS

VCS and CCB are responsible for administering the registry and record of standard compliance, and in the case of VCS of managing the VCU registry. On the side of the project implementation bodies, Fondo Acción will be responsible for producing verification reports, and keeping track of VCUs production and trading.

1.6 PROJECT START DATE

The project start date is 08/26/2013. This is the date that a letter of intent with OPTIM was signed to reduce emissions through a REDD+ project (see Annex J). Because communities within the same project signed letters on different dates, the most recent date is used as the official project start. This approach to the start date is based on the financial viability of the project. In order for the project to function at the appropriate scale for which it was designed, all communities (that are allocated to be in the project) must partake. Without the agreement of all the communities, the project for the entire cabildo would not be viable and it likely would not be carried out. Essentially, the final community's choice to participate is the deciding factor in determining if the project will successfully occur. As the final community agrees to participate, it provides the financial foundation on which the project can begin, thus meriting the date of the final community's agreement as the date when the project is logistically able to begin.

The signing of the letter of intent also shows that project activities were initiated on that date, most notably a conscious change in forest governance that establishes the project start date. Based on the project's theory of change model (see Annex D) forest governance is an important project activity which addresses the drivers of deforestation and degradation. By addressing the drivers of deforestation and degradation, the project generates emissions reductions. Therefore the letter of intent establishes the date on which the project began project activities and began generating GHG emissions reductions through forest governance. The signed letters of intent document formalized a number of forest governance actions that were also signed by community leaders (See Annex AX).

1.7 PROJECT CREDITING PERIOD

Project crediting period will last for 30 years.

1.7.1 PROJECT LIFETIME AND CHRONOLOGICAL PLAN

The project will have 2 main phases:

- Phase I (1-7 years), to undertake most of the governance oriented activities, complete business plans, set SPVs for productive activities, and provide technical assistance to farmers. During this phase, the community councils will work on their land use plans, capacity building, set-up of patrolling bodies, conservation areas demarcation, and internal agreements for benefit distribution. Also, it will be used to allow for implementation of productive activities, revenue sharing, and re-investment agreements. This phase will consolidate the REDD+ project activities with the communities, and will help build capacity for MRV.
- Phase 2 (8-30 years), to continue with the implementation of the project activities. Years11 and 21 will be used to re-assess the baseline situation regarding carbon, deforestation and degradation drivers, and project activities, and to define needs for readjustment. Land use plans and progress will be assessed and discussed at the assembly level.

1.7.2 IMPLEMENTATION SCHEDULE

While a 60-year Implementation Plan including activities that will extend beyond the crediting period has been developed and included as Annex M, the project crediting period and project longevity are both 30 years, as the Financial Plans use a timeframe of 30 years after the project start date. The Implementation Plan is an exhibit to the agreement between the communities and the implementing partner, and the agreement which formally establishes the Implementation Plan is provided in Annex N.

1.7.3 BASELINE REASSESSMENT

The project baseline will be reassessed in years 11 and 21.

1.7.4 ARR/IFM HARVESTING PERIODS

Not applicable. The project is not conducting ARR or IFM activities.

1.7.5 DIFFERENCES IN CREDITING PERIOD AND IMPLEMENTATION SCHEDULE

The crediting period has a duration of 30 years. The Implementation Schedule also has a duration of 30 years as financial resources are planned over this period as exhibited by the financial plan. However, the management plans, including the Implementation Plan, extend in some instances out to 60 years.

2 DESIGN

2.1 SECTORAL SCOPE AND PROJECT TYPE

This project is an Agriculture, Forestry and Other Land Use (AFOLU) project under the Reducing Emissions from Deforestation and Degradation (REDD) project category, sectorial scope 14. Specifically, the project is of the "Avoided Unplanned Deforestation & Degradation" (AUDD) project category. The project will not pursue IFM nor ANR activities in any of the project areas. None of the project activities occur on wetlands; thus the specific carbon pools and GHG sources have not been accounted for. The methodology VM0006 establishes that both below ground biomass and soil organic carbon are optional carbon pools and may be conservatively excluded.

2.1.1 GROUPED PROJECT

This project is not a grouped project; nor will the project use the Programmatic approach. All of the project areas, communities and activities, and associated risks, intended to be part of the project are included as part of the current scale of the project.

2.1.2 PROJECT ELIGIBILITY

The project meets all of the requirements set forth in the VCS Standard v3.4, issued October 8th 2013, and the VCS AFOLU Requirements v3.4, issued October 8th 2013.

The project further complies with all of the rules and requirements of the Climate, Community and Biodiversity Standard (CCBS), Third Edition, December 2013.

The project also complies with all relevant legislation as specified in Section **3**.

2.1.3 METHODOLOGY REQUIREMENTS

The project is using VCS-approved methodology VM0006, "Methodology for Carbon Accounting for Mosaic and Landscape-scale REDD Projects v2.1" for quantification of GHG emission reductions and removals generated in mosaic and landscape scale REDD+ projects.

The project applies the methodology VM0006 in full (See Section 4). It further uses the VT0005 Tool for measuring aboveground live forest biomass using remote sensing, designed by Terra Global Capital. The tool provides a method for determining Aboveground Live Forest Biomass (ALFB) through a combination of remote sensing data and field measurements to provide an accurate and cost effective estimation of ALFB across varied LULC classification types and broad spatial extents. The tool is intended for use with all approved VCS methodologies within the scope of Agriculture, Forestry, and Land Use.

This methodology also refers to the latest versions of the following approved tools and modules:

- CDM A/R Methodological Tool Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities.
- CDM A/R Methodological Tool 03 Calculation of the number of sample plots for measurements within A/R CDM project activities.

- CDM A/R Methodological Tool 06 Procedure to determine when accounting of the soil organic carbon pool may be conservatively neglected.
- CDM A/R Methodological Tool 09 Estimation of GHG emissions related to displacement of grazing activities in A/R CDM project activity.
- CDM Tool for testing significance of GHG emissions in A/R CDM project activities.
- VCS Tool VT0001 Tool for the demonstration and assessment of additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) project activities.
- VT0005 Tool for measuring aboveground live forest biomass using remote sensing
- VCS Tool for calculating deforestation rates using incomplete remote sensing images.
- VCS Module VMD0033 Estimation of emissions from market leakage.

Finally, the project meets all of the requirements for models and default factors set forth in the VCS Standard v3.4, issued October 8th 2013, and the VCS AFOLU Requirements v3.4, issued October 8th 2013.

2.1.4 PROJECT CONVERSIONS

The project is designed to protect native vegetation. None of the project activities will lead to the conversion of forest ecosystems nor will any of the project activities drain native ecosystems. Specifically the project is following the World Bank environmental safeguard, operational policy 4.04 which specifically prohibits Bank support for projects which lead to the significant loss or degradation of any Critical Natural Habitats, whose definition includes those natural habitats which are either: legally protected, officially proposed for protection, or unprotected but of known high conservation value.[6] Additionally, the project is consistent with the Bank's safeguards on forests, seeking three equally important and inter-dependent pillars to guide investments: harnessing the potential of forests to reduce poverty; integrating forests in sustainable economic development; and protecting vital local and global environmental services and forest values.[7]

In addition to the above-mentioned standards, the project is also complying with the IFC Performance Standards on Environmental and Social Sustainability, which specifically restricts the conversion or degradation of natural habitats.[8]

The project does not contain any ARR, ALM, or ACoGS project areas and is therefore not required to provide documentation that the project activities (alternative agricultural activities) will not lead to conversion of forest ecosystems. The project does occur on wetlands; however the project is not subject to WRC requirements (see Section 2.1).

[6] World Bank Operational Policy 4.04: Natural Habitats, 2001. Found at: http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTSAFEPOL/0,,contentMDK:20543920~menuPK:1286576~pagePK:64168445~piPK:64168309~theSitePK:584435,00.html

[7] World Bank Operational Policy 4:36: Forests, 2002. Found at: http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTSAFEPOL/0,,contentMDK:20543943~menuPK:1286597~pagePK:64168445~piPK:64168309~theSitePK:584435,00.html

[8] IFC Performance Standards on Environmental and Social Sustainability: January 1, 2012. Found at:

http://www.ifc.org/wps/wcm/connect/c8f524004a73daeca09afdf998895a12/IFC_Performance_Standards.pdf?MOD=AJPERES

2.1.5 JURISDICTIONAL REDD+

Currently, there is no national or jurisdictional REDD+ program. Therefore, the project is not located within a jurisdiction covered by a REDD+ jurisdictional program in Colombia and not required to follow the VCS jurisdictional REDD+ Requirements.

However, the Colombian Government (GOC) is in the process of developing the national REDD strategy, which is considering establishing jurisdictions for nesting REDD activities. All of the BIOREDD+ projects fall under two of the potential jurisdictions being developed for the Colombian Pacific. Since BIOREDD+ is moving faster than the national strategy, this project takes into the account the need to be nested within potential jurisdictions established by national or sub-national authorities. BIOREDD+ is participating in the national REDD strategy discussions, and is also coordinating with IDEAM to ensure that all information produced on deforestation and degradation, carbon estimates, and land use classification can be used by the national government.

2.1.6 GOOD PRACTICE AND GUIDANCE

The project follows the IPCC good practice guidance for land-use, land-use change and forestry (LULUCF) that was developed from the Marrakesh Accords; as well as the Social and Biodiversity Impact Assessment Manual for REDD+ projects (see **Annex AM**) Manual for REDD+ projects for guidance on the community and biodiversity elements of the project.

2.1.7 MULTIPLE PROJECT ACTIVITIES

The project includes only one project activity, AUDD, and is using only one methodology, VM0006. Further, the methodology does not specify requirements for demonstrating additionality other than those specified in the latest version of the VCS Tool for the Demonstration and Assessment of Additionality in VCS AFOLU Project Activities to demonstrate additionality; therefore, only the additionality requirements of the VCS Tool are adhered to.

2.1.8 MULTIPLE INSTANCES OF PROJECT ACTIVITIES

The project is not a grouped project and is therefore not planning to add further project activity instances subsequent to initial validation.

2.2 DESCRIPTION OF THE PROJECT ACTIVITY

Project activities have been designed in close consultation with the local communities, who, as the primary agents, have participated in the identification of main deforestation and forest degradation drivers and the types of measures to mitigate them. For complete tables of the drivers of deforestation and forest degradation, see section **4.5.3.2**.

Governance

Strengthening of Land-tenure Status and Forest Governance

Land tenure for the communities of BM and BC is secure (see Section 1.2.1 and Section **3.2**); however the project aims to strengthen forest governance in a number of ways. Specifically, the project will assist communities in updating their internal rules, such as their by-laws taking into account the community commitments made within the context of the REDD+ project. For example, by-laws do not currently contain information about benefits sharing or about the use of revenues generated by levies on productive activities. The updated by-laws will be disseminated and socialized among the communities, and then approved according to established procedures including approval by the General Assembly. In addition, the project will strengthen the capacity of Community Boards by supporting travel by Board Members to different townships.

Finally, the project will assist the communities in raising awareness about private boundaries within the titled community land. Strengthening private property will create more secure property rights for individual families and will promote additional control, particularly in controlling illegal logging, as each family will be responsible for overseeing their own individual parcels.

Support with the Development and Implementation of Sustainable Forest and Land Use Management Plans

Forest and land use management plans are being developed and updated in a participatory and democratic way. The project is working with the communities to assess and update existing management plans according to priorities identified during the REDD+ planning process. In the case of Bahia Malaga, the project will conduct an evaluation and update of zoning and forest management plans with communities. In the case of Bajo Calima, agency meetings to coordinate and harmonize the management plans will be held.

The plans will include defined zones that can be used for timber harvesting, as well as areas for grazing, settlements, cropland, and conservation areas; and the demarcation of forest reserves (see below). Plans are being developed based on the current and future needs of the community for forest products as well as land (for agriculture, settlements, etc.), and will be disseminated to the communities for approval by the General Assembly.

Demarcating Forest, Tenure and Ownership Boundaries, and Areas of Forest Protection

The project recognizes that legal protection alone (i.e. strengthening of land-tenure status and forest governance) may not be sufficient to prevent deforestation and/or degradation in the project area. Thus a physical boundary and/or signage will be used to assist the communities with social fencing and patrolling activities. There will be two types of demarcation activities:

1. **Demarcation of forest "reserve" areas.** These are areas that have been subject to high levels of degradation. They will be marked as reserves to allow for forest recovery. The areas will be demarcated with appropriate signage. This activity will take place in Bajo Calima.
2. **Forest and carbon monitoring activities.** In both Bajo Calima and Bahia Malaga, monitoring will have the dual purpose of preventing logging in areas with conservation agreements and for reporting on possible breaches of conservation commitments to the Council. This activity will involve the creation of a monitoring and surveillance patrol team that will have a constant presence in the territory.

Productive Activities

Sustainable Intensification of Agriculture on Existing Agricultural Land

Project activities will increase productivity and agricultural yields on existing cropland, and include such activities as agroforestry. Only sustainable farming techniques are being promoted, and on lands that are already under agricultural production or lands sanctioned for agricultural production in land use management plans.

The following productive activities will be developed as part of the project:

Cocoa. Bajo Calima already has some cocoa production, with close to 1,200 kg in annual yields. Although, most of these crops are still relatively young - under 3 years old – so production is still emerging. The project will support the establishment of new cocoa crops, increasing the area under production and improving productivity and basic earnings locally (i.e. dried and fermented cocoa). Cocoa production is traditionally combined with other products, such as banana and timber, so that producers are able to earn short-term income while the cocoa crop develops and long-term income when crops are renewed.

Acai. Acai (or naidí) occurs naturally in Bajo Calima and Bahia Malaga, and its fruit is harvested for local consumption, with seasonal and limited presence in local markets in Buenaventura. The buds of young palms are also used to collect and pack the palm of Acai for urban markets in Colombia and abroad. The project will assist producing families in the development and commercialization of products along the Acai value chain, resulting in fresh and freeze-dried Acai for domestic and international markets. While the natural supply of the product will be used initially, the project includes the establishment of new crops. As in the case of cocoa, Acai cultivation will be mixed with other crops that can provide short-term income to households while the necessary crop productivity is reached. In this case, Acai will be mixed with papachina or cassava.

Chontaduro. Bajo Calima already has some Chontaduro cultivation, with an annual turnover of roughly 600 kg; however, production is still in its infancy. Crops can be harvested 4-5 years from planting, twice a year. The proposed activities include increasing the areas under cultivation, and improving productivity and basic earnings locally. Chontaduro can be combined with borojó, to earn income in the short-term while the crop matures.

Providing Alternative Livelihoods to the Agents of Deforestation

Alternative livelihood activities are aimed at addressing the root cause of deforestation and forest degradation in the communities, which is economic. The project will ensure that the agents of deforestation and forest degradation can engage in livelihoods not based on timber extraction so that they can have a secure income without the need to further clear forests. The activities below will be carried out by local communities. The sustainable extraction of non-timber forest products, such as Acai, as well as agricultural products on already converted lands, such as cocoa, will be further developed and commercialized. The development of value chains provides income to farming families as well as Community Councils. It is assumed that people will shift towards these alternative livelihoods, which have a significantly greater return, than their current livelihoods, which rely on timber extraction.

The following productive activities will be developed as part of the project:

Cocoa. As mentioned above, Bajo Calima already has some cocoa production; however, yields have yet to reach their full potential. In addition to increasing the area under production and improving productivity and basic earnings locally (i.e. dried and fermented cocoa), the project will develop the value chains for roasted beans or cocoa paste, and bacao (i.e. cocoa liquor), for domestic and international markets. The property of the processing facility will be shared with other REDD+ project communities that are able to supply products.

Acai. As mentioned above, Acai (or naidí) occurs naturally in Bajo Calima and Bahia Malaga. In addition to assisting in the production of Acai, the project will help producing families in the commercialization of products along the Acai value chain, resulting in fresh and freeze-dried Acai for domestic and international markets. This includes developing a processing facility, logistics and marketing infrastructure.

Chontaduro. As mentioned above, Bajo Calima already has some Chantaduro cultivation but production is still in early stages. In addition to increasing the areas under cultivation and improving productivity, the project will develop the value chain for the production of chonta-chips (fried chontaduro) for domestic and international markets. Similar to cocoa, the property of the processing facility will be shared with other REDD+ project communities that are able to supply products.

Ecotourism. In Bahia Malaga, there is significant potential for ecotourism due to the areas' natural beauty and attractions (i.e. whale watching). There are some tourism facilities and services in the area already. The project will invest in activities that attract higher-end tourists with a way to create additional jobs and revenue. The tourism activities will be planned along existing logging routes, as a way to de-motivate the use of logging as a source of income.

Fisheries. The project will support the commercialization of fisheries, and the development of a profitable logistic chain. This will include strengthening the association of local fishermen through technical assistance and training. The project will also conduct a study on species in the area that are suitable for fishing and seasonality. This study will include life cycles of species and use of the area within this cycle. The study will then be used in training and promoting the use of fishing gear for responsible fishing in the area, respecting size, closed areas, life cycles of species, among others.

In addition to the above-mentioned alternative livelihood activities, the project will be engaging local communities in social fencing, forest patrolling, boundary demarcation, and other activities that provide employment and a greater financial return, compared with logging, to the communities.

Other Activities

Although municipal governments are in charge of providing basic services, in practice these investments do not always take place in isolated, rural areas of Colombia. Therefore, BIOREDD+ hired local universities to initiate social and economic assessments with the aim of defining the best options for social investments according to the communities' declared priorities, and to identify potential projects to address them.

Thus, in addition to the above mentioned activities that will create emission reductions as a result of directly or indirectly reducing deforestation and forest degradation, the project aims to create and maintain social investments. An integral aspect of the project is tocreate an equitable benefits distribution plan that will improve livelihoods. The investments are based on priorities identified by the communities and implemented with the support of net revenues from the sale of carbon credits. These project investments will also enhance the ability of the communities to implement the project over the long-term, through training and capacity building activities. Combined these activities also ensure the sustainability of the project beyond the crediting period.

Social Investments

The community of Bahia Malaga identified basic sanitation services, especially the management of solid waste and septic tanks as the highest priority for social investment, taking into account municipal plans and programs. Other priorities include improvements in housing, health care, education and access to electricity.

The community of Bajo Calima prioritized food security, due to the high rates of malnutrition among children. As a means to improving food security, Bajo Calima proposed that the project provide assistance in strengthening and improving the productivity and yield of subsistence crops and animal husbandry. Other social investment priorities included sewage and solid waste disposal, and strengthening of sports, recreation and culture.

Training and Capacity Building

A number of activities are planned that will allow the communities to take over the management of resources and implementation of the REDD+ project. This will ensure long-term ownership and sustainability of the project long after the crediting period. For example, the project will enhance the administrative capacity of communities, through The National Training Service (Servicio Nacional de Aprendizaje, or SENA) and other educational institutions, by providing courses in:

1) accounting,
2) financial analysis and project evaluation,
3) environmental and social project management,
4) markets,
5) administration and management, and
6) leadership.

Additionally, the project will support on-going workshops and awareness campaigns to increase awareness about the project, as well as its scope and benefits. Included in these workshops will be community input in order to prioritize social investments based on community needs at the time. Workshops will also include environmental education modules that inform participants about the importance of conservation and natural resources, and will be designed specifically to include and address the needs of women. Participants in both Bahia Malaga and Bajo Calima will receive training on how to communicate information about the project, efficiently and effectively, throughout the territory.

2.2.1 DESCRIPTION OF PROJECT TECHNOLOGIES

The project will employ a number of technologies that reduce GHG emissions. Specifically, the project will prevent deforestation through a suite of project activities including: strengthening land tenure status and forest governance; supporting the development of sustainable forest and land use management plans; demarcating forest, tenure and ownership boundaries, and areas of forest protection; providing assistance for sustainable intensification of agriculture on existing agricultural lands; and providing alternative livelihoods to the agents of deforestation. See Section 2.2.

2.2.2 PROJECT CLIMATE IMPACTS

The project is expected to produce an estimated 14,961,575tCO_2e of emission reductions over a period of 30 years. The climate impacts are determined by the ex-ante estimates of GHG emission reductions, and are expected to be generated as a result of reducing deforestation and degradation in the project area.

The main driver of deforestation and degradation in the project area is commercial logging, used by families to complement other sources of income. Most of the community members periodically go to the forestlands to extract timber, harvesting based on selective logging. Forests represent a source of cash for these communities, and logging is normally done without formal permits from the local environmental authorities.

A causal relationship between activities that will be implemented to address the main drivers of deforestation and degradation and climate impact, is built on a theory of change analysis. This is the same analysis of drivers and actors of land use used for the without-project scenario described in Section **4.5**. The project activities are aimed at establishing sustainable sources of income that create an alternative to logging. To be sustainable and create long-term effects, these alternative livelihood activities are combined with improved governance and land use planning. Demarcating and patrolling activities will also be implemented to further prevent and deter potential loggers.The theory of change model provides a structured approach to thinking about how these project activities will lead to a series of expected short and medium term outcomes, and eventually to the desired long-term climate impacts. See below for graphical representations of the project's expected climate impacts determined through the theory of change analysis for each project activity area (see **Annex D** for the project's complete theory of change model).

Governance

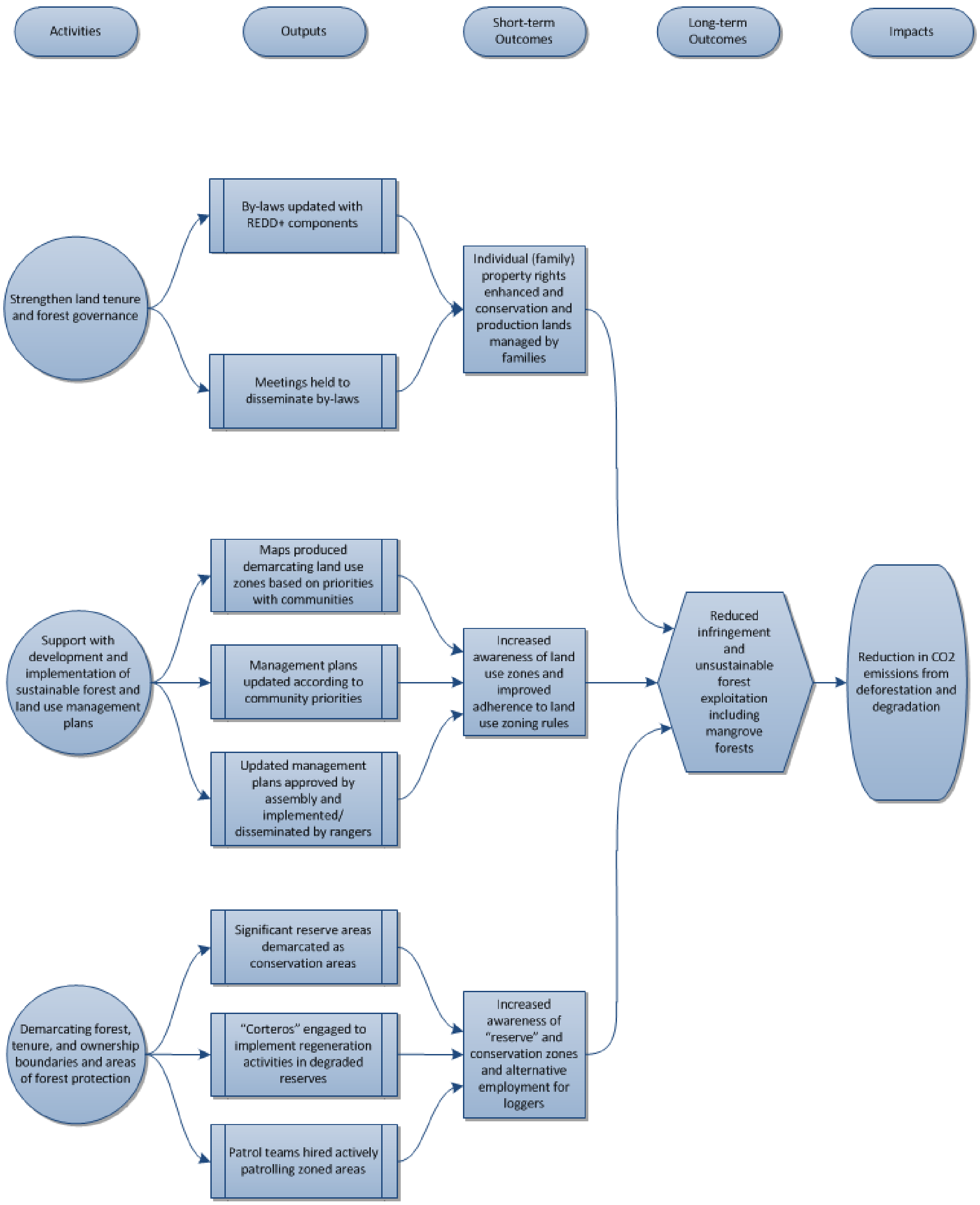


Figure 17. Expected climate impacts from governance activities.

Productive Activities

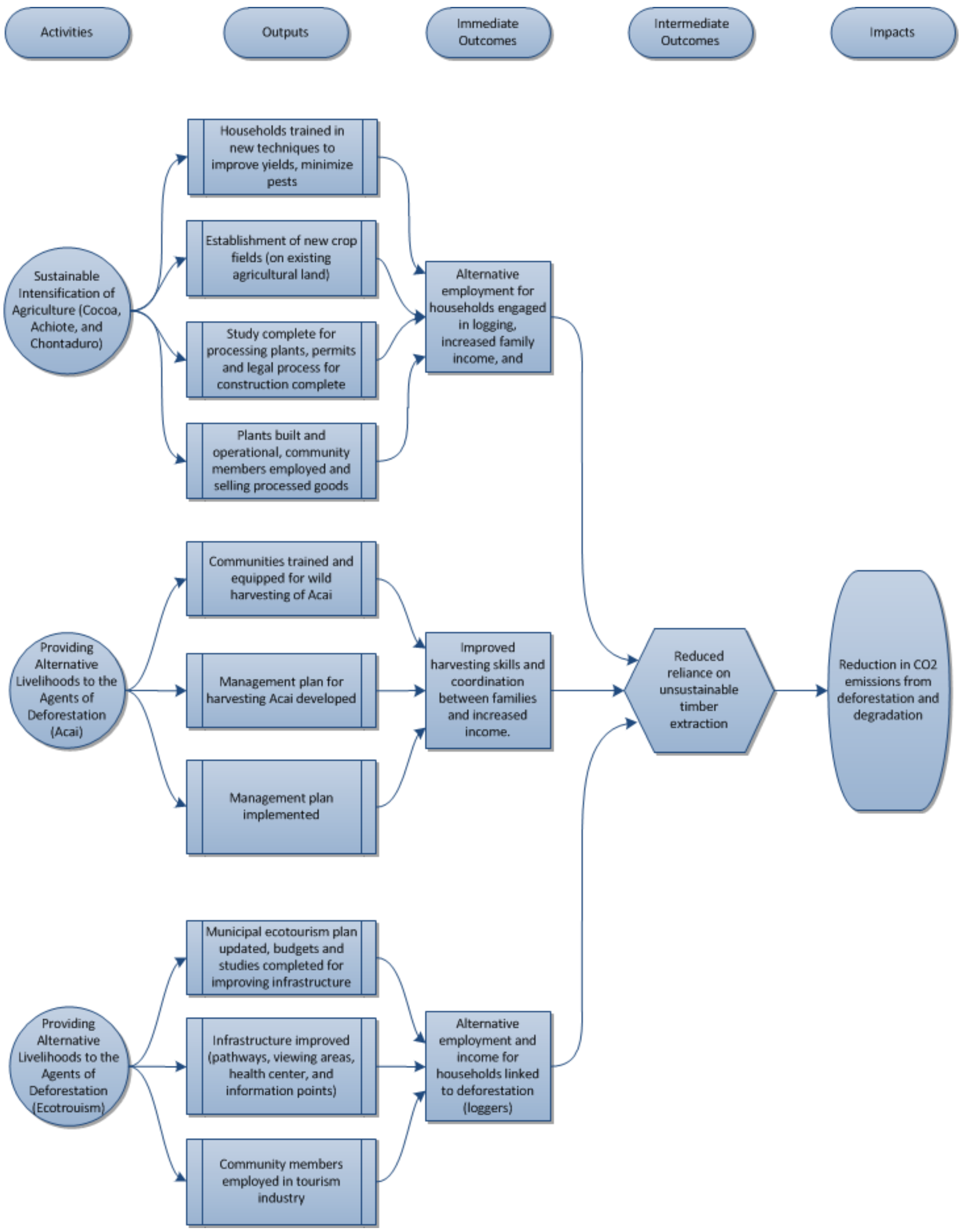


Figure 18. Expected climate impacts from productive activities.

Training and Capacity Building

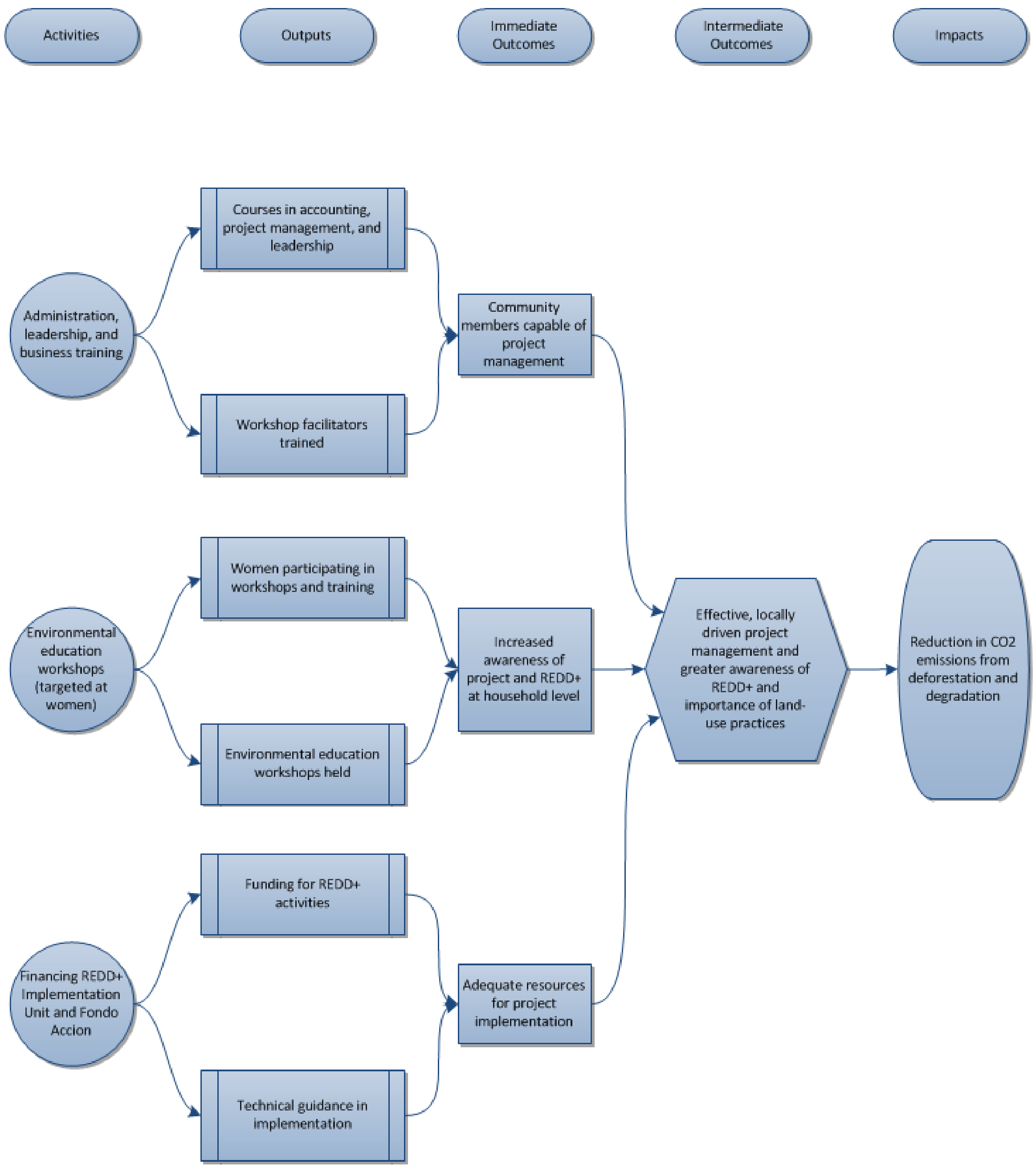


Figure 19. Expected climate impacts from training and capacity building activities.

2.2.3 PROJECT ACTIVITY LIFETIME

Both the crediting period of the project and the project lifetime are 30 years. While the management plans, including the Implementation Plan, extend in some instances out to 60 years, the financial plan for project activities extends out 30 years, setting the project activity lifetime at 30 years as well.

2.2.4 COMMUNITY AND BIODIVERSITY IMPACTS

Community Impacts

The Colombian Pacific is largely occupied and owned by ethnic Afro-Colombian and indigenous communities, organized in collective, autonomous territories. The region is largely undeveloped and remote;access is limited as there are very few roads, and most of the transport takes place by canoe or boat.

Bahia Malaga has a population of approximately 650 residents in 5 communities. The inhabitants of BM mainly derive their income from trading activities (30%), followed by fishing (23.3%), and tourism (16.7%). Prior to the project, inhabitants of Bahia Malaga also derived 14.4 % of their income from logging. The main crops are cassava and plantains produced to meet family needs. Other products such as cocoa, breadfruit, rice, borojó, peach palm, sugarcane, coconut, lemon, corn, papachina, and papaya are also grown. In general, these territories import most of the food they need, and export oil palm, coconut and cocoa to the rest of the country. The extraction of shellfish and hunting of animals are also important. Conditions of basic services (e.g., housing, water, sanitation, education, health) are precarious. The majority of household expenditures are devoted to food (34%), clothing and footwear(24%), and transportation (13%). Health care is poor, without the presence of health care centers in la Plata or a naval base in case of emergencies. The houses are in poor condition, and sanitary conditions are practically nonexistent, even for the attention of tourists. There are no water purification services and energy is only provided for a few hours a day from small diesel plants. There are high levels of illiteracy due to lack of teachers and classrooms.

Bajo Calima has a population of 3500 inhabitants, and 1045 families, in 10 villages. The main source of income is agriculture (54%), followed by animal husbandry (10%), sale of food (10%), and mining (4%). Prior to the project, inhabitants of Bajo Calima also derived 10 % of their income from logging. Agricultural activities are aimed at generating livelihood and marketing for major products such are banana, peach palm, papachina, cassava, yams, and corn borojó. There is some hunting of animals for meat consumption and marketing. Animal husbandry is concentrated on poultry, pigs and fish (tilapia). Beef cattle production is concentrated in 2 families, with a total of 240 head of cattle. Most household spending goes to food (45%), followed by education (20%), health services, and housing (10% each). The condition of housing is fair or poor; water and sanitation are poor. The communities have inadequate health services, with poorly equipped health facilities serving a limited number of communities. The communities use traditional medicine in the majority of cases. The allocation for education is poor, with insufficient classrooms. In addition, the distances and difficulties of access, coupled with child labor in the field, generate absenteeism and high dropout rates. Water is collected and consumed without purification. Electrical power is available in 4 villages, but only 20% of the population has power because of the costs. Communication is limited, as only half of the villages have access to mobile phones.

The project has been built on a theory of change analysis to improve the livelihoods of the households involved in the project area (see Section **6**). This tool provides a structured approach to thinking about how project activities lead to a series of expected short and medium term outcomes, and eventually to the desired community benefits from the project. For example, the theory of change identifies the extreme poverty and lack of government transfers for social services as a condition. The related activities include evaluating the construction of a water treatment and distribution facility in different villages, and then prioritizing and initiating development of the facility based on the study. The long-term impact of this and other activities is improved social well-being.

The project does not anticipate any net negative socio-economic impacts. However, some potential negative impacts on the communities could result from unsafe security in harvesting Acai (i.e. working at heights), occupational health and safety (e.g. hiring people without paying social security), and potential discrimination based on race or gender. In addition, there could be an opportunity cost, including but not limited to timber harvesting, in the project area.

The project has mitigated each of these from occurring by requiring that the project implementers utilize World Bank and other donor safeguards. The project is also mitigating the potential negative impacts on communities by ensuring that the Implementing Partner (i.e. Fondo Acción) has adequate worker safety (see Section **2.6.4**), anti-discrimination hiring practices (see Section **2.6.2**), and grievance redress procedures in place (see Section **2.7.5**).

In addition, the project has developed business plans that demonstrate that the anticipated income from planned productive activities (i.e. fisheries, cocoa, coconut and acai) is similar or greater than the income lost from reduce logging activities (see **Annex E**).

Outside of the project zone, potential negative offsite stakeholder impacts include a potential increase in unregulated logging and cutting of mangroves due to leakage, an increase in cost of living due to a reduction in transportation, and a potential decrease in revenue due to increased governance in the project zone. The project is mitigating each of these potential impacts as well (see Section 6.2).

Biodiversity Impacts

The Colombian Pacific is deemed to be one of the most bio-diverse areas of the world, with over 9,000 species of vascular plants, 200 mammals, 600 birds, 100 reptiles, and 120 amphibians, many of which are endemic to Colombia. It is characterized by a variety of ecosystems, transitioning from coastal mangroves and wetlands to paramos and high mountain forests. Being part of the Choco Biogeographic corridor, one of the world´s 10 mega-diverse hotspots, this region alone accounts for more than 40% of the total vertebrate population of Colombia, some of which are threatened with extinction, including tamarins, spider monkeys, sloths, eagles (*Spizaetus isidori*), poison dart frogs (*Ranitomeya minuta*, *Ranitomeya altobueyensis*), crocodiles (*Caiman crocodylus*), otters (*Lontra longicauda*) and peccaries. The area is also host to several endangered trees species – including Jigua Negro, Guayaquil, Abarco, Nispero, cedar, mahogany and oak - prized for their high-value timber potential.

The project has been built on a theory of change analysis to improve biodiversity in the project area (see Section **7.1.3**). This tool provides a structured approach to thinking about how project activities lead to a series of expected short and medium term outcomes, and eventually to the desired biodiversity benefits from the project. For example, For example, the theory of change for biodiversity identifies the lack of boundary demarcation for reserves and conservation areas as a condition leading to limited awareness of allowable resource uses in those areas. The related activity is to demarcate important reserve and conservation areas that have been subject to degradation in the past, to allow these areas to recover. The medium term outcome of this will be increased awareness of the areas zoned as reserves and conservation areas, with a long-term impact leading to improvements in biodiversity.

The project does not anticipate any negative impacts on biodiversity, as all of the interventions have been designed to promote improved environmental management, through avoiding deforestation and degradation and fostering the regeneration of already degraded forests. Potential negative environmental impacts could result from the use of fertilizers / pesticides, monocultures, water and waste management, and energy sources. The project has mitigated each of these from occurring by requiring the project implementers to utilize World Bank and other donor safeguards (see Section **7**).

2.2.5 FUELWOOD GATHERING

Fuelwood gathering for commercial purposes was identified as a negligent driver of degradation (see Section 4.5.3.1). Thus, the project will not implement activities related to reducing fuelwood consumption by increasing energy efficiency.

2.2.6 WOODLOT/WOODLAND ESTABLISHMENT

No lands are being cleared in the project area to establish woodlots.

2.2.7 SUSTAINABLE EXTRACTION

Sustainable extraction of the non-timber forest product acai will be further developed and commercialized. Harvest management plans are being developed to ensure sustainable extraction and proper use of the naturally occurring acai, which will be complemented with agroforestry that includes crops to be cultivated in already degraded forest lands. These harvesting plans have been provided in Annex F.

2.2.8 SUSTAINABLE AGRICULTURE

Agricultural intensification will be done for cocoa, acai, and chontaduro will consist of enhancing existing crop areas, to better manage pests, increase yields, and to establish proper agroforestry arrangements, with complementary production seasons. No new forest lands will be cleared for these activities. Also, the project activities will add value to the crops by enhancing commercialization channels, and establishing processing facilities where profitable, low volume, products--such as freeze dried acai, cocoa liquor, chonta-chips--can be produced.

2.2.9 ASSISTED NATURAL REGENERATION

Assisted Natural Regeneration is not a planned project activity.

2.3 MANAGEMENT OF RISKS TO PROJECT BENEFITS

The project proponents have assessed the non-permanence risks that are applicable to the project, and judged the overall risks to the permanence of the project's benefits to be 14%. In most cases these risks are mitigated by either the project proponent's management activities or the project activities. The assessment was conducted as prescribed by the VCS AFOLU Non-Permanence Risk Assessment Tool, v. 3.2.

2.3.1 CLIMATE RISKS

Potential natural climate risks to be faced by these communities are likely to be sea-level rise and a potential increase in the severity of storms. These communities have traditionally dwelled in these territories for generations, and have learned to live with the natural cyclic climate variations and risks. For instance, houses are built on piles (stilts) so that changes in the water flows (that occur on a daily basis, and increase seasonally with rain and potentially raised sea levels) do not greatly affect daily life and living conditions. This is important as an adaptation to potential sea-level rise resulting from climate change. As these communities inhabit one of the rainiest places on Earth, they are relatively adapted to severe precipitation events. The communities tend to be located around rivers and water bodies, travel by boat/canoe and engage in subsistence agriculture according to seasons in the low fertile floodplain lands along the rivers. It is possible that an increase in severe precipitation events will improve fertility on flooded lands. The temperature is warm all year long, and therefore there is no need to mitigate it. Climate change is not expected to alter ocean levels and temperatures in the short-term. In the long-term, they may alter aquatic habitats to the point where fishing is no longer viable, which is an adaptation issue – but it is expected to be beyond the timespan of the project.

Potential human-induced risks to the climate benefits of the project include both short and long-term risks. Short-term risks include the lack of capacity and governance on the part of the communities. The lack of capacity and governance are being directly mitigated with training and capacity building activities in the project. Prospective mid-term and long-term human-induced risks to the project include the potential lack of a forest carbon market to cover opportunity costs; significant change to the local economic conditions in the communities (e.g. finding valuable minerals under the forest); or the possibility of a dramatically altered socio-political security situation (e.g. new drug trafficking patterns, war). The project itself has mitigated mid-term insecurities from the potential lack of an international forest carbon market, by working to secure initial investors to cover the cost of project development and initial project implementation until credits can be sold. Long-term risks from potential socio-economic and/or security dynamics in the region of the communities are not directly incorporated in the project planning. It is expected, however, that the presence of the project--through improved governance and livelihoods—will provide some buffer to these potential future impacts. Project activities work with local stakeholders on improved planting and processing techniques for foodstuffs, which will help locals adapt to changing climate and social conditions.

Potential natural risks to the climate benefits of the project were also evaluated, including the risk of events such as (i) fire, (ii) pests,(iii) climate, (iv) geological, and (v) other natural risks. In each type of risk, the possibility of occurrence based on historical events or studies showing the potential that each will occur and repeat before 10 years, every 10-25years, every 25-50, every 50-100 years or 100 years or more, has been assessed. Additionally, the significance of the ability of each event, depending on the potential impact on carbon (stocks) was evaluated, ranging from impacts of over 70%, 50-70%, 25-50%, 5-25%, and 0-5%.

The communities found that the risks posed from fire, pest and disease outbreaks, extreme weather, and geologic events were insignificant. Data from the DesInventar system (see Annex AU) shows no reports of forest fires, significant pest or disease outbreaks, or significant seismic events within the region. While flooding is a form of extreme weather event that does occur naturally within the region with a frequency of less than 10 years, it poses a negligible risk to carbon stocks, as floods affect annual crops rather than forests, as demonstrated in the DesInventar data (see Annex AU). Further, the protection of natural forests from deforestation and degradation will reduce the impact of flooding events as a result of forest ecosystem services. While seismic events do occur within the region every 10 to 25 years on average, the risk posed to forest vegetation is minimal.

The project has very consciously developed measures to mitigate risks to climate benefits over the project life. The pay for performance structure of the carbon purchase contracts aligns stakeholder interest with long-term, sustainable implementation. Significant investments in improved governance and stakeholder capacity development are both key to mitigate potential human-induced risks to climate benefits. Lastly, the project activities will directly mitigate human-induced climate benefit impacts through the forestry activities and the long term forest protection and "social fencing" work that integrate all community members together in the long-term conservation goals of the project.

2.3.2 COMMUNITY RISKS

To ensure that the communities benefit from the project’s ability to produce returns, and that those returns are properly handled, Fondo Acción has started a coaching process and participatory capacity building process. The process is aimed at defining the benefit sharing mechanisms, to ensure that all community members benefit as a result of project implementation. In addition, as part of the on-going monitoring of the project, social surveys will be conducted annually. Through these surveys the equitable distribution of community benefits will be monitored, and community members will be able to provide input to project activities and the reach of carbon and productive activities. Moreover, Fondo Acción has established a mechanism for complaints and grievances management, where continuous community feedback will help adapt the project implementation.

Backing commitments under the REDD+ project is a permanent challenge, as the project is long term, and the communities’ representation and expectations may change over the years. Mitigating the risks attached to commitment will depend on the program’s ability to keep socialization at the right level, so that communities are educated and aware of the benefits related to project implementation. This is to be done through education and capacity building programs already started and led by Fondo Acción, complemented with a proper benefit sharing mechanism, that relies on a good participation policy and related procedures.

2.3.3 BIODIVERSITY RISKS

Biodiversity benefits will be achieved provided that the theory of change model underpinning the project activities remain accurate. There are, however, a number of human and natural risks associated with the assumptions in the theory of change model. Specifically, there are factors out the control of the project that may continue to have a negative impact on some HCVs and other species (i.e. damage to migratory bird habitat outside the project, or hunting pressure outside the project). There is a risk that the income generated from the productive activities will not be of a sufficient level to compete with logging as a source of income, and thereby successfully achieve the desired deforestation reduction impact. Other risks, as mentioned above, include the lack of capacity and governance on the part of the communities, the carbon market risk, changes to the local economic conditions or the possibility of a dramatically altered socio-political security situation (see Section 2.3.1). Finally natural risks such as (i) fire,(ii) pests,(iii) climate, (iv) geological, and(v) other natural risks could impact the biodiversity benefits of the project. The only ones that were found to be significant were extreme weather and geological risks (see Section 2.3.4).

In order to ensure that the project can achieve the broad goals it has established a number of measures to mitigate the risks to biodiversity. Specifically, the entire project is aimed towards conservation and reducing deforestation; there are no monoculture (or any) forest plantations that will be using non-native species in the project; and the planned productive activities and other project interventions are intended to offset any potential livelihood shifting within that project that could impact biodiversity. Additionally, the conservation goals of the project will be monitored on a regular basis; a key risk management measure is to establish proper indicators, and monitoring and reporting mechanisms that the community members can address themselves. Coaching and training on monitoring will be provided to key interested members of the community.

2.3.4 NON-PERMANENCE RISK AND BUFFER POOL

The project team has prepared an overall risk rating for the project under the VCS AFOLU Non-Permanence Risk Assessment Tool (VCS Version 3.2), which is summarized in Table 9 and has been provided separately to validators in Annex AU.

Risk Category	Rating
a) Internal Risk	11
b) External Risk	0
c) Natural Risk	3
Overall Risk Rating (a + b + c)	**14***

*Overall risk rating cannot be below 10.

Table 9. Total risk rating.

2.3.5 MANAGEMENT OF RISKS BEYOND PROJECT LIFETIME

The project is minimizing risks to the expected climate, community, and biodiversity benefits and maintaining those benefits beyond the lifetime of the project. Specifically, the VCS project crediting period is 30 years, starting in 2013 and ending in 2043. The VCS project lifetime is also 30 years, the period of time during which the project proponents and implementing partners are committed to maintain the following activities that will protect previously issued credits. While the management plans, including the Implementation Plan, extend in some instances out to 60 years, the implementation of the project activities will occur during the 30 years of the project lifetime. However, the project benefits are expected to last far beyond this time frame.

The project is taking measures to enhance the climate, community, and biodiversity benefits of the project beyond the project crediting period by implementing the following long-term activities throughout the project lifetime:

- Continuing to strengthen land tenure and forest governance. The communities will update internal by-laws every 10 years, taking into account requirements of the REDD+ project.
- Continuing to develop and implement sustainable forest and land use management plans. The communities will continue to assess and update forest management plans, based on current priorities for sustainable land use.

- Developing alternative livelihoods. The communities will continue to increase household incomes, reducing the need for income from timber extraction, through the production, processing and marketing of cocoa, acai and Chontaduro.

In addition to the above-mentioned activities, the project implementers are establishing a benefits distribution mechanism that will provide net income to participating communities to create and maintain the social investments identified by the communities. The benefits from these investments will improve livelihoods long beyond the life of the project.

2.4 MEASURES TO MAINTAIN HIGH CONSERVATION VALUES

The following table indicates the specific HCVs identified in the project area, activities that will be limited in order to maintain the HCVs, the ways in which protection will be integrated into management plans, and the training required.

HCV Management	Areas of protection	Limitations	Integration into general management plan	Required training
HCV 1.1, 1.2, 1.3, 1.4 Threatened Species	The areas important for the maintenance of key threatened species will be protected to ensure the maintenance or improvement of the HCV. Important areas for the maintenance of threatened species shall include nesting and breeding areas.	The hunting of these species must be avoided in protected areas and other controlled areas.	Monitoring patrols will be responsible for reporting all eventualities in these areas and in other key areas of the territory	Members of the patrols shall receive training for species identification, data collection, use of protocols, reporting methods using equipment(computers, GPS)
HCV 2,3,4	Key areas of mangroves will be protected to ensure the maintenance or	A buffer zone that abuts mangrove areas can be used sustainably. There shall be restrictions on hunting and fishing	Monitoring patrols will be responsible for reporting all eventualities	Members of the patrols shall be trained for species identification, data

Mangrove forests identified according to the criteria of conservation condition	improvement of the HCV.	depending on the season and the state in the life cycle of important species. Forest use shall be restricted to domestic use	in these areas and in other key areas of the territory	collection, use of protocols, reporting methods using equipment(computers, GPS)

Table 10. Measures to maintain HCVs.

2.5 PROJECT FINANCING

In the first year the project activities have been implemented with financial support from USAID under the BioREDD+ Program. The BioREDD+ Program will end in March 2015. The project has secured funding to cover all implementation costs through 2022 (see commercially sensitive **Annex F**).

Estimates of net carbon revenues from the project, plus revenues from the productive alternative livelihood activities will be sufficient to cover all estimated project costs and net benefits to the communities. These additional revenues will be used by the communities to finance priority activities for social investments, not necessarily linked to drivers of deforestation, but important to improve livelihoods and achieve community buy-in for the REDD+ project over the long term. See **Annex F** for details.

Project implementation budgets for the longevity period of the project (i.e. 30 years of the project lifetime plus 30 more years for maintaining carbon stocks from previously issued credits), have been developed and cover all the project activity costs and costs associated with creating emission reductions. These costs have been compared with the projected revenues, including the projected revenues from emissions reductions and other income-generating programs. The outcome of these analyses demonstrate that there is adequate cash flow for the project to cover all projected costs in order to achieve the anticipated climate, community and biodiversity benefits. These confidential financial projections can be made available to the validator.

Additionally, the financial mechanisms adopted by the project, and implemented by Fondo Acción, are being developed in such a way to achieve the project's climate, community and biodiversity benefits. See Section 6.3.5. Specifically, the benefits sharing mechanism will be developed in a participatory manner with community members, consistent with community Development Plans and based on a REDD+ Investment Plan that reflects communities' priorities on how REDD+ revenue will be spent and distributed. Fondo Acción will establish an in-house team of REDD+ experts that will advise the communities on expenditures based on spatially-explicit monitoring information and project needs, ensuring that the climate and biodiversity objectives of the project are also being met.

2.6 EMPLOYMENT OPPORTUNITIES AND WORK SAFETY

2.6.1 EMPLOYMENT TRAINING

A substantial amount of training and capacity building will be organized by the local implementing partner, Fondo Acción, and provided to the community members. Orientation and training for the project's workers and relevant people from the communities will be provided, with the objective of building locally useful skills and knowledge to increase local participation in project implementation.

Specifically, Fondo Acción implements capacity building activities with communities all over the country. When working with community members, the community itself will select the people participating in the proposed activities. Fondo Acción periodically evaluates commitment on the part of the community; if commitment of individuals or of the community organization declines along the way and Fondo Acción believes its goals may not be achieved, it may suspend planned activities. Contents and tools for capacity building activities are designed to be culturally appropriate. In particular, the HARMOS scheme (an organizational coaching strategy designed by Fondo Acción) includes a module for "Practice in Context" oriented to develop particular skills necessary for a specific community enterprise.

Specific training will be provided to support project activities including improved forest protection, creation of livelihood programs, crop diversification, etc. In addition, the productive alternative livelihood activities may invest in Special Purpose Vehicle (SPV) companies that will be in charge of adding value to the cash crops, through processing at special facilities. These SPVs, as well as the different steps in the value chain, such as crop setting, transport and logistics, stockpiling, transformation and packaging, will generate employment for local communities. They will also provide formal training to perform tasks such as agriculture techniques, naturally grown acai harvesting, product processing, and packaging. Also, they will provide training associated with the post-harvest management and to the Community Council Governing Board members in disciplines such as leadership, accounting, and management.

In the case of staff turnover, training will be passed on to new workers so that local capacity is not lost. Procedures will be developed based on Fondo Acción's existing protocols. For example, Fondo Acción currently implements activities with the Tropical Forest Conservation Alliance (TFCA). As part of these activities, Fondo Acción requires that all project beneficiaries prepare and turn in written documentation of all protocols, procedures, methodologies developed with TFCA funds and that these materials are left in appropriate repositories in project sites. Training activities are also a well-received component of all TFCA projects.

2.6.2 EQUAL OPPORTUNITY FOR EMPLOYMENT

Fondo Acción is an Equal Opportunity Employer which aims to include community members in its work regardless of age, gender, ethnicity or other characteristics. They provide in-depth training for their own staff as well as for local community members involved in project implementation.

Currently, Fondo Acción is structured around implementing objective and transparent RFP processes and as such has developed tools to run competitive processes to select recipients. These protocols guarantee equal opportunity to all organizations submitting a proposal if they comply with published terms of reference for the corresponding RFP.

Fondo Acción's employees and consultants are selected through a competitive procedure that is part of their Quality Control System (ISO 9000 – 2008), based on predefined terms of reference. Terms of reference are generally published on Fondo Acción's web page or circulated among professional networks. Short list selection processes are also common. Only in cases where there is a strong reason, does Fondo Acción hire a person without a competitive process.

Additionally, a key component of benefit sharing distribution schemes, as conceived by Fondo Acción, is to ensure that benefits (including employment opportunities) reach women and the most vulnerable and/or marginalized people in the community. Benefit distribution plans for REDD+ projects with Afro-descendant or indigenous communities are rooted in locally created development plans. For Fondo Acción to consider these plans as legitimate, they must be developed with broad community participation following the internal rules by Community Assemblies. Once the key activities for the benefit distribution plans are agreed, the next key step is to determine who will be directly involved in implementation. This section of the distribution plan is the place to formally define equal opportunities for all community members.

Additional procedures that guarantee equal opportunities for community members, including women and vulnerable and/or marginalized people, to fill all positions, including management positions, are currently being developed.

2.6.3 WORKER'S RIGHTS

The project will meet or exceed all applicable national labor laws and regulations covering worker rights. Fondo Acción will ensure that the project is in compliance with all existing and future laws regarding workers and their rights.

Fondo Acción will inform workers of their employment rights during community meetings. Documents explaining national rules on worker's rights and the obligations of both contracting parties will be made available in local languages when relevant.

Fondo Acción operates under the general "Codigo Sustantivo del Trabajo", law of 1950, which establishes all worker rights in Colombia and all other laws in force today. Since 1950, several laws have been approved to regulate, complement, or modify the "Codigo". The following is a list of some of laws which include worker rights provisions: Law 100 1993, Law 1496 2011, Law 962 2005, Law 1280 2009, Law 1468 2011, Law 789 2002, Law 1429 2010, Law 50 1990, National Decree 089 2014, National Decree 2264 2013, National Decree 535 2009, Law 584 2000.

Workers are informed of their rights through contracts with Fondo Acción. All Fondo Acción contracts (staff and consultants) are governed by all worker-rights-related laws. In contracts with staff there is a clause that explicitly mentions these laws and by signing the two parties acknowledge the relevant laws. In contracts with consultants, a clause lists all Fondo Acción's obligations with the consultant, according to these same laws and regulations. All workers (staff or consultants) are allowed enough time to carefully read and comment on the content of their contracts before signing.

To ensure that the project meets or exceeds all applicable laws and/or regulations covering worker rights, the technical teams of Fondo Acción conduct a startup workshop called *Preparation for Project Management* (PGP for its name in Spanish) with all project implementers. During this workshop there is a session devoted to explaining the formal engagement of workers in the project. Staff and consultant contracts are reviewed and the requirements of each type of contract are presented. During regular evaluations of all projects, Fondo Acción supervisors are entitled to look into all contracting information of people hired with project funds and may suspend project disbursements if there is any evidence that worker rights are not being respected, according to the law.

2.6.4 WORKER SAFETY

Colombia has strong legislation regarding worker's safety. Decree 1295 of 1994 establishes the general system of professional risk, and sets the basis for preventing and addressing worker's risks. The decree was modified in 2012, by Law 1562. According to the decree, all workers under contract are required to be affiliated with the General Work Risk System. The law enables worker risk prevention companies to administer risk training at the companies. These regulations have grown strong in Colombia and help companies to pursue good practice in relation to work safety and occupational health.[9]

Specifically, Fondo Acción complies with the Colombian law regarding worker safety. All staff members are covered with insurance for worker related risks. There is a risk assessment for each person according to the kind of work they are performing. According to national regulation (Resolución 2013 de 1986) all institutions that have 10 or more workers have to set up an internal Committee for Occupational Safety (COPASO for its name in Spanish), and have to produce a Risk Management Plan. Fondo Acción has both in place, and adheres to the following procedures:

1. Comprehensively assess situations and occupations that might arise through the implementation of the project and pose a substantial risk to worker safety;
2. Describe measures needed to inform workers of risks and to explain how to minimize such risks; and
3. Where worker safety cannot be guaranteed, project proponents must show how the risks are minimized using best work practices in line with the culture and customary practices of the communities.

In areas where there are security issues for field teams, Fondo Acción has developed a security protocol with best practices specifically for project staff.

Finally, the project is also compliant with IFC Performance Standards on Environmental and Social Sustainability. Performance Standard 2 recognizes " that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers" and contains a number of requirements related to workers' rights and safety.[10]

2.7 STAKEHOLDERS

From the start of the project, communities and other stakeholders who would be potentially affected by the project activities have been involved in the project design through a well-constructed consultation process. The process was initiated with communities that had already received support through the USAID-funded "More Investment for Sustainable Alternative Development Program" (MIDAS), which was implemented from 2006 to 2010 and together with the Presidential Agency for Social Action and International Cooperation, ACCIÓN SOCIAL, worked with the private sector to sustainably strengthen sources of income and legal employment and to promote

[9]See http://www.arlsura.com/index.php/imgprevenimos for more info on the system and laws

[10] IFC Performance Standards on Environmental and Social Sustainability: January 1, 2012. Found at:

http://www.ifc.org/wps/wcm/connect/c8f524004a73daeca09afdf998895a12/IFC_Performance_Standards.pdf?MOD=AJPERES

Colombian economic growth. Overall this program benefitted 287,812 families and supported the creation of 260,000 jobs in vulnerable populations focused in the Pacific region.[11]

Importantly, the MIDAS program was the first USAID initiative in Colombia that specifically linked Payments for Environmental Services (PES) to the protection of specific, high conservation value areas, which were mapped and formally included in agreements with communities. Performance against conservation objectives were monitored against conservation objectives by the Colombian National Forestry Institute, CONIF, and shown to be effective during the life of the Program. The community councils that had experience with PES (essentially as an economic substitute to logging) through MIDAS became the initial "anchor communities" (or "nodes") for the development of the subsequent BioREDD+ Program. Based on these anchors, surrounding communities were then consulted regarding their interest in participating in future REDD+ initiatives and selected based on a variety of criteria including: (i) security, (ii) territorial composition and potential for generating carbon emission reductions, and (iii) expressed community interest in participation and quality of local leadership.

2.7.1 STAKEHOLDER ENGAGEMENT STRUCTURE

From the beginning of the project, the BioREDD+ team was careful to establish project management, advisory, oversight and consultative structures to ensure the active involvement of all stakeholders in the planning and execution of project activities. Furthermore, the REDD+ project is being jointly developed with the local communities, who are not only project owners, but will also be the ones implementing the project activities and achieving GHG emission reductions over the long term.

With regards to planning, the project has respected existing community governance structures. Specifically, the communities are organized in Community Councils, led by a Governing Board, and represented by a Legal Representative. The board members are democratically elected every 3-4 years, and the Board normally appoints the Legal Representative. The election is made at the General Assembly, which is the widest and most representative governing body, as every member of age has a right to be present and to vote. The General Assembly will approve the REDD+ Plan for the project to ensure wide-spread representation among all community members. Board members, and especially appointed delegates, will be in charge of working and agreeing on the REDD+ Plan, developed jointly with the communities.

As well as respecting and incorporating formal governance structures and processes, the on-going planning exercise has also been based upon around continuous, informal exchanges between BioREDD+ and the communities, facilitated by the long-term, physical presence of BioREDD+ regional coordinators in each of the 4 Nodes. These coordinators receive continual professional support from the Program´s Climate Change Component within BioREDD+, comprised of 5 professionals, who provide technical support and oversight to the entire project on REDD+ issues from the Bogota office. This team is in turn supported by a REDD+ socialization team that functions as a bridging mechanism between the communities and the climate change group. This group is responsible for undertaking formal social engagement activities (workshops, work sessions, meetings, etc.). This entire effort is overseen by Program Management from the BioREDD+ Main Office in Cali.

The stakeholder engagement effort is also supported by outside groups providing technical support services, including: 1) baseline socio-economic assessments that have been developed by the Autonomous University of the

[11] http://www.ard.org.co/midas/midas_english/quienes_somos2.html

Department of Valle; the University of Antioquia; and the Laurel Foundation (former professors from the University of Nariño); 2) EcoPartners, ClearSky Climate Solutions and Offsetters providing advisory services to specific components of community engagement, and 3) the Colombian Forestry Institute, CONIF, and the Humboldt Institute, who have worked closely with communities in order to establish forest plots for carbon and biodiversity monitoring.

Project execution will follow a similar structure to planning. Specifically, there will be an administrative support and oversight organization (i.e. Fondo Acción). Their role will be to provide oversight on the budget, ensuring that payments are made according to the objectives of the project, and transparent processes agreed upon with the investor, the communities and the stakeholders/community members. They will liaise permanently with the governing boards of the community councils in conjunction with community-level REDD+ coordinators who are currently being identified and trained to play this role. All fundamental decisions regarding REDD+ development will be taken by the governing boards of the councils or by a smaller designated group with the authority of the council. Fondo Acción will provide technical support and coaching to communities and will hire outside technical experts for support on implementation of specific project activities and MRV, where necessary.

Finally, as requested on CCB Standards Third Edition G3, the Framework Implementation Agreement (Annex AV) describes measures needed and taken in order to ensure that the project proponent (Communities) and all other entities involved in project design (BioREDD+) and implementation (Fondo Acción), are not involved in harassment or discrimination, including discrimination based on gender, race, religion, sexual orientation or other habits.

2.7.2 STAKEHOLDER IDENTIFICATION

The process of stakeholder identification was initiated with communities that had already received support through the USAID-funded MIDAS program. See Section **2.7** above. The initial list of communities consulted is contained in Figure 14. The on-going engagement with the communities explained above (see Section **2.7.1**) led to the final list of 20 communities, organized into 8 BioREDD+ projects, which constitutes the current portfolio.

The process has been open and honest, and one in which the potential benefits and risks of participating in the REDD+ project have been outlined and discussed. Throughout the entire process, the Program has respected the autonomy of communities to arrive at their own decisions regarding their involvement in REDD+ and this has been reflected in the decision on the part of several communities in the Buenaventura region (in particular Yurumangui, which was considered a high-potential REDD+ project just eight months ago) not to continue with REDD.

The final list of selected communities reflects: (i) the level of community commitment to continue with the REDD+ project; (ii) the perceived costs and benefits of engaging in the project (i.e. the potential to generate credits, implement project activities, etc.) and (iii) security and access issues. See Table 20.

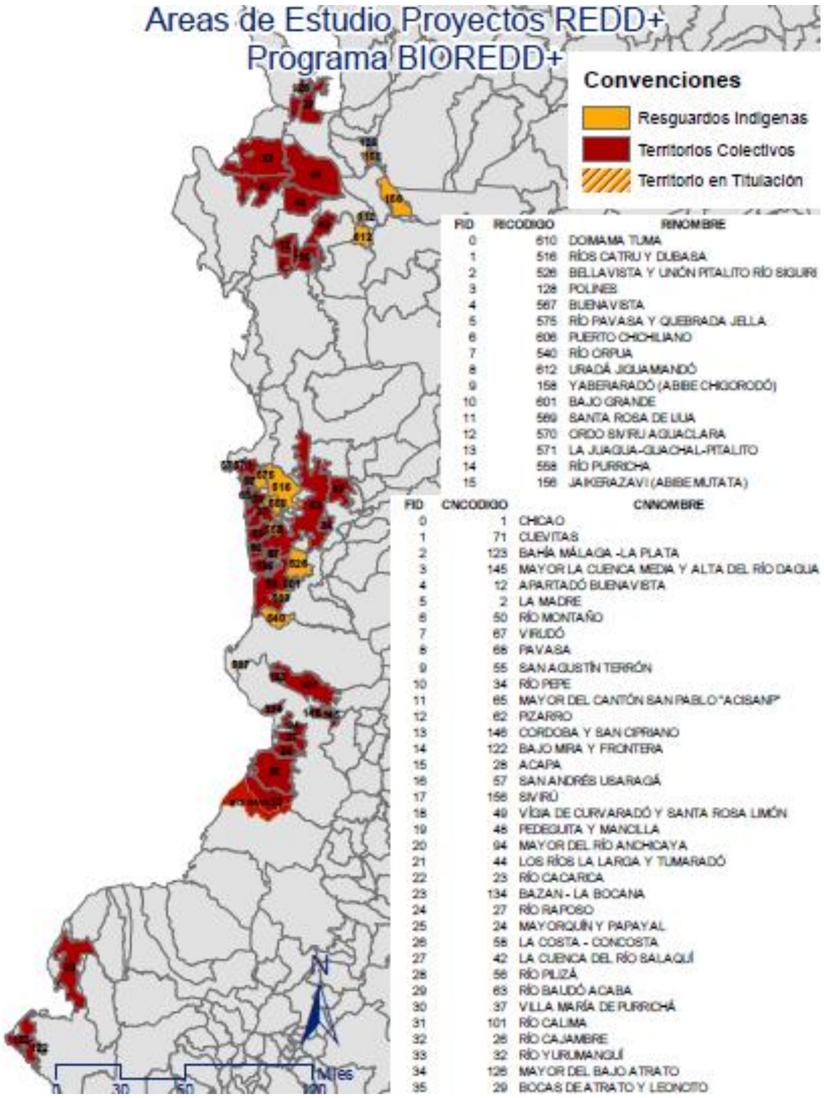


Figure 20. Initial communities engaged in BioREDD+.

PRIORITIY PROJECTS			
REDD+	**Community**	**Area (Ha)**	**Families**
1	**CC Bajo Mira y Frontera**	109.782	1240
	CC Acapa		1453
2	**CC Cajambre**	75.71	1497
3	**CC Bajo Calima**	104.761	801
	CC Bahía Málaga-La Plata		

4	**CC Concosta**	73.034	829
5	**CC Pizarro**	59.887	595
	CC San Andrés de Usaragá		
	CC Sivirú		
	CC Río Piliza		
6	**CC Río Pepé**	84.803	323
	Acaba		
7	**RI Chontadural Cañero (Emberá Katío)**	57.702	432
	RI Polines (Emberá Katío)		
	RI Yaberaradó (Emberá Katío)		
	RI Jaikerazavai (Emberá Katío)		
8	**CC Chicao**	143.313	221
	CC Apartadó-Buenavista		
	CC La Madre		
	CC Río Montaño		
	CC Vigía de Curvaradó y Santa Rosa de Limón		
	Rio Domingodo		

Table 11. Final list of communities included in BioREDD+ program

2.7.3 STAKEHOLDER CONSULTATION

There have been a number of important outcomes from the community consultation process described above. For example, both BC and BM have agreed to participate in the development of potential REDD+ activities, and signed a document called Hoja de Ruta, which specified the type of studies required. Since then, there have been many opportunities for training the communities on REDD+ projects and on the benefits and commitments required to be part of this type of activities.

At the end of 2013, both communities signed Letters of Intent with BioREDD+, so that the program representatives could talk to potential investors, and advance with the negotiations, always under close coordination with the local stakeholders. The most recent process has been to develop a REDD+ Plan of Action, where the communities identified the causes of degradation and deforestation, mitigation activities, created a budget, and identified implementing agents (see **Annex O**).

BioREDD+ has submitted to the General Assembly the Letter of Intent. A set of mini-workshops has been conducted to discuss the REDD+ Plan. A Spanish executive summary of the REDD+ PD will be submitted to the Assembly along with detailed interactions with BioREDD+ staff for discussion and approval. Finally, a Spanish translation of the project description will be presented to the Assembly for further circulation amongst the community, thereby ensuring that full FPIC procedures are followed.

In addition, the stakeholders have been participating in the assessment of their own social and economic situation, as a participatory assessment was carried by Universidad Autonoma de Occidente, top research institution specialized in that part of the country. And, through the community socialization meetings carried out by the BioREDD+ program, communities have helped identify deforestation and degradation drivers, agents, and the best strategies to address and mitigate them. The project activities have resulted from these participatory meetings where priorities have been set by stakeholders, with the support of the BioREDD+ team, including the climate change technical team and outside specialists.

Throughout the socialization process, emphasis has been placed on the development of appropriate community level engagement processes and materials to ensure complex issues are presented in a way that communities can understand. This included identification of the project zone, participatory mapping of project areas, identification of risks to the communities, prioritization of project activities, and role-playing to better understand potential financing and implications for the project. These have all been conducted in local languages, with translation (e.g. indigenous meetings translated to Embira). All of the socialization activities are finalized with a formal signing of meeting minutes (See **Annex G**).

More recently, Fondo Acción has continued to expand and deepen the social engagement exercise with additional materials and techniques that build upon the successful experience of the Acandi REDD+ Project, and include Acandi community members as part of the social engagement team.

The organization of the social engagement agenda is planned and executed in line with the key milestones and agreements that the communities will sign at appropriate points in time. The process is initiated with a signed Letter of Intent granting BioREDD+ the rights to facilitate the negotiation process between the communities and any potential investors, and undertake the relevant social engagement activities. This process guarantees the legitimacy of any subsequent decisions taken related to the on-going REDD+ process.

Similarly, the scheduling of meetings and workshops has been done to ensure: 1) ensure formal approval from community assemblies is undertaken in an objective and timely manner; 2) communities understand and can take coherent decisions regarding the negotiation of any term sheet with investors; 3) the communities are able to understand and commit to any final contract that emerges as a result of these activities. The BioREDD+ team will provide legal services at relevant times as part of this activity.

2.7.4 PUBLIC COMMENT PERIOD

Parallel to the publishing of the English-language PDD on the website of the CCB and the mechanism on the CCB website (http://www.climate-standards.org) to provide public comments, a number of activities are organized to provide local communities and stakeholders with the opportunity to provide public comments. Specifically, a REDD+ Plan has been developed with the communities that are part of the project. Once complete, the REDD+ Plan will be approved by the General Assembly. Once the REDD+ Plan is approved, a Spanish executive summary of the REDD+ PD will be disseminated to the Assembly and community members. Finally, this project description, as submitted to VCS for validation, will be translated to Spanish and distributed to the communities to ensure full back up and understanding.

This document will also be distributed within the communities that are part of the project, as well as to relevant government officials, at the local and national level by BioREDD+ with the aid of Fondo Acción. All comments will be centralized and translated from Spanish to English, and sent to CCB and the validator.

2.7.5 STAKEHOLDER CONFLICTS AND GRIEVANCES

The project relies on existing and emerging institutions to mediate any conflict arising from project related activities. Specifically, within each Community Council jurisdiction there will be a REDD+ Unit, which will consist of, at a minimum, a coordinator and a team of rangers, who will be assigned specific responsibilities and duties, relevant to the project. These responsibilities will include the operation of a grievance and redress mechanism associated with REDD+ project activities. Each REDD+ Unit will establish a Grievance and Redress Mechanism in order to receive, respond to, and solve inquiries, complaints, and potential claims.

The organizational structure of the Grievance and Redress Mechanism will be as follows:

- During the first three months of the project, each Governing Board and Legal Representative, along with Fondo Acción, will develop an Assignments Manual. The Community Council Assembly and Fondo Acción will provide written approval of the Operations Manual, signed by all members of the Governing Board and Fondo Acción.
- The Project Coordinator of each Community Council will be the Grievance Mechanism Manager.
- Rangers will assist the Grievance Mechanism Manager in researching and understanding each grievance or claim.
- Grave conflicts or complaints (i.e. those that cannot be solved by other procedures in the Grievance and Redress Mechanism) will be heard by a mediation body, including the Governing Board President, Legal Representative and representatives from Fondo Acción. The Grievance Mechanism Manager, concerned parties and other guests are welcome to attend the Mediation Session. After studying each particular case and employing the procedures established in the Assignments Manual, a decision will be rendered.

The process for receiving, hearing, responding to and attempting to resolve Grievances, within a timely manner, is as follows:

First, the project will attempt to amicably resolve any Grievances that arise, and provide written responses, in a way that is culturally appropriate and takes into account traditional methods that the communities currently use to resolve conflicts. Specifically, the project will be able to receive requests in both oral and written form. Oral requests will be presented to the Grievance Mechanism Manager, who will write hear arguments and write a manifest considering the meaning and language of what is being communicated. Once written, the manifest will be read, adjusted as appropriate, accepted and signed by the person making the grievance. The Grievance Mechanism Manager, and witnesses if requested, will also sign the request including the place, date and time.

Written requests will be presented according to the following procedures. These can be placed in the mailbox placed outside the Administrative Office of personally handled to the Grievance Mechanism Manager, or delegates, within office hours.There will be an official notice indicating the hours of operation, the name of the person responsible for hearing grievances, and instructions for following up on any grievances left in the mailbox. For all written grievances, receipt of the delivery will be given that includes the date, time and place of receipt, name of stakeholder, the name and signature of the person receiving the grievance, the classification process and an identifiable serial number in order to keep track of the document.

Once requests are received, the Grievance Mechanism Manager will classify the Grievance as either: 1. Request for more information, clarification or requirement for communication. These types of requests will receive a written response; 2. A critique, protest, or demand over a situation, process or problem to be solved. These types of requests will receive a signed written response according to the responsibilities set forth in this Grievance Mechanism. The Grievance Mechanism Manager will attempt to resolve the claim, possibly with the support of Fondo Acción or with the Governing Board of the Community Council through its Legal Representative. Claims will be classified and handled accordingly. Specifically:

- Claims related to operational, organizational, planning or coordination related matters will be handled directly by the Grievance Mechanism Manager within 8 days;
- Claims related to inequity of resource allocation and/or distribution of benefits will be addressed by the Govening Board of the representative Community Council.;
- In cases of: inequality and/or impaired ability to participate in social processes to define and implement REDD+ activities, conflicts due to land and family or community resource use and ownership, and impacts of project activities on offsite stakeholders, claims will be first addressed by the Grievance Mechanism Manager. If the claim is beyond the scope of his ability to resolve, the Governing Board of the respective Community Council and/or their Legal Representative will take appropriate action within 30 calendar days; and
- Finally, in cases related to administrative failures or irregularities, copies of the claim will be sent to Fondo Acción. Claims will be first addressed by the Grievance Mechanism Manager. If it is beyond his/her scope, the matter will be addressed directly or in coordination with the Legal Representative of the Community Council, who will officiate in front of Fondo Acción.

Secondly, Grievances that cannot be resolved by the above-mentioned internal procedures will be referred to to the Camara de Comercio de Buenaventura or to the Defensoria del Pueblo, identified as the Mediation Bodies.. These cases would be considered Grave Conflicts that require a response from the President and Legal Representative of the Governing Board of the Community Council, and representative from Fondo Acción. For such conflicts, a response will be provided within 45 calendar days. The Assignments Manual produced within the first three months of the project will contain more detailed procedures for listening to the conflicting parties.

Finally, any Grievances that are not resolved through mediation shall be referred either to a) arbitration, to the extent allowed by the laws of the relevant jurisdiction; or b) competent courts in the relevant jurisdiction, without prejudice to a party's ability to submit the Grievance to a competent superior adjudicatory body, if any. Such procedures will also be developed in the Assignments Manual.

In addition to the formal grievance procedures established through community governance structures, Fondo Acción will be developing a 'Complaints and Grievance Procedures for the project based on its existing procedures. Specifically, Fondo Acción has a formal Complaints and Grievances Procedure as part of its Quality Control System (ISO 9000 – 2008). Under this procedure, the Board of Directors receives all complaints and these are registered in Board Meeting Minutes. The Executive Director is responsible for treating these complaints according to a second procedure that is also part of the Quality Control System (ISO 9000 – 2008) (Corrective and Preventive Actions). This process will be adjusted to suit conditions of the REDD+ project.

A stakeholder satisfaction survey is also as part of the Complaints and Grievances Procedure. This survey inquires about the stakeholders' opinions regarding Fondo Acción's management, innovation, communication, internal reporting etc. Surveys are conducted once a year and results evaluated by the Board. If there is a low grade in a given survey (2 or less), the Executive Director has to address it under the Corrective and Preventive Actions Procedure.

Fondo Acción will develop Complaints and Grievances Protocol for all REDD+ projects where it is in charge of administering resources. The basic elements of such protocols are included in Section S of The Rain Forest Standard (http://cees.columbia.edu/the-rainforest-standard). For finalized protocols, see provided **Annex H**.

2.8 COMMERCIALLY SENSITIVE INFORMATION

The following information is commercially sensitive and is not publically available. This information will be made available to the validator.

- REDD+ Plans of Action
- Project Budget
- Financial Projections
- Some Standard Operating Procedures and Forms
- LULC Classifications and computer code used to produce them
- Government Approvals and/or permits (as needed)
- Agreements between implementing, technical partners and communities
- Models used to create carbon calculations and supporting computer code

3 LEGAL STATUS

3.1 COMPLIANCE WITH LAWS, STATUES, PROPERTY RIGHTS AND OTHER REGULATORY FRAMEWORKS

The project proponents are committed to complying with all applicable laws, statutes, property rights and other regulatory frameworks. The extensive stakeholder consultation process will ensure that compliance is achieved. See **Annex I** and **Annex G** for evidence of the project's legal compliance. Listed below are the laws, and sections of laws and regulations, relevant to the project that are specific to Colombia.

- Decree 2811 of 1974 (Renewable Natural Resources Code), art 42 establishes that the renewable natural resources belong to the nation. Art 44 sets principles for managing the natural resources to promote a balance between economic development and environmental protection, and for the efficient use of resources.
- Law 164 of 1994 ratifies UNFCCC. Decision 1/CP16 requests, according to national circumstances, that partiesadopt measures to reduce emissions from deforestation and forest degradation, set aside forest reserves, and sustainably manage forests.
- Law 52 of 1994. Law 52 of 1994 regulates article 342 of the 1991 Constitution and defines the procedures for the elaboration, preparation, approval, and implementation of development plans. It represents the law that most affects the structuring and implementation of sustainable development in the country.

Departmental and municipal authorities are called on to harmonize their programs, plans and projects for local investment, to be established as part of this protocol. (Refer to **Annex I**– Colombia Law 52.)

- Article 63 and 330 of the Colombian Constitution and Article 6 of Law 70 of 1993 (Consejos Comunitarios) are known as “Recognition of the Right of Black Colombians to Collectively Own and Occupy their Ancestral Lands” and address land ownership. Specifically, communal lands of ethnic groups are “inalienable, imprescriptible and unseizable”.
- Article 76 of Law 99 of 1993, “General Environmental Law of Colombia,” states that "The exploitation of natural resources should be done without detriment to the cultural, social and economic characteristics of Indigenous and Afro-Colombian communities according to Law 70 of 1993 and Article 330 of the National Constitution and the decisions on the matter shall be made after consultation with representatives of such communities."
- Law 21 of 1991 (Resguardos Indigenas) “Ratification of Convenio 169” Colombian law to adopt the international rules and norms as put forth International Labor Organization’s Resolution of 1989. Generally interpreted to give indigenous groups right of use of their “Resguardos” or reservations and to do with right of use of the natural resources. This gives rights to indigenous to work free of discrimination and measures to be adopted “to safeguard the persons, institutions, property, labor, cultures and environment of these peoples and that these special measures should not go against the free wishes of indigenous peoples.” Consultation with indigenous peoples should be undertaken through appropriate procedures, in good faith, and through the representative institutions of these peoples. The peoples involved should have the opportunity to participate freely at all levels in the formulation, implementation and evaluation of measures and programs that affect them directly. Appropriate consultation must be undertaken with indigenous people. Effective consultation is consultation in which those concerned have an opportunity to influence the decision taken, “a simple information meeting does not constitute real consultation.”
- Forest Policy (1996). The forest law dates back to 1959 and was updated in 1974 and 1996. The country’s forestry policy was adopted in 1996 through document 2.834 of the National Council for Economic and Social Planning and has the general objective of achieving sustainable use of forests in order to conserve them, consolidate the incorporation of the forestry sector into the national economy and improve the population’s standard of living. The guiding principles of the policy are as follows:
    - Forests are one of the country’s strategic resources, an integral part of and support for biological diversity, so that knowledge of them and their management is a vital responsibility for the State, with the support of civil society.
    - Sustainable forest development is a joint, coordinated task of the State, the local community and the private sector.
    - Sustainable harvesting of forest resources is a strategy for forest conservation and requires an enabling environment for investment.
    - Most of the country’s forest areas are inhabited and the local inhabitants rights must be respected.
    - Scientific research is vital with a view to achieving sustainable development of the sector.
    - Planted forests and agroforestry systems play a fundamental role in producing energy and industrial raw materials, maintaining ecological processes and generating employment, and also in the country’s socio-economic development, and should therefore be promoted.
    - The national policy will be implemented at the regional level, taking the specific features of each region into account.
    - The forestry policy sets the following specific objectives:

- a reduction in deforestation by coordinating and refocusing intersectoral policies;
- promotion of reforestation and the rehabilitation and conservation of forests in order to restore catchment areas and degraded soils;
- enforcement and rationalization of administrative processes for the sustainable use of forests;
- addressing of the cultural, social and economic problems that give rise to deforestation. (FAO, 2014)

- Forest Reserves Act (Law 2 of 1959) is separate from the National Parks system and doesn't represent property rights of the state, but establishes a classification and management regime for the lands that fall under its purview including public lands, Indian reservations and Afro-Colombian lands.
- The Strategic Plan to Restore and Establish Forests (Plan Verde) approved in 1998, has as a main objective the inclusion of agroforestry, conservation and ecological restoration in the environmental management of the territory, the recuperation of degraded ecosystems and the promotion of protective reforestation in areas which generate basic environmental services to the population, the control of deforestation and encouraging the implementation of agroforestry. The goal of this Plan is to reach a total area of 1 million hectares of reforested or restored land (World Bank 2009).
- Decree 3570 of 2011 sets functions for the Ministry of Environment and its dependencies and ascribed institutions. It establishes that the Directorate on Forests, Biodiversity and Ecosystem Services, is responsible for developing and coordinating the implementation of the National Forestry Development Plan.[12]

In addition to the above-mentioned national laws and regulations, Colombia has adapted the following international legislation:

- Convention for the Protection of the World Cultural and Natural Heritage. Paris, 1972.
- Convention on International Trade in Endangered Species: wild fauna and flora. Washington, 1973.
- Convention on Biological Diversity. Rio de Janeiro, 1992.
- Convention on Wetlands of International Importance especially as Waterfowl Habitat - Ramsar (hosted by Colombia in 1997).

3.1.1 WORKER'S RIGHTS AND TREATIES

The REDD+ project's implementation will comply, at a minimum, with the following national laws and regulations as they pertain to worker's rights and treaties:

- ILO Convention 169 - The **Indigenous and Tribal Peoples Convention, 1989** is an International Labour OrganizationConvention, also known as ILO-convention 169. It is the major binding international

[12] The National Forests Development Plan (2000), approved in December 2000 by the National Environmental Council, this plan has been adopted as official state policy and offers a strategic vision for forest management through 2025. The plan tries to actively incorporate the forestry section into the nation's social and economic development. It aims to reach a balance between conservation, sustainable use and equitable distribution of benefits (Taylor 2006). It is aimed at conservation in situ, restoration and rehabilitation of forestry ecosystems and protection against forest fires. One of the results of this program is the reforestation of 95,400 hectares of strategic land for conservation of water resources. Various subprograms exist within this program. One of them is the program titled Strengthening of forest management for the conservation and restoration of forestry ecosystems in water basins, with a duration of three years, consisting of conservation and restoration actions on 120,000 hectares of forestland, in rural and urban areas, through increasing of forest coverage and management of water basins (World Bank, 2009).

convention concerning indigenous peoples, and a forerunner of the Declaration on the Rights of Indigenous Peoples.

- Law 278 of 1996 – formally creates the Standing Committee on concertation of wage and labor policies created under Article 56 of the Constitution, and assigns it to the Ministry of Work and Social Security.
- Law 524 of 1999 – formally creates "Convention 154 on the promotion of collective bargaining" as adopted at the 67th session of the Gene Conference.
- Law 931 of 2004 – dictates the national regulations of the right to work in conditions of equality without age discrimination.
- Law 789 of 2002 – establishes the rules to support employment and extend social protection and security to workers.
- Law 1562 of 2012 – which modifies, and improves the system of Worker Risk and Safety and establishes other regulations about Worker Health.In order to comply with this Law, a document called: ¨BioREDD+ Bajo Calima y Bahía Málaga (BC-BM) REDD+Project´s occupational risks assessment and mitigation measures¨ (Annex AY) has been produced. This document shows a complete evaluation of occupations that might arise through implementation of the project and pose a risk to worker safety, and Fondo Acción´s risk management to mitigate risks in order to comply with the implementation framework agreement. (Annex AV)
- Law 100 of 1993 – which creates an Integrated Social Security System for the country.
- Decree 1771 of 1994 – which establishes the legal requirement for all affiliated members of the General System of Occupational Hazards (Worker Safety) to pay for medical care for injuries that occur on the job.
- Decree 1772 of 1994 – which regulates who can/must affiliate with, and the contributions to, the General System of Occupational Hazards.
- Decree 1295 of 2004 – which determines the organization and administration of the General System of Occupational Hazards.

3.2 EVIDENCE OF RIGHT OF USE (G5)

Based on the VCS Standard Section 3.11.1, the project demonstrates that the proponents have Right of Use over the emission reductions under subsection 4:

"A right of use arising by virtue of a statutory, property or contractual right in the land, vegetation or conservational or management process that generates GHG emission reductions and/or removals (where such right includes the right of use of such reductions or removals and the project proponent has not been divested of such right of use)…"

The project proponents, the communities themselves, are the legal owners of the land and forests in the project areas. Through the laws and policies detailed in Section **3.1** above, specifically the Colombian Constitution and several additional pieces of legislation—including Law 70 of 1993 (Consejos Comunitarios), Law 21 of 1991 (Resguardos Indigenas)—the lands belong to the communities, and cannot be sold, transferred or have liens set upon them. The community lands are autonomous, and have their own governance structure. Specific titling is formalized through resolution bills issued by INCODER, the national agency in charge of land title issuance in Colombia. REDD+ territories are governed by Community Councils, in the case of the Afro-Colombian communities; and by Cabildos, in the case of indigenous peoples. According to the Law 70, the Afro-descendant communities have clear rights to their lands and forests, as long as the latter get managed according to their ecological function.

In addition to granting land rights, Chapter IV of Law 70 given inalienable rights to the Communities to their renewable resources, forests, genetic materials and traditional knowledge.

The specific resolution establishing Right of Use for the communities of Bajo Calima and Bahia Malaga are as follows:

- Resolution Bajo Calima. The Incora/INCODER, by Resolution No.002244 of December 4, 2002 awarded 66,724 hectares to the Black communities organized and integrated into the Community Council of the Lower Calima River Basin.
- Resolution La Plata-Bahía Málaga. The Incora/INCODER, by Resolution No.002802 of December 13, 2012 awarded 38037.76 hectares 1,364 square feet to the Black Community organized and integrated in Community Council La Plata Bahia Málaga.

The law in Colombia provides for various rights of use for the ethnic afro descendant communities with ancestral traditions, with regards to the mangroves. Mangroves are considered public goods, but are included in territories titled to Community Councils, as there are rivers, or beach areas. Considered a protective forestry reserve, mangrove protection falls under the ecological function assigned to the titled lands under Law 70/93. Rights of use derived from this category of ecosystem protection is consistent with the types of rights of use 3.1.11 (1), (2), (4), and (7) according to VCS Standard v3.4. These as the Law (Constitution and Law 70) have given the ancestral ethnic communities right of title to the lands and resources they have traditionally occupied and use, and the land titles assign an ecological obligation to the right of use. Moreover, Resolution 1602/95, together with Article 4 of Law 1377/2010 allow for domestic use of mangroves to right holders, or regular users of mangroves. Moreover, the right to prior consultation about administrative acts about the use of mangroves would always make these ecosystems subject to the usage objection by the local ethnic communities.

ILO Convention 169, article 15 also provides a legal safeguard for the communities on their right to use, manage, and conserve the natural resources present in their territories. The government has recognized that the last rights to use or not use the forests in the REDD+ territories belong to the communities. Therefore, it is commonly understood that all carbon rights derived from the use or not use of the natural resources should pertain to the holders of the rights of use of the natural resources. Nonetheless the Government is developing a decree to clarify the carbon rights and tenure, which is expected in the months to come.

Under VCS Standard Section 3.11.1, Section 6:

"An enforceable and irrevocable agreement with the holder of the statutory, property or contractual right in the land, vegetation or conservational or management process that generates GHG emission reductions or removals which vests the right of use in the project proponent."

Towards this end, the project is establishing an effective financial and administrative support mechanism to manage all investments and proceeds—from carbon and non-carbon—and to distribute cash flows to the beneficiaries and investors in an efficient and transparent manner over the REDD+ project implementation time frame. All of the REDD+ investments will be managed through Fondo para la Acción Ambiental y la Niñez (Fondo Acción), which will provide the financial and administrative mechanism to support investments in the carbon, productive and social activities described above. The mechanism will establish trust accounts for each of the 4 territories, which will be managed separately.

3.2.1 EVIDENCE OF PROTECTING RIGHT OF USE

The project proponents have agreed that their boundaries will be protected and patrolled, to protect Right of Use and that they will coordinate with local administration to determine which types of actions can be undertaken in the case of illegal trespassing.

Among the project activities planned for the REDD+ project is to provide monitoring and surveillance patrols (see Section **2.2**).

3.3 EMISSIONS TRADING PROGRAMS AND OTHER BINDING LIMITS (CL1)

Colombia is a non-Annex I signatory of the Kyoto protocol and it does not have an emissions trading program to binding limits on GHGs.

3.4 PARTICIPATION UNDER OTHER GHG PROGRAMS

The project has not been registered, nor is it seeking registration under any other GHG program.

3.5 OTHER FORMS OF ENVIRONMENTAL CREDIT

Carbon credits are currently the only environmental credit being generated from this project. In addition, the appropriate legal agreements are in place between project participants to ensure credits are not sold more than once.

3.6 PROJECTS REJECTED BY OTHER GHG PROGRAMS

The project has not been rejected by any other GHG program.

3.7 RIGHTS TO LAND AND FREE, PRIOR INFORMED CONSENT

The project proponents are the communities themselves who have been granted property rights on their lands by means of INCORA resolutions, and that plan to remain in their territory. Forced resettlement is not a component of the project design nor would it be acceptable under Colombian Law. None of the project activities require any relocation, voluntary or involuntary.

As part of the Social Economic Assessment, and participatory workshops, the project team has conducted household surveys and participatory rural appraisals to better understand any migration patterns and drivers in the project areas.

Through a broad socialization process, the communities themselves agreed to receive BioREDD+ support to develop their own REDD+ projects. Signed, Hojas de Ruta (see **Annex AN**) documents state the will of the communities to advance in the preparation of REDD+ projects. Thus, the communities are freely pursuing the BioREDD+ program opportunities.

The Free Prior Informed Consent (FPIC) criteria are met precisely by the free and unfettered participation of the communities in the REDD+ projects proposed, which has followed a thorough process of internal consultation and community approval, reflecting the communities own institutional governance structure and by-laws.

Several communities that were involved in the MIDAS program requested support from USAID to move from existing PES schemes to REDD+ projects. In all cases, the BioREDD+ Program signs letters of intent with the communities interested in moving forward with potential investors (see **Annex J**).

Through these Letters of Intent, the communities entitle BioREDD+ to negotiate on behalf of, and in coordination with the communities (under conditions of exclusivity and confidentiality), the sale of emission reductions generated from the project.

Final approval of REDD+ contracts or any other formal type of agreement will in all cases be obtained at the General Assembly level, which guarantees the broadest participation by Afro-Colombian communities. In the case of indigenous territories, such approval will come from the Cabildo Indigena, which is the elected general assembly.

Also, to support the PD drafting process, a series of consultations with the communities and participatory workshops have enabled the production of REDD+ Plans of Action, documents which define deforestation and forest degradation drivers, key strategies and activities to mitigate them, and sets priority activities to address the drivers (see**Annex O**). These REDD+ Plans relate to all key sections of the PD where the community's expression of consent is required. The plans are being finalized and have been submitted to the communities' general assemblies for approval. These processes guarantee full compliance with FPIC procedures.[13]

Documentation of community consultations can be found in **Annex G**.

3.8 ILLEGAL ACTIVITIES AND PROJECT BENEFITS

The project is designed to combat all illegal activities within the project areas and project zones. The most common illegal activity in the community forest areas is illegal timber harvesting (see Section **5.3.3** for a complete description of illegal drivers of deforestation). There are some sparse cocaine plantations distributed in small plots that only occupy minor areas. Illicit crops of cocaine in Indigenous and Community Councils are scares and have been decreasing over time (Annex BE).

A number of project activities are planned to mitigate the impacts of these illegal activities on the project's climate, community, and biodiversity benefits. Specifically, the project proponents will strengthen land tenure status and forest governance, increase patrolling and enforcement of forest boundaries, and improved livelihood/productive programs. These programs will reduce the incidence of illegal activities.

All project advances have been undertaken in accordance with the Colombian Interior Ministry regulations pertaining to projects that involve Afro-Colombian or Indigenous Groups. None of the project benefits will be derived from illegal activities.

[13]Documentation of community consultations can be provided separately to validators.

4 APPLICATION OF METHODOLOGY

4.1 TITLE AND REFERENCE OF METHODOLOGY

VCS Methodology VM0006, Version 2.1. Methodology for Carbon Accounting for Mosaic and Landscape- scale REDD Projects.

4.2 APPLICABILITY OF METHODOLOGY

The project is using the VCS-approved methodology VM0006, "Methodology for Carbon Accounting for Mosaic and Landscape-scale REDD Projects v2.1" for quantification of GHG emission reductions and removals generated in mosaic and landscape scale REDD+ projects.

The project applies the methodology VM0006 and the VT0005 Tool for measuring aboveground live forest biomass using remote sensing. The tool provides an approach for determining Aboveground Live Tree Biomass (ALFB) through a combination of remote sensing data and plot-based biomass field measurements to provide an accurate and cost effective estimation of ALFB across varied LULC classification types and broad spatial extents, and will be used along-side VM0006.

In combination with the methodology, the latest version of the following approved tools and modules are used by the project:

- CDM A/R Methodological Tool Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities.
- CDM A/R Methodological Tool 03 Calculation of the number of sample plots for measurements within A/R CDM project activities.
- CDM A/R Methodological Tool 06 Procedure to determine when accounting of the soil organic carbon pool may be conservatively neglected.
- CDM A/R Methodological Tool 09 Estimation of GHG emissions related to displacement of grazing activities in A/R CDM project activity.
- CDM Tool for testing significance of GHG emissions in A/R CDM project activities.
- VCS Tool VT0001 Tool for the demonstration and assessment of additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) project activities.
- VCS Tool for calculating deforestation rates using incomplete remote sensing images.
- VCS Module VMD0033 Estimation of emissions from market leakage.

Finally, the project meets all of the requirements for models and default factors set forth in the VCS Standard v3.4, issued October 8th 2013, and the VCS AFOLU Requirements v3.4, issued October 8th 2013.

Per the VM0006 eligibility requirements, the project meets the following conditions:

Condition 1

"Land in the project area, consists of either one contiguous area or multiple discrete project parcels (see definition of project area), and must meet an internationally accepted definition of forest, such as those based on UNFCCC

host-country thresholds or FAO definitions, and must qualify as forest for a minimum of 10 years before the project start date."

The project proponent has obtained satellite imagery from ten years before the project start date to demonstrate that the land in the project area parcel qualified as forest in accordance with the national definition of forest: "land spanning more than 1 ha with trees higher than 5 meters and canopy cover of more than 30%, or trees able to reach these thresholds in situ"(UNODC).

Condition 2

"The project area must be deforested or degraded in absence of the REDD project activity and the deforestation and degradation must be mosaic in nature as described in the VCS AFOLU Requirements. Drivers of deforestation and forest degradation must fall into one or more of the following categories:

- *Conversion of forest land to cropland for subsistence farming*
- *Conversion of forest land to settlements;*
- *Conversion of forest land to infrastructure, including new roads;*
- *Logging of timber for commercial sale (e.g., wood planks or poles for commercial sale);*
- *Logging of timber for local enterprises and domestic uses;*
- *Wood collection for commercial sale of fuelwood and charcoal;*
- *Fuelwood collection for domestic and local industrial energy needs (e.g., cooking, home heating, tobacco curing, brick making);*
- *Cattle grazing in forests;*
- *Extraction of understory vegetation (e.g., thatch grass collection for roof and livestock bedding materials, shrubs and small trees for straw fences);*
- *Forest fires to the extent that they are not part of natural ecosystem dynamics (e.g., forest fires related to hunting, honey collection, intentional land clearing on land with a high fuel-load).*

None of the drivers listed above must be planned in nature. If deforestation from a specific driver is occurring as a result of planned forest conversion activities, then such a driver must be excluded from analysis."

The primary drivers of deforestation and degradation in the baseline are logging of timber for commercial sale and conversion of forest land to cropland (see section **4.5.3.2**). None of the drivers identified are planned in nature.

Because the agents and drivers of degradation and deforestation identified in Sections **4.5.3.1** and **4.5.3.2**, respectively, are spread out across the landscape, the drivers are considered to be mosaic in nature in accordance with Section 4.2.9 of the VCS AFOLU Requirements v 3.4.

Condition 3

"Accurate data on past LULC and forest cover in the reference region must be available for at least three points in time, with at least one remote sensing image (i.e., data) from 0-3 years before the project start date, at least one image from 4-9 years before the project start date, and at least one image from 10-15 years before the project start date. No images older than 15 years can be used for the historical reference period"

The project meets this condition as demonstrated in Section **5.3.2.1**.

Condition 4

"The classification accuracy of LULC and forest cover maps must be greater than 70%. Emission reductions and/or removals from avoided forest degradation can only be included if the accuracy of determining forest strata is at least 70%."

The overall classification accuracy is greater than 70% as demonstrated in Section **4.5.3.4**.

Condition 5

"This methodology is not applicable to organic soils or peatland."

The Food and Agricultural Organization (FAO) defines peat and organic soils as, "…soils that have more than 50% organic matter in the upper 80-cm".[14] Per Section 1.2.3.1 the soil analysis and classification provided by IGAC shows that the SOC content does not exceed 50% for any soil class in the watersheds of Rio Anchicaya and Rio Calima which include the extent of the BCBM project area. Moreover, mangrove systems in Colombia that were directly sampled for SOM did not find SOM to be above 50% per Section 1.2.3.1.1.

No organic soils or peatland are present in the project area, see Section 1.2.3.1.

Condition 6

"This methodology is applicable to projects that implement one or more of the following activities:

- *Strengthening of land-tenure status and forest governance. Supporting the development and implementation of sustainable forest and land use management plans*
- *Demarcating forest, tenure and ownership boundaries; promoting forest protection through patrolling of forests and forest boundaries; promoting social inclusion and stewardship in local communities; facilitating social fencing through capacity building; and creating mechanisms to alert law enforcement authorities of forest trespassing.*
- *Fire prevention and suppression activities including the construction of fire breaks, reduction of fuel loads, prescribed burning, education to minimize intentionally started fires, support for fire brigades, water cisterns, fire lookouts, and communication systems.*
- *Reducing fuelwood consumption and/or increasing energy efficiency by introducing fuel-efficient woodstoves or brick kilns and curing equipment.*
- *Creation of alternative sources of fuelwood through agroforestry, farm woodlots management and introduction/intensification of other renewable and non-fossil fuel based energy sources (such as solar).*
- *Sustainable intensification of agriculture on existing agricultural land.*
- *Development of local enterprises based on sustainably harvested non-timber forest products (NTFPs) such as honey, medicinal plants, etc."*

[14]See: http://www.fao.org/docrep/x5872e/x5872e03.htm#TopOfPage

All project activities as described in Section **2.2** have been categorized under the following list of eligible activities:

- Strengthening of land-tenure status and forest governance.
- Supporting the development and implementation of sustainable forest and land use management plans.
- Demarcating forest, tenure and ownership boundaries; promoting forest protection through patrolling of forests and forest boundaries; promoting social inclusion and stewardship in local communities; facilitating social fencing through capacity building; and creating mechanisms to alert law enforcement authorities of forest trespassing.
- Sustainable intensification of agriculture on existing agricultural land.
- Development of local enterprises based on sustainably harvested non-timber forest products (NTFPs) such as honey, medicinal plants, etc.

The project will not implement any activities considered “optional” under the methodology such as Assisted Natural Regeneration (ANR) or Cookstove and Fuel Efficiency (CFE) activities.

In addition to meeting the applicability conditions of VM0006 the project meets the requirements of the VT0005 tool. Per the VT0005 tool the following conditions are met:

Condition 1

“The tool is applicable in conjunction with AFOLU methodologies in which estimation of ALFB is required.”

The VT0005 tools is being used in conjunction with VM0006 which requires that aboveground tree biomass be measured as it is considered a major carbon pool affected by project activities.

Condition 2

“The remotely sensed data necessary to estimate ALFB is accessible for the time period desired.”

The remotely sensed data necessary to estimate ALFB includes LiDAR dataset that were collected across the project area as described in GeoEcoMap Task 2 (Annex AA). Additional LiDAR data will be collected at the first verification and at baseline updates as required by VM0006 as is discussed in the MRV plan (GeoEcoMap Task 14, Annex AA).

Condition 3

“Predictive model (PM) relating RS metrics to ALFB is parametric (eg, ALFB = $f(x, \alpha, \varepsilon)$)”

The project uses a lidar-biomass model that is parametric and has inputs of the mean value of wood density and mean top canopy height. GeoEcoMap Task 8&9 detail the development of the parametric model and GeoEcoMap Task 14 standardizes the parametric model to be used for monitoring purposes (Annex AA).

Condition 4

“This tool is not applicable under the following conditions:

- *The overarching methodology requires specific method for determining change in biomass density over time. This tool does not provide methods for temporal change in ALFB density. However, the tool can be repeated at distinct points in time to determine an ALFB delta."*

Remote sensing techniques are used to determine the change in biomass stocks over time per the requirement of VM0006 and standard methods for their implementation are discussed in the MRV plan (GeoEcoMap Task 14, Annex AA). Additional LiDAR data will be collected during the first verification and baseline updates as indicated by the MRV Plan. The tool allows for Lidar data flown at different times in time to estimate the AFLB and update the baseline estimates. The predictive model for Lidar biomass estimation remains the same and will be not modified for each baseline update.

4.3 METHODOLOGY DEVIATIONS

The project requests two methodology deviations as described in the tables below.

First Deviation	
Source:	VM0006 v2.1 Section 8.1.2.1
Criteria and Procedures:	The historical reference period must consist of at least three images of forest cover, (1) at minimum one image from 0-3 years before project start date, (2) at minimum one image from 4-9 years before project start date, and (3) at minimum one image from 10-15 years before project start date. No images older than 15 years may be used for the historical reference period.
Relation to Monitoring or Measurement:	This procedure is related to measurement. To estimate the baseline deforestation rate, the land cover must be determined and compared at a minimum of three points in time.
Requested Deviation:	The imagery used for the three time points in the historical reference period are from 23 years before the project start date, 13 years before the project start date, and 1 year before the project start date only if this extension of the historical reference period and temporal spacing of images provides a conservative estimate of the deforestation rate.
Justification:	The proposed deviation increases the accuracy of baseline measurement by including cloud-free imagery. In many areas with tropical forests, extensive and consistent cloud-free imagery for an area is difficult to come by within specified time constraints. For the remote sensing analyses of this project, the accuracy and coverage of the project area and reference region would have been compromised without using imagery from more than 15 years before the project start date. GeoEcoMap selected Landsat images over roughly 23 years to insure a significant amount of cloud free coverage for statistically

<table>
<tr><td></td><td>robust deforestation and degradation estimates (see Annex U).

This deviation is also justified because of the principle of conservativeness. The combined degradation and deforestation rate calculated between 1990 (the earliest time-point) and 2000 (the middle time-point) is lower than the rate calculated between 2000 and 2012 (the most recent time-point). An analysis of the combined deforestation and degradation rates is shown in the table below. By including imagery older than 15 years before the project start date, the rate is lowered and can therefore be considered conservative.

<table>
<tr><th>LULC Transition
(ha/yr in Reference Region)</th><th>1990 - 2000</th><th>2000 - 2012</th></tr>
<tr><td>Deforestation</td><td>2346</td><td>2629</td></tr>
<tr><td>Degradation</td><td>4407</td><td>5694</td></tr>
<tr><td>Combined Deforestation and Degradation</td><td>6753</td><td>8322</td></tr>
</table>
</td></tr>
<tr><td>Quantification Impact:</td><td>Because the combined degradation and deforestation rate is conservatively lowered with the use of imagery older than 15 years before the project start date, the impact on GHG emissions reductions and removals is conservative.</td></tr>
</table>

Second Deviation	
Source:	VM0006 v2.1 Section 9.3.2
Criteria and Procedures:	Carbon stocks densities must be re-measured at least once before every baseline update using ground-based biomass inventories, as described in Section 8.1.4.4.
Relation to Monitoring or Measurement:	This procedure is related to measurement and monitoring. Measurements of carbon stock densities are taken to derive emissions factors which are used in conjunction with land use land change data to establish the GHG inventory for validation/verification. The monitoring of carbon stock densities must be carried out at least once before each baseline update.

Requested Deviation:	Carbon stock densities will be re-measured at least once before every baseline update using LiDAR methods per the VCS approved VT0005 *Tool for Remote Sensing Biomass Measurement*.
Justification:	During validation LiDAR was utilized to establish carbon stock estimates using the VCS approved VT0005 *Tool for measuring aboveground live forest biomass using remote sensing v1.0* and will also be used for each baseline update. The tool is applicable for this project because the large areas and remote location of the project make ground-based measurements alone costly. Further, the use of the tool demonstrates fulfillment of methodological requirements of VM0006 in which aboveground live forest biomass (ALFB) must be determined. Section 9.3 of VM0006 states that the monitoring of carbon stock densities (and transitions) in LULC classes and forest strata is required for calculating actual NERs. This includes aboveground live forest biomass. Additionally, the project meets the applicability conditions outlined in Section 4 of VT0005 (see PD section 4.2).Although Section 9.3.2 of the VM0006 methodology requires that carbon stock densities be re-measured at least once before every baseline update using ground-based biomass inventories, usage of the VT0005 tool is in compliance with VCS requirements for methodology deviations in such that it is a deviation that shall not negatively impact the conservativeness of the quantification of GHG emission reductions or removals, except when resulting in increased accuracy of such quantification (Section 3.5.1 of VCS Standard v3.4). Section 2 of VT0005 exemplifies the improved accuracy of using LiDAR to create the biomass inventory for ALFB in describing the infeasibility of implementing statistically valid sampling strategies using traditional ground-based forest inventory plots.
Quantification Impact:	Carbon stock densities measured using the VT0005*Tool for measuring aboveground live forest biomass using remote sensing v1.0* employ LiDAR to create biomass inventories that are more accurate than inventories based off of ground-based measurements.

4.4 PROJECT BOUNDARY (G1)

Carbon Pools

Carbon Pool	Included?	Justification/ Explanation of Choice
Aboveground tree biomass	Yes	Major carbon pool affected by

Carbon Pool	Included?	Justification/ Explanation of Choice
		project activities.
Aboveground non-tree biomass	Yes	Expected to increase from project activities. Must be included when the land cover under the baseline scenario is perennial tree crop.
Belowground biomass	Yes	Major carbon pool affected by project activities.
Dead wood	Yes	May potentially be affected by project activities.
Litter	No	Excluded as per VCS AFOLU Requirements.
Soil organic carbon	No	May be conservatively excluded as it expected to decrease under the baseline scenario.
Wood products	Yes	Major carbon pool affected by project activities

Table 12. Carbon pools

Source		Gas	Included?	Justification/Explanation
Baseline	Baseline Deforestation and Forest Degradation	CO2	Yes	Emissions are included in the changes of carbon pools.
		CH_4	No	Not required for REDD projects per the VCS AFOLU requirements.
		N_2O	No	Not required for REDD projects per the VCS AFOLU requirements.
Project	Cookstove and Fuel Efficiency (CFE) activities	CO_2	No	CFE activities are not implemented.
		CH_4	No	CFE activities are not implemented.
		N_2O	No	CFE activities are not implemented.
	Biomass burning from unplanned large and small scale fires	CO_2	No	Emissions are included in the changes of carbon pools.
		CH_4	No	CH_4 emissions of burning woody biomass from unplanned fires are insignificant. If the fires are catastrophic, CH_4 emissions must be estimated and demonstrated negligible or otherwise

Source		Gas	Included?	Justification/Explanation
				accounted for.
		N_2O	No	N_2O emissions of burning woody biomass from unplanned fires are insignificant, unless fires are catastrophic, N_2O emissions must be estimated and demonstrated negligible, or otherwise accounted for.
	Fossil fuel used during harvesting	CO_2	No	Harvesting is not an included project activity
		CH_4	No	Harvesting is not an included project activity
		N_2O	No	Harvesting is not an included project activity
	Removal of woody biomass for fire prevention and suppression activities	CO_2	No	Fire prevention and suppression is not an included activity.
		CH_4	No	Fire prevention and suppression is not an included activity
		N_2O	No	Fire prevention and suppression is not an included activity.
	Removal of woody biomass during assisted natural regeneration (ANR) activities	CO_2	No	ANR is not an included activity
		CH_4	No	ANR is not an included activity
		N_2O	No	ANR is not an included activity
	Fertilizer used during enrichment planting for assisting natural regeneration	CO_2	No	ANR is not an included activity
		CH_4	No	ANR is not an included activity
		N_2O	No	ANR is not an included activity
	Increased area of rice production systems	CO_2	No	Rice production is not an included activity
		CH_4	No	Rice production is not an included activity
		N_2O	No	Rice production is not an included activity
	Increased fertilizer use	CO_2	No	Not applicable
		CH_4	No	Not applicable
		N_2O	No	N_2O emissions related to increased fertilizer use are de minimis
	Increased livestock stocking rates	CO_2	No	Not an included activity
		CH_4	No	Not an included activity
		N_2O	No	Not an included activity

Table 13. GHG emissions from sources not related to carbon pools.

4.4.1 DE MINIMIS

The soil organic carbon pool is excluded from GHG accounting, thus there are no applicable de mimimis calculations. Per VCS Requirement 4.3.4, the methodology shall establish criteria and procedures by which a project proponent may determine a carbon pool or GHG source to be conservatively excluded. According to VM0006 methodology Section 5.2, it is conservative to exclude the soil organic carbon pool as it is expected to decrease under the baseline scenario.

4.5 BASELINE SCENARIO (G2)

Per VM0006, the most plausible baseline scenario for this project is the existing or historical changes in carbon stocks in the carbon pools within the project boundary. The project area would be degraded or deforested in the absence of the REDD project activity and the deforested and degraded areas are mosaic in nature.

Existing or historical, as applicable, changes in carbon stocks in the carbon pools within the project boundary.

This option applies because under the mosaic typology of deforestation, the historical changes in land-use are representative for the most likely future changes in land-use.

4.5.1 COMMUNITY SCENARIO

In order to determine baseline conditions in the communities, the BioREDD+ program engaged the Autonomous University of the Department of Valle, the University of Antioquia, and the Laurel Foundation (former professors from the University of Nariño) to develop socio-economic assessments of the communities in the region.

An assessment of anticipated community conditions in the without-project scenario was completed via consideration of the socio-economic assessments, current and expected future trends in community condition, projected change in forest cover in the absence of the project, and the causal factors summarized in Table 14. As recommended by Richards and Panfil (2011), an analysis of factors which contribute to the ongoing focal issues identified by the communities forms a central component of the community baseline scenario analysis.

As depicted in Table 14, poverty, insufficient infrastructure and programs (e.g. water, sanitation and health facilities), and decline in ecosystem services have been identified to be important focal issues for the project communities. The factors most directly responsible for these issues are lack of sustainable livelihood and economic alternatives, lack of funding for infrastructure, health and education programs, and the unsustainable exploitation of natural resources to meet short-term economic and capital needs. In the absence of the project there are no plans, and no anticipation of future interventions that would be sufficient to address the various factors that contribute to these problems. Therefore, for example, a continued lack of training opportunities, technical extension, capital for value-added facilities, and expertise for value chain development will result in limited to no improvements to poverty conditions, livelihood alternatives, and unsustainable forest exploitation to meet short-term needs in the baseline.

Similarly, a lack of resources and capacity in the absence of the project for integrated planning, infrastructure, and project management will most likely result in limited or no future improvement to community health and education programs and infrastructure. This trend also pertains to the expected decline in natural capital including important community ecosystem services. Ecosystem services (Sections **1.3.8.7**-**1.3.8.9**), including water supply and erosion control, will decline as forest depletion continues unchecked. In addition, the significant role filled by local forests in supplying fundamental community needs such as timber and non-timber forest products for domestic uses (medicines, fuel wood, construction) and cultural identity will be further at risk.

<table>
<tr><th>Project Intervention Areas</th><th>Contributing Factors</th><th>Contributing Factors</th><th>Direct Factors</th><th>Community Focal Issues</th></tr>
<tr><td rowspan="3">Support for productive activities: training, extension, crop improvement, processing facilities, value chain development.</td><td rowspan="3">Insufficient training opportunities, technical extension, and capital.</td><td>Limited technical capacity to develop alternatives</td><td rowspan="7">Lack of sustainable livelihood and economic alternatives

Lack of funding for community infrastructure and health

Unsustainable timber and fisheries exploitation</td><td rowspan="7">Extreme poverty

Insufficient community infrastructure and health & education programs

Long-term loss of natural capital and associated ecosystem services</td></tr>
<tr><td>Insufficient access to financing for value added facilities, crop improvements</td></tr>
<tr><td>Limited connectivity with potential markets</td></tr>
<tr><td rowspan="2">Integrated development planning, long-term investment in infrastructure and programs.</td><td rowspan="2">Limited access to alternative capital for infrastructure. Low capacity for integrated planning</td><td>Lack of funding transfers, government support</td></tr>
<tr><td>Lack of integrated planning</td></tr>
<tr><td rowspan="2">Management and administration training, environmental education, funding for salaried project personnel and implementation logistics.</td><td rowspan="2">Lack of capacity and resources for administration, project mgmt. and environmental awareness</td><td>Natural resources utilized without long-term planning, to help meet short-term economic and capital needs</td></tr>
<tr><td>Limited environmental awareness.</td></tr>
</table>

Table 14. Problem flow analysis: community conditions in the absence of the project.

4.5.2 BIODIVERSITY SCENARIO

An assessment and description of how the without-project land-use scenario would affect biodiversity conditions in the project zone has been completed via consideration of current biodiversity trends in the Pacific Region, trends in change to natural forest cover, and through an analysis of causal factors (Richards and Panfil 2011, **Annex AM**). The scope of biodiversity conditions considered is defined and linked to the objectives and major activities of the project (i.e. the conservation of natural forest land cover and attributes).This is so that the later comparison (Section 7) of the without-project scenario to the project scenario is relevant to biodiversity variables which are to a greater extent influenced by project activities and that will be measured during future monitoring activities.

Increasing threats to biodiversity in the Colombian Pacific and Choco-Darien Bioregions are well documented (e.g. **Annex AP**; **Annex X**; **Annex AQ**) and as evidenced in species at risk documented by the IUCN. Biodiversity changes correlate to changes in vegetation cover (Richards and Panfil 2011.**Annex AM**), and deforestation as well as forest degradation are key issues for the project area as documented through land-use change analysis and projected future land-use in the absence of the project. As noted in Section 1.3.7, annual deforestation averaged 549 ha per year from 2000 to 2011, and forest degradation averaged 1519 ha/year over the same period. Historical analysis found that while deforestation rates decreased slightly from 590 to 508 ha/year over this period, the degradation of primary forest increased from 1356 to 1682 ha/year. These trends signify a continuingthreat to biodiversity in the without-project scenario.

Direct biodiversity threats associated with forest loss, and their contributing factors are identified in Table15. Mangrove and dry land forest, key conservation targets for the project, are impacted by a number of direct threats from commercial and domestic timber and fuel wood extraction, to land-use conversion for crops. Threatened species and forest dependent species in general, as well as important mangrove ecosystems are at risk of further decline without significant intervention. However, the factors identified as contributing to these declines are not being addressed in the absence of the project and there no signs currently of them being addressed in any significant way in the future. For these reasons, it is projected that in the absence of the project, the amount and connectivity as well and the structure, function and available habitat provided by project area forests will continue to decline.

Project Intervention Areas	Contributing Factors	Contributing Factors	Direct Threat	Conservation Target, Focal Issues
Governance (strengthening legal framework, land title, land-use planning & implementation)	Limited local resources, legal framework, governance and capacity for land-use planning	Community laws do not limit forest exploitation	Commercial logging Logging for local enterprise, domestic use Commercial sale of fuel wood and charcoal Fuel wood for local enterprise, domestic use Conversion to crop land	Mangrove and non-flooded forests (diminished forest area, fragmentation, degradation of forest composition, structure, function and habitat) Biodiversity HCVs
		Lack of clarity & definition of individual / family land rights.		
		Ineffective land-use planning		
	Limited land-use implementation capacity	Limited awareness of boundary locations for land-use zones, titled property		
Support for productive activities, alternative livelihood	Limited alternatives to timber extraction and land clearing	Unmet economic, sustenance needs for families. High demand and price for timber.		
Capacity building, administration and management		Limited local capacity for environmental leadership project implementation		

Table 15. Biodiversity problem flow analysis.

Threat to biodiversity in the without-project scenario resulting from the factors depicted in Table 15 is also illustrated by projected forest decline from LULC modelling. Figure 21, for example, illustrates how primary forest is estimated to decline from about 38,000 ha to less than 500 ha in the absence of the project, while the amount of degraded forest increases from just over 42,000 ha to approximately 77,000 ha. These trends represent a substantial and continued reduction to intact forest ecosystems and associated biodiversity attributes as described above.

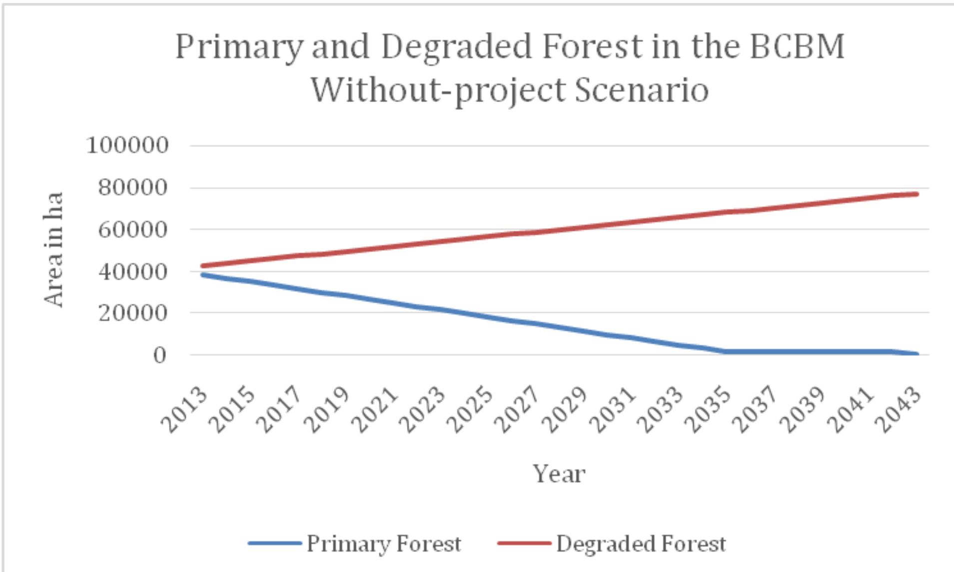


Figure 21. Primary and degraded forest in the BCBM without-project scenario.

Over the same period Table 22 illustrates an associated increase in anthropogenic impact. In the absence of the project, land in pasture is expected to increase from about 5800 ha to almost 14,000 ha. Cropland will increase from approximately 4400 ha to almost 11,000 ha. Clearly cropland and pasture, being substantially devoid of the structural, compositional and functional ecosystem attributes inherent to intact primary forest (and degraded forest as well to varying extents depending on its condition) contribute to a substantially negative biodiversity outcome in the without-project scenario.

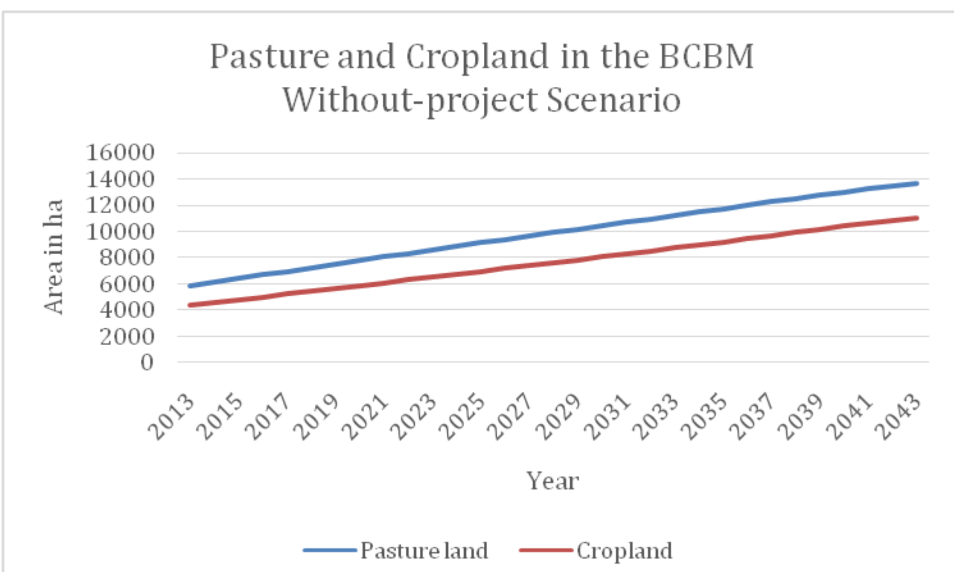


Figure 22. Pasture and cropland in the BCBM without-project scenario.

4.5.3 CLIMATE SCENARIO

Under the defined baseline scenario (see Section **4.5**), the project area would be degraded and deforested at existing or historical rates in the absence of the project. This scenario would result in significant emissions of carbon dioxide (see Section **5.3**) compared to the expected decrease in emissions from project activities under the with-project scenario.

4.5.3.1 Agents

Deforestation agents are those who perform the activities that lead to forest loss. Primarily, these are the inhabitants of the territories who fell trees to generate income, legally or illegally (See **Annex AB**). Included in that group are full-time, occasional, or seasonal tree cutters, who combine timber harvesting with other sources of income. Also, external companies involved in logging act as agents through large-scale clearing of forests for the production of timber revenue.

The ability of degradation or deforestation agents to impact the forest is related to their mobility and geographical conditions of tree harvesting areas. The table below indicates which mode of transport is used by each agent and activity and the average speed of each: (i) walking, (ii) animal; (iii) motorcycle; (iv) car; (v) truck; and (vi) boat.

Activity	Walking	Animal	Motorcycle	Car	Truck	Boat
1. Conversion of forest for subsistence cultivation	X					X
2. Conversion of forest to settlements	X					X
3. Conversion of forests for infrastructure such as roads or power lines (Not applicable—driver not identified as contributor to degradation or deforestation)						
4. Selective logging and forest thinning for commercial sale of timber	X	X				X
5. Logging for domestic use (Not applicable—driver not identified as contributor to degradation or deforestation)						

Activity	Walking	Animal	Motorcycle	Car	Truck	Boat
6. Collecting firewood for sale as fuel or charcoal (Not applicable—driver not identified as contributor to degradation or deforestation)						
7. Firewood for domestic or industrial use (Not applicable—driver not identified as contributor to degradation or deforestation)						
8. Grazing cattle in the forest	X					
9. Collection of understory plant material for roofs, fences, or livestock fodder (Not applicable—driver not identified as contributor to degradation or deforestation)						
10. Small forest fires that are not part of natural ecosystem dynamics (Not applicable—driver not identified as contributor to degradation or deforestation)						

Table 16. Mode of transport.

Drivers of degradation and deforestation are considered either spatial or non-spatial.

Non-spatial variables include:

- Economic Activities: There are two factors related to the economic activities:
    - External demand for wood products in Colombia and around the world.
    - Internal factors driven by the poverty of local communities.
- Both of these create incentives for illegal activities that offer higher returns more quickly. This is especially relevant for families who are not engaged in full-time logging.
- Increased population. Population growth influenced by migration from other cities for education or income.

Spatial variables include:

- Proximity to land or waterways can promote the mobility of agents of deforestation.
- Population density generates greater numbers of deforestation agents and consumption centers.
- Forest type: Certain forests attract high value timber cutting for marketing.

- Proximity to the forest encourages timber harvest.
- Population centers nearby: Settlements or urban centers are potential markets for timber and charcoal products and the closer they are, the higher the pressure on forest resources.
- Proximity to processing centers: Encourages logging because timber can be easily processed into higher value products.

The table below presents the activities, agents, and relative contribution of each to the drivers of deforestation and degradation.

	Agents of Deforestation			
Driver	**Local community**	**External Agents**	**Private companies**	**Armed illegal groups**
1. Conversion of forest to subsistence food crops	X	X	X	X
2. Conversion of forest to settlements	X	X		
3. Conversion of forests for infrastructure such as roads or power lines (Not applicable—driver not identified as contributor to degradation or deforestation)				
4. Selective logging and forest thinning for commercial sale of timber	X			
5. Logging for domestic use (Not applicable—driver not identified as contributor to degradation or deforestation)				
6. Collecting firewood for sale as fuel or charcoal (Not applicable—driver not identified as contributor to degradation or				

	Agents of Deforestation			
deforestation)				
7. Firewood for domestic or industrial use (Not applicable—driver not identified as contributor to degradation or deforestation)				
8. Cattle grazing in the forest				
9. Collection of understory plant material for roofs, fences, or livestock fodder (Not applicable—driver not identified as contributor to degradation or deforestation)				
10. Small forest fires that are not part of natural ecosystem dynamics (Not applicable—driver not identified as contributor to degradation or deforestation)				

Table 17. Causes and agents of deforestation and degradation.

4.5.3.2 Drivers

Drivers of deforestation and degradation

Degradation and deforestation in the area is dependent on activities that encourage exploitation of the forest resources and the agents that undertake them. Deforestation is defined as a change in land use to another cover type in the medium or long term. This is generally done to make way for new cropland, settlements, mining operations, or pastures. Other processes where logging or clearing are undertaken on a less permanent basis are considered degradation. This distinction is important because all productive activities that require land use change are considered drivers of deforestation, while clearing activities to generate income periodically without affecting land use, are the drivers of degradation.

The main activities that generate degradation or deforestation are ranked by contribution of GHG emissions as follows:

1. Logging of timber for commercial sale;
2. Conversion of forestland to cropland for subsistence farming
3. Conversion of forestland to settlements.

Driver	Proportion Deforestation	Proportion Degradation	Contribution Deforestation	Contribution Degradation	Annual Carbon Loss (tC/yr)
1. Conversion of forest to subsistence food crops	100%	0%	100%	0%	15,882
2. Conversion of forest to settlements	100%	0%	0%	0%	19
3. Conversion of forests for infrastructure such as roads or power lines	100%	0%	0%	0%	0
4. Selective logging and forest thinning for commercial sale of timber	0%	100%	0%	100%	224,938
5. Logging for domestic use	0%	100%	0%	0%	0
6. Collecting firewood for sale as fuel or charcoal	5%	95%	0%	0%	0
7. Firewood for domestic or industrial use	5%	95%	0%	0%	0
8. Cattle grazing in the forest	5%	95%	0%	0%	0
9. Collection of understory plant material for roofs, fences, or livestock fodder	50%	50%	0%	0%	0

10. Small forest fires that are not part of natural ecosystem dynamics	0%	100%	0%	0%	0

Table 18. Relative contribution of drivers to degradation and deforestation.

4.5.3.3 Reference Region

A map of the reference region is unambiguously defined in section **1.2.5.4** and section **5.3.1**. The project is not nested within a JNR program.

4.6 ADDITIONALITY

4.6.1 COMMUNITY BENEFITS

Community benefits would not have occurred in the absence of the project, since inputs provided by the project including funding, technical expertise, infrastructure, business development, training and capacity building would not have occurred. This is documented through definition of community conditions that would have occurred in the absence of the project, in Section 4.5.1; net-positive impacts as identified in Section 6.1; and the projects theory of change.

4.6.2 BIODIVERSITY BENEFITS

Biodiversity benefits would not have occurred in the absence of the Project since the projects interventions related to the maintenance of natural forest cover through reduced deforestation and degradation would not have occurred. This is documented through definition of biodiversity conditions that would have occurred in the absence of the project, in Section 4.5.2; net-positive impacts as identified in Section 7.1; and the project's theory of change model.

4.6.3 LAWS AND REGULATIONS

This project is additional since none of the project activities are required by law. See section **3** for a discussion of the applicable laws.

4.6.4 APPLICATION OF VCS ADDITIONALITY TOOL

The project has used the VCS Tool for the Demonstration of Additionality in VCS AFOLU Project Activities (VT0001) version 3.0 to assess the additionality of the project and select the baseline scenario.

Step 1: Identification of alternative land use scenarios to the proposed VCS AFOLU project activity

Sub-step 1a(a): Identify credible alternative land use scenarios to the proposed VCS AFOLU project activity

i. Continuation of pre-project land use. The following land uses occurred in the project area prior to project initiation:

1. Unplanned selective logging and Subsistence Agriculture – As stated above, community members harvest timber for commercial purposes either to supplement income or as their primary source of income. The project area is sited on areas zoned as communal/traditional. Logging in these areas is unsanctioned by the Regional Environmental Authority, and is thus considered illegal. Additionally, community members practice subsistence agriculture in the project area, primarily near rivers but also expanding inland. This land use results in deforestation (unplanned), though it represents a lower impact than illegal logging.

ii. Project activity on the land within the project boundary performed without being registered as the VCS AFOLU project

2. It is possible, though highly unlikely, that the Regional Environmental Authority could cease illegal logging and other activities that result in degradation and deforestation in the project area without registering the activity as a VCS project through increased patrolling and enforcement.
3. It is possible, though highly unlikely, that national or international development or non-governmental organizations could implement similar alternative livelihood, governance, and capacity building activities to reduce deforestation and forest degradation.

iii. Activities similar to proposed project activity on at least part of the land within the project boundary resulting from legal requirements or observed similar activities

4. Not applicable, none of the project activities are required by law, and there are no similar activities occurring in the region that are not VCS AFOLU projects.

Sub-step 1a(b): Credibility of identified land use scenarios

Scenario 1 was present in the project area prior to project initiation and is thus credible. The timber and socio-economic studies (Annexes X and C) confirm that these land uses were present in the project area prior to the project start dates and are likely to continue unabated in absence of the project. Scenario 2 above is considered credible since the baseline activities are considered illegal by the Regional Environmental Authority and logging regulations in the project area. The Regional Environmental Authority would thus have legal precedent to cease illegal logging activities in the area. Scenario 3 is considered credible because while aid and non-governmental organizations have implemented sustainable development projects in the region before, though markedly different in scale. Moreover, there are no similar projects underway in the region that are not VCS AFOLU projects (see below for common practice).

Sub-step 1a(c): List of credible alternative land use scenarios

1. Continuation of selective logging and subsistence agriculture, see number 1 above.

2. Cessation of illegal logging and degradation activity by the Regional Environmental Authority, see number 2 above

3. Implementation of alternative livelihood, governance, and capacity building activities to reduce deforestation and forest degradation by an international or national non-profit, see number 3 above.

Sub-step 1b(a): Consistency of credible land use scenarios with enforced mandatory applicable laws and regulations

i. Land use scenario 1 is the result of overlapping regulations. Communities have the right to derive income and livelihood from resources in their territories, but only in areas zoned for these uses. As such, these scenarios are not in compliance with all mandatory applicable legal and regulatory requirements. Land use scenario 2 is based on the legal rights of the Regional Environmental Authority, as described in Section 3 above, and is thus in compliance with all regulatory requirements. Land use scenario 3 involves the action of local or international NGOs and it is assumed that their activities would be in compliance with regulatory requirements.
ii. For land use scenario 1, the results of the timber study (Annex X demonstrated that logging and land use conversion are systematically un-enforced. Community members either do not obtain a permit or legal permits are illegally re-used beyond their intended scope. These practices occur throughout the project area.
iii. Based on above, no land use scenarios have been removed.

Sub-step 1b(b): Outcome of Sub-step 1b

1. Continuation of selective logging and subsistence agriculture, see number 1 above.

2. Cessation of illegal logging and degradation activity by the Regional Environmental Authority, see number 2 above

3. Implementation of alternative livelihood, governance, and capacity building activities to reduce deforestation and forest degradation by an international or national non-profit, see number 3 above.

Sub-step 1c: Selection of baseline scenario

Due to the lack of adequate governance and resources to limit logging and land conversion for agriculture within the project area as demonstrated by the Timber Study (Annex X), the most plausible baseline scenario is the continuation of previous and current land use scenario (number 1 above). This scenario has been ongoing in the project area and reference area over the last few decades and is unlikely to cease without effective intervention.

The project activities described in this document require substantial financial resources and long-term presence in the project area to manage the activities. Without significant financial returns to ensure project longevity, aid and non-governmental projects cannot operate at the scale described above. Because of these limitations on potential regional, national, and NGO activities, scenarios 2 and 3 were not selected.

Step 2: Investment Analysis

The VCS Additionality Tool requires that either step 2 (investment analysis) or step 3 (barrier analysis) be undertaken (or both). The barrier analysis was selected and the analysis is completed below.

Step 3: Barrier analysis

This section shows how project activities would not take place without the revenues arising from the sale of GHG credits.

Step 3a: Identify barriers that would prevent the implementation of the type of proposed project activity

Investment barriers. Similar activities to the Alternative livelihood productive activities have only taken place with the aid of grants from international cooperation or the national government. Debt funding is not available for these type of project activities, unless under a REDD+ project. Community lands cannot be used as guarantee for loans, due to legal requirements, and the communities do not have other relevant assets to establish liens on. So access to credit is practically non-existent, including national and international markets. The REDD+ project enables the carbon streams to be used as guarantee.

Institutional barriers. There are risks related to changes in government policies, as the National REDD+ Strategy is being developed, and there are on-going discussions about the adoption of a jurisdictional framework. Early REDD+ initiatives are being promoted by the Government, and will help bring down the barrier. The main institutional barrier, though, is the lack of enforcement of forest harvesting restrictions; this is due to the low capacity of the institutions in the area in charge of enforcing controls (i.e., CORPONARIÑO, and the national police).

Technological barriers. There are no facilities or equipment to transform and commercialize products.

Barriers related to local tradition. Traditional use of resources and agriculture is very basic, not linked with broader markets, and relies on the harvest potential of a combination of subsistence crops.

Lack of organization of local communities. There is no organization culture or tradition for building transformation facilities and commercialization systems to add value to their local produce to access national and international niche markets.

Barriers related to Land tenure and property rights. The prevailing communal land ownership limits the incentives for conservation, as property rights on the timberlands are not clearly defined. The internal informal tenure systems present a risk of land fragmentation.

Barriers related to markets, transport and storage. There are infrastructure barriers, including lack of transportation, energy and waterways to generate stock piling or processing of agricultural goods in the territories. It is difficult to transport products included in project activities to market as infrastructure is scarce or nonexistent.

Unregulated and informal markets. The markets for products related to the project activities do not allow the transmission of effective information to the communities proposing the project.

Remoteness of AFOLU activities. The project occurs in an area with underdeveloped road and infrastructure resulting in high transportation costs, eroding competitiveness and profitability of non-timber forest products

Lack of infrastructure. There are no facilities to convert, store, or add value to production from proposed project activities. This lack of infrastructure limits the possibilities for communities to profit from the goods produced through the proposed project activities.

Step 3b: Show that the identified barriers would not prevent the implementation of at least one the alternative land use scenarios (except the proposed project activity):

All barriers identified above will not prevent the land use scenarios identified in Step 1.

Step 4: Common practice analysis

Due to the lack of governmental and community resources, there are no similar development assistance projects or initiatives to reduce deforestation and forest degradation on this scale in the region with the exception of the other BioREDD+ VCS projects and the Choco-Darien Conservation Corridor VCS project. While USAID has supported productive and employment activities in the region previously, there are no similar activities currently under way (see description of MIDAS program in Section 2.7 above). The Colombian Ministry of Agriculture and INCODER have implemented programs to subsidize sustainable products such as cocoa and fisheries, but these programs do not contain policies or incentives for reducing degradation or deforestation.

The region is predominately comprised of lands titled to Consejos Communitarios and Resguardas Indigenas, who do not have the financial capacity to implement activities similar in scope to those presented here. Therefore, efforts to reduce deforestation and forest degradation through supporting local governance capacity, land titling, land-use planning and implementation, value added products, access to markets, and local capacity building, are not common practice in the region. As a result of this analysis, the project activities are determined to be additional.

5 QUANTIFICATON OF GHG EMISSION REDUCTIONS AND REMOVALS (CLIMATE)

5.1 Project Scale and Estimated GHG Emission Reductions or Removals

Project	
Large project	X

The GHG emissions reductions and removals as a result of the project technologies and activities are measured by Net Emissions Reductions (NERs) and are given in Table 19. NERs are calculated using EQ104 of VM0006 and have not been adjusted to reflect an allocation to or release from the buffer account (see Section **5.6.4**).

Years	**Estimated GHG emission reductions or removals (tCO2e)**
2013	26,564
2014	276,879
2015	419,725

2016	462,957
2017	512,364
2018	540,709
2019	552,525
2020	564,962
2021	576,923
2022	590,295
2023	604,337
2024	608,412
2025	606,988
2026	604,938
2027	601,291
2028	611,199
2029	606,650
2030	588,097
2031	581,247
2032	574,684
2033	567,195
2034	560,067
2035	551,452
2036	545,227
2037	539,021

2038	413,164
2039	267,111
2040	268,060
2041	279,168
2042	277,612
2043	181,752
Total estimated ERs	**14,961,575**
Total number of crediting years	**30**
Average annual ERs	**498,719**

Table 19. Estimated Net Emissions Reductions (NERs).

5.2 Leakage Management (CL2)

Through consideration of the timber study and the analysis of agent mobility, the project proponents predict that activity shifting leakage –the increase in illegal commercial logging in areas surrounding, but excluded from, the project area – is the most likely form of leakage to occur. Because activity shifting leakage is produced as a result of the same acting drivers of deforestation and degradation identified in the project area, the strategy for leakage management is consistent with the main project activities.

Leakage mitigation strategies for the project include the implementation of productive activities which improve socio-economic status, the strengthening of governance, and the establishment of forest patrols. Productive activities enable communities to market and add value to certain choice commodities, which in turn provides these families with an alternative source of income that is not derived from illegal logging. The strengthening of local governance improves the ability of the community councils to manage local participation in project activities that generate income (not from illegal logging), and to effectively distribute those economic benefits thereby mitigating the incentive to illegal logging. Finally, the presence of forest patrols may discourage illegal logging in the leakage area that directly borders the project area boundaries. The predicted outcome of implementing these types of activities throughout the project zone is the successful mitigation of leakage by providing alternatives and incentives to prevent illegal logging in the surrounding areas.

5.3 Baseline Emissions(G2)

5.3.1 Delineating a Reference Region

A combination of different geospatial data was used to delineate a reference area that conservatively and accurately reflects the baseline scenario in the project area. The main defining unit for the reference area was a combination of various Afro-Colombian community boundaries because the project area itself consists of similar community territories. By restricting the reference area boundaries to these territories, it is ensured that similar systems of governance, regulations, social structure, and customs are present in both the project and reference areas.

Within these boundaries, the reference region was further narrowed down using data such as slope, elevation, forest cover types, precipitation, and temperature (Table 20). These factors were considered in order to make the reference area as similar to the project area with respect to land cover, climate, and geography.

To ensure that no areas with restricted access to agents of deforestation existed in the reference region, all protected areas such as national parks, military bases, and areas under conservation were excluded from the reference area. Data and maps of these excluded areas can be found in Annex AT. Similarly, no areas of planned deforestation, forest management including forestry concessions, or plantations were included in the reference area during the historical reference period (Annex AT). Additionally, areas with planned mining operations during the historical reference period were removed. Government sanctioned and registered mining activities began in 2005, and available INGEOMINAS data on government-registered mining concessions was used to remove the areas that were active during the historical reference period (see Annex AT for data and maps of excluded mining concessions). There were no areas found in the reference region that were deforested due to natural circumstances.

A map of the reference area is provided as Figure 23

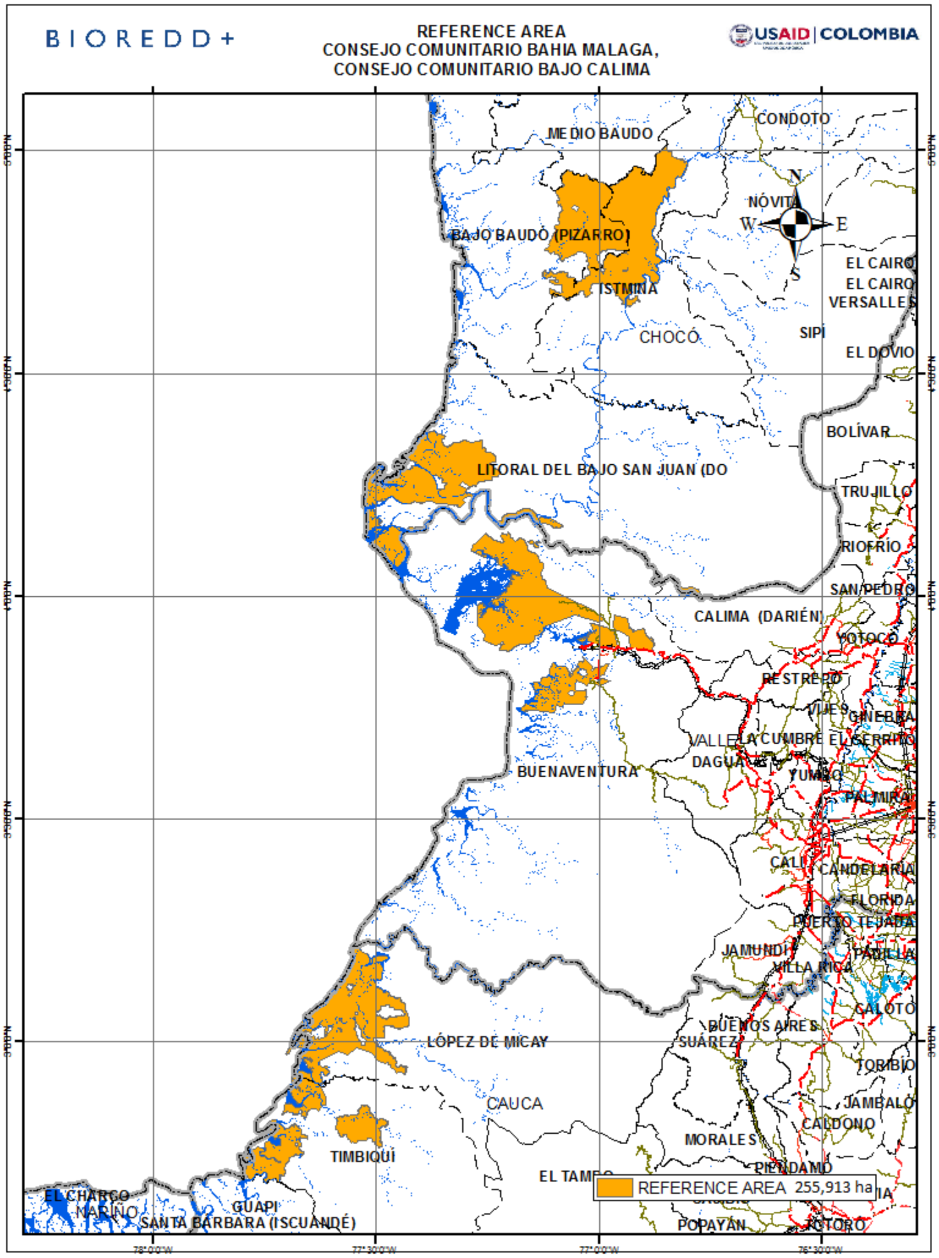


Figure 23. Map of reference area.

5.3.1.1 Similarity between Reference Region and Project Area

An analysis of key variables between the reference region and project area can be seen in Table 20 below.

Category	Variable	Comparison
Drivers of deforestation	Drivers of deforestation	A multitemporal analysis of the reference area and project zone was conducted for three points in time: 1990, 2000, and 2012. It was evident from this analysis that most deforestation and degradation is caused by commercial logging and the subsequent expansion of agricultural land.
Landscape configuration	Distribution of native forest types	Forest type is partially defined by species composition, canopy gap frequency and gap size. Differences in species composition were accounted for using GeoEcoMap's 14-class map (Annex AA). We account for gap frequency and size by considering slope and aspect. Literature supports that slope and aspect affect canopy gap and size in tropical forests (Lobo and Dalling 2013). A historical dataset for 1990 was generated by replacing all degraded forest and non-forest pixels from GeoEcoMap's 2012 14-class LULC dataset with historical LULC data from 1990. This data was then subdivided into slope and aspect classes and the resulting data was clipped to the project area and reference area extents. The counts for each forest type were then compared between the project area and reference region. The results of the analysis show that for all forest types, the proportion of that forest type within the reference region was within 10% of the proportion of that forest type within the project area (Annex AS).
	Elevation	A comparison of contour data produced at a scale of 1: 100000 for Colombia by the Geographic Institute Augustin Codazzi was conducted for the reference region and project area. This elevation information indicates that the reference area and the project area are both between 0 - 400 m of elevation.
	Slope	Slope was modeled using contour data and was classified according to the methodology of the USDA Department of Agriculture of the United States. Both the project area and the reference area were found to be relatively flat, with slopes in the range of 0%-3%.
Socio-economic and cultural conditions	Land-tenure status	The reference area and the project area are located in the collective territories of Bahia Malaga, Bajo Calima, Acadesan, Rio Cajambre, Rio Yurumangui, Mayor del Rio Anchicaya, Taparal, Bajo Potedo, Guadualito, Campo Hermoso, Zacarías Rio Dagua, Gamboa, Caucana, La Brea, and la Esperanza. The land belongs to these communities and is titled and protected according to Law 70 of 1993.

	Policies and regulations	The reference area and the project areas are regulated by the internal regulations of each of the community councils. Both the reference area and project area do not include protected areas, natural parks, military base areas, timber or logging concessions, or forest plantations.
	Degree of urbanization	The proportion of area urbanized within the reference area and the project area is 0.03%.

Table 20. Reference region and project area comparison.

5.3.2 Analyze Historical Deforestation/Forest Degradation

Historical deforestation and forest degradation were analyzed in the reference region from 1988 to 2012. Historical degradation was included in the analysis because the primary driver of both degradation and deforestation is illegal commercial logging.

5.3.2.1 Data

The data used to analyze historical deforestation and forest degradation vary from medium to high resolution and come from a number of different sources outlined and described in Table 21 below. All data used follow guidelines from Chapter 3A.2.4 of the IPCC 2006 GL AFOLU document.

Data Source	Main Use of Data	Data Characteristics
Landsat Data collected from the USGS archive to provide three key periods consisting of 1990 (1988-1991), 2000 (1998-2001), and 2012 (2010-2012) over the BioREDD+ project areas. The images are used to provide deforestation and degradation rates for three periods of about 0-3 years from the start of the project, ~10 years before the start of the project, and ~20 years before the start of the project.	Land cover and land use classification using the requirements for cover and use types provided by the VM0006 methodology, and change detection and transitions between land cover and land use types over the three time periods.	All Landsat images are at ≤ 30m spatial resolution including all visible and near infrared bands available for the Landsat satellite. Cloud cover <20% of the entire area for each period. Geometric accuracy <1 pixel absolute and relative among image mosaics. 1990s (1988-1991) Landsat 4 (TM). 2000s (1998-2001) Landsat 5 (TM) and Landsat 7 (ETM+). 2012s (2010-2012) Landsat 5 (TM) and Landsat 7 (ETM+).

Data Source	Main Use of Data	Data Characteristics
Landsat Mosaics from Global Land Cover Facility and Hansen et al. (2014) for the two periods of 2000 and 2012. The tiles for mosaic imagery were downloaded from: http://earthenginepartners.appspot.com/	The two mosaic images are relatively cloud free but extremely noisy in reflectance values. These images are combined by individual images downloaded from the USGS archive to great the best cloud free images for the project areas.	Spatial resolution ≤ 30m. Images are considered cloud free but extremely noisy because of banding and filled scan line artifacts. 2000 Mosaic: (bands: 7,5,4,3). 2012 Mosaic: (bands: 7,4,5,3).
ALOS PALSAR data purchased from the Japanese Space Agency (JAXA) for five years (2007-2010) over the entire study area. The images were processed, the terrain was corrected to remove the effect of topography in the imagery, and then the images were mosaicked in order to classify land cover types and examine the deforestation and degradation rates over the historical time frame.	ALOS PALSAR images were used to map intact, degraded, and deforested areas over the entire coastal region and to separate the wetlands (Guandal) and mangrove (Manglar) forests from terra firme (Colinas) forests.	Spatial resolution: 25m. ALOS PALSAR bands: HH and HV polarization. Data collected during the dry season of 2007, 2008, 2009 and 2010. Geometric accuracy: <1 pixel.
Readily available ecosystem map produced by IDEAM over the entire country.	The land cover and ecosystem types included approximately 81 class types over the study region. The general cover and use types were used to train Landsat classification for crops, pasture, and wetland classes.	Raster image at 30m resolution was produced from the land cover and land use polygons. Cloud cover was extensive, but less than 30% over most of the BioREDD+ project areas.
Recent high-resolution (<1m) airborne remote sensing aerial photography data acquired as sampling for the project and reference areas along with Lidar data.	High-resolution imagery was used for validation and accuracy assessments. Imagery was visually interpreted and examined by experts to create a large number of samples for validation of land cover maps.	Spatial resolution: 20cm. RGB camera (3 bands). Orthorectified at 1000-2000 ha tiles randomly sampled over the project and reference areas in 2013. Geometric accuracy <1m.
Direct field observations during the plot data collection for forest structure and	Ground truthing the classification products and	18 1-ha (100m x 100m) plots

Data Source	Main Use of Data	Data Characteristics
biomass in randomly sampled lidar images.	accuracy assessments.	109 0.25-ha (50m x 50m) plots

Table 21. Data sources used to analyze historical deforestation and degradation.

As part of the requirement for VM0006 methodology, at least three images of forest cover are required during the historical reference period, (1) at minimum one image from 0-3 year before project start date, (2) at minimum one image from 4-9 years before project start date, and (3) at minimum one image from 10-15 years before project start date. A series of available images were selected to quantify the historical deforestation and degradation. Although the VM0006 methodology prohibits the use of images older than 15 years before the project start date, data from the Landsat thematic mapper archive was selected over a longer period of time(~26 years) because of the extensive cloud cover over the project areas that are located along the coastal plans in low altitude terrains. The Landsat images, along with radar data were combined to ensure a significant amount of cloud free coverage over the project and reference regions for statistically robust deforestation and degradation estimates. See Table 22 for imagery date selection and Table 23 for a list of all Landsat imagery used in the LULC analysis.

Scene Number	Imagery Year	Years Before Project Start Date
1	1990	23.6
2	2000	13.65
3	2012	1.65

Table 22. Imagery date selection

Number	Landsat	Path/Row	Date	Scene
1	TM	008/054	7/15/89	1990
2	TM	008/058	1/2/88	1990
3	TM	010/056	5/7/88	1990
4	TM	009/057	8/7/89	1990
5	TM	009/058	8/7/89	1990
6	TM	009/059	8/7/89	1990
7	TM	009/060	8/7/89	1990
8	TM	008/059	12/22/89	1990
9	TM	008/060	12/22/89	1990
10	TM	010/054	3/21/91	1990
11	TM	010/055	3/21/91	1990
12	TM	008/055	8/14/91	1990
13	TM	008/055	8/14/91	1990
14	TM	008/056	8/14/91	1990
15	TM	008/058	6/5/92	1990
16	ETM+	010/060	11/14/99	2000
17	ETM+	010/056	2/18/00	2000
18	ETM+	010/057	2/18/00	2000
19	ETM+	009/055	8/21/00	2000
20	ETM+	009/056	8/21/00	2000

Number	Landsat	Path/Row	Date	Scene
21	ETM+	008/058	8/30/00	2000
22	ETM+	008/059	8/30/00	2000
23	ETM+	008/060	8/30/00	2000
24	ETM+	009/054	1/12/01	2000
25	ETM+	010/054	2/4/01	2000
26	ETM+	008/055	2/6/01	2000
27	ETM+	010/058	4/9/01	2000
28	ETM+	009/057	4/18/01	2000
29	ETM+	008/056	7/16/01	2000
30	ETM+	008/057	7/16/01	2000
31	ETM+	008/054	8/1/01	2000
32	ETM+	009/058	8/24/01	2000
33	ETM+	009/059	8/24/01	2000
34	ETM+	009/060	9/9/01	2000
35	ETM+	010/055	10/18/01	2000
36	TM	008/054	1/22/10	2012
37	TM	008/058	1/22/10	2012
38	TM	009/054	1/29/10	2012
39	TM	009/055	1/29/10	2012
40	TM	010/055	3/12/11	2012
41	TM	010/056	3/12/11	2012

Number	Landsat	Path/Row	Date	Scene
42	TM	010/057	3/12/11	2012
43	TM	010/058	4/13/11	2012
44	TM	010/059	4/13/11	2012
45	ETM+	008/055	1/14/10	2012
46	ETM+	008/056	12/13/09	2012
47	ETM+	008/057	1/14/10	2012
48	ETM+	008/059	1/1/11	2012
49	ETM+	008/060	1/1/11	2012
50	ETM+	009/056	1/5/10	2012
51	ETM+	009/056	1/21/10	2012
52	ETM+	009/057	1/5/10	2012
53	ETM+	009/057	1/21/10	2012
54	ETM+	009/058	1/5/10	2012
55	ETM+	009/058	1/21/10	2012
56	ETM+	009/059	9/18/10	2012
57	ETM+	010/060	9/9/10	2012
58	TM	Mosaic	~1990	1990
59	TM/ETM+	Mosaic	~2000	2000
60	TM/ETM+	Mosaic	~2012	2012

Table 23. Imagery used in LULC analysis.

5.3.2.2 Land Transitions

There is no land within the reference region that is considered unstocked forest. Forest degradation is accounted for as a land transition and is only considered degradation if the transition from a larger carbon stock density to a smaller carbon stock density has persisted for three years. For descriptions of expected land transitions, see Table 24. For a list of complete land transitions observed in the reference period, see Section **5.3.5.1.2** for the historical land transition matrix.

Expected LULC Transition	**Description**
Primary Forest to Primary Forest	Primary forest remaining primary forest.
Primary Forest to Degraded Forest	Primary forest that is in the process of being logged illegally transitions to degraded forest.
Primary Forest to Pastureland	Primary forest to pastureland implies aggressive illegal logging of forest with the end land use for grazing.
Primary Forest to Cropland	Primary forest to cropland implies rapid illegal logging of forest with the end land use as cropland.
Primary Forest to Wetland	Primary forest to wetland suggests the seasonal inundation of forested areas near water bodies, or a change in water level over time.
Primary Forest to Settlement	Primary forest to settlement implies the rapid illegal logging of forest for the construction of housing, roads and other infrastructure.
Primary Forest to Other	Primary forest to other suggests the rapid illegal logging of forest, which is converted to unmanaged lands.
Degraded Forest to Degraded Forest	Degraded forest remaining degraded forest.
Degraded Forest to Pastureland	Degraded forest to pastureland implies further illegal logging of degraded forests that are then converted to pasture.
Degraded Forest to Cropland	Degraded forest to pastureland implies further illegal logging of degraded forests that are then converted to cropland.
Degraded Forest to Settlement	Degraded forest to settlement implies further illegal logging of degraded forest for the construction of

Expected LULC Transition	Description
	housing, roads and other infrastructure.
Pastureland to Pastureland	Pastureland remaining pastureland.
Pastureland to Cropland	Pastureland to cropland implies a change of use in already cleared land from grazing to agriculture.
Cropland to Pastureland	Cropland to pastureland implies a change of use in already cleared land from agriculture to grazing.
Cropland to Cropland	Cropland remaining cropland.
Wetland to Wetland	Wetland remaining wetland.
Settlement to Pastureland	Settlement to pastureland implies the removal of structures or infrastructure for the purpose of grazing.
Settlement to Cropland	Settlement to cropland implies the removal of structures or infrastructure for the purpose of agriculture.
Settlement to Settlement	Settlement remaining settlement
Other to Primary Forest	Other to primary forest suggests rapid forest regeneration in unmanaged lands.
Other to Degraded Forest	Other to degraded forest suggests slow forest regeneration in unmanaged lands.
Other to Pastureland	Other to pastureland suggests the transition from unmanaged lands to management for grazing use.
Other to Other	Other lands remaining other lands.
Water to Water	Water remaining water.

Table 24. Expected LULC transitions and descriptions.

5.3.2.3 Historical LULC Class and Forest Strata Transitions

All remote sensing data used in the land cover change analysis was pre-processed. A LULC classification, forest stratification, and an accuracy assessment were conducted prior to completing an analysis of land cover change.

5.3.2.3.1 Pre-Processing of Remote Sensing Data

All remote sensing data was pre-processed before conducting the LULC analysis. Pre-processing steps included converting the raw digital number data into ground reflectance values and correcting for differing atmospheric conditions. Images with excessive cloud cover or haze were rejected, and remaining pre-processed imagery was mosaicked together. Average RMSE between images was less than one pixel and cloud cover across each mosaicked image was calculated to be less than 20%. The 2012 LULC map was used as the forest benchmark map for the project area and leakage area. For a more detailed description of the pre-processing of Landsat data, see **Annex U**.

5.3.2.3.2 LULC Classification and Forest Stratification

LULC Classes

Only pre-processed data was used to conduct the LULC classification. Image pixels were classified as one of the following eight land cover classes: primary forest, degraded forest, pastureland, cropland, wetland, settlement, other, and water. As the classes are named differently in the reports included in **Annex U**, a key for LULC class names is shown in Table 25 below. Any areas that were classified as cloud or cloud shadow were masked out of all classified images. The classifications were performed using a Support Vector Machine classifier, using at least 25 training regions chosen by eye and in consultation with experts and high resolution optical and lidar imagery for each class. As all land cover change analyses were performed at 30 m resolution, the minimum mapping unit for LULC classes is less than 1 ha. For detailed procedures on the LULC classification and forest stratification, see **Annex U**.

GeoEcoMap LULC Classes	Accounting Model LULC Classes
Intact Forest	Primary Forest
Degraded Forest	Degraded Forest
Grasslands	Pastureland
Croplands	Cropland
Wetlands	Wetland
Settlement	Settlement
Other Lands	Other
Water	Water

Table 25. LULC class key between GeoEcoMap reports and carbon accounting models.

Forest Stratification

A high-resolution multi-input stratification was performed in order to create a broad land cover and vegetation type classification of the BioREDD+ project region. The stratified maps were developed using available spatial data such as a Digital Elevation Model (DEM), soil, land cover types, climate, and topography and provide distinct segments within each project node that were used for airborne Lidar data sampling and field inventory. No measurements of biomass plot density or carbon stock density were used in the forest stratification process. The features of each strata include different ranges of soil types (e.g. texture, Ph, etc.), surface elevation and slopes, distinct climate zones, and general land cover (forest, nonforest, and swamps) that are used to separate forests with different structure and biomass.

To complete the final forest stratification, the four data layers of climate, soil, topography, and land cover, were combined and analyzed using a program written in IDL. First, all data layers were confirmed to be the same size and spatial resolution. Climate and soil data were resampled to 100 m resolution to match the SRTM and ALOS products. The stratification was then performed by multiplying all data layers to create 3 x 3 x 3 x11=297 classes, which were grouped into 103 distinct strata in the region. The majority of the region – more than 90% – was covered by only 46 distinct classes. The stratified image was then colored into 30 distinct colors to demonstrate the potential variations of the landscape features that may influence the forest structure, carbon stocks, and forest dynamics (see Figure 24 below). The final stratified map was used to allocate plots for the forest inventory and to define areas for airborne Lidar samples. See **Annex AB** for data sources and a detailed methodology for developing the forest stratification map.

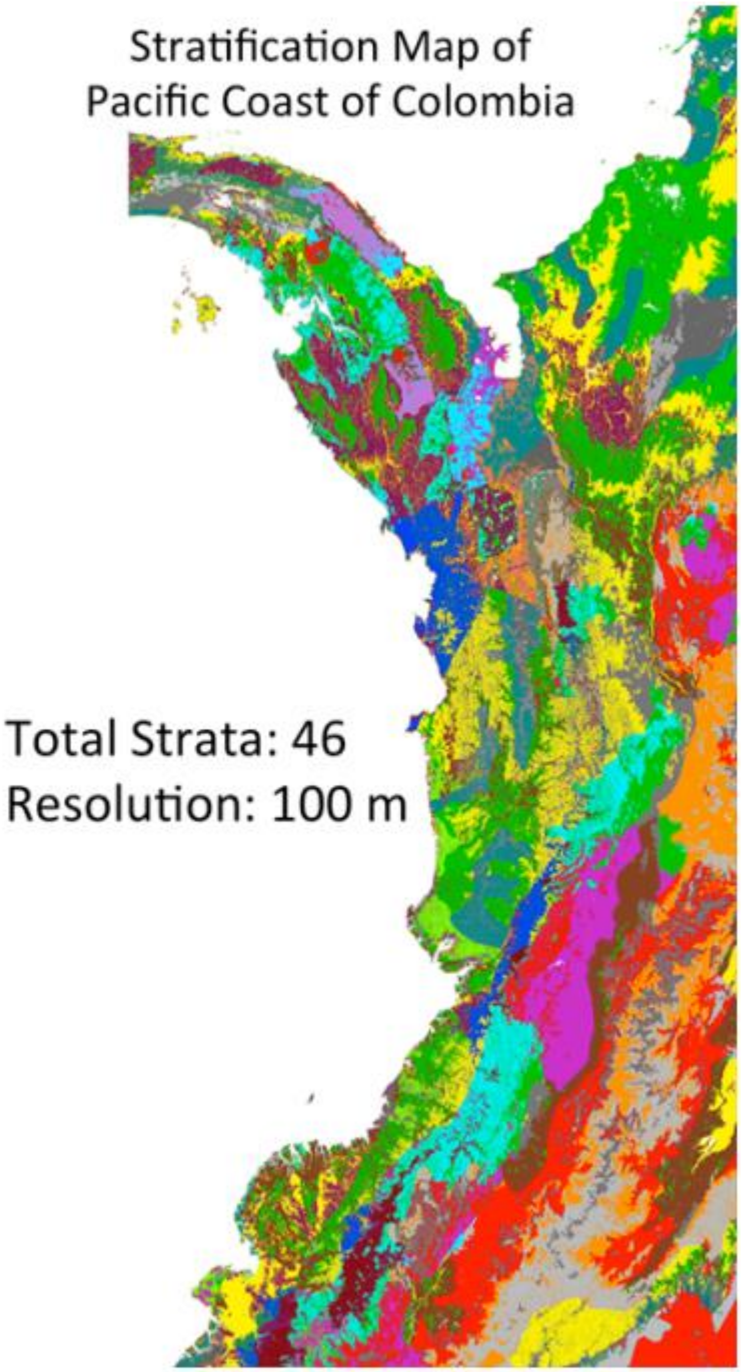


Figure 24. Stratification map used for sampling.

5.3.2.3.3 Estimating and Minimizing Uncertainty

An accuracy assessment of LULC classification was conducted for all LULC maps across the whole analysis area, i.e., the union of the project and leakage areas and the reference region. The accuracy has been assessed by comparing predicted classes for a number of reference locations with independently determined LULC classes. Reference locations are located throughout the reference region, leakage area, and project area. The LULC classes for these reference locations were identified using three different sources of data: high resolution aerial photography, ground plots that were randomly located in lidar and aerial images, and historical land cover maps developed by IDEAM based on Landsat visual interpretation. The calculated accuracy of LULC maps is greater than 85%, which equates to a STEP 2 factor of 1.0 per Table 5 of VM0006. Because only three points in time are used in the historical reference period, the STEP 3 factor is 0.9. Hence the overall classification uncertainty and discounting factor is 0.9. The stratification uncertainty was determined to be 0.75 based off of Table 5 in VM0006. To see the results from the accuracy assessment, refer to **Annex U**.

Image classification is the key methodology used in detecting changes of the forest cover associated with deforestation and degradation in the study area. All classification approaches are based on the state of the art methodologies and have internal tests for accuracy and precision. In the process of detecting changes, all potential changes that may have either large errors or low confidence intervals were eliminated. The key source of error in the analysis is due to the extensive cloud cover along the Pacific coast of Colombia. However, as results reported based on the rate of change and aggregated over each project site, the overall estimates are expected to be representative of the changes of forest cover in the region. Any potential bias may be due to the underestimation of the forest cover change primarily due to clouds partially blocking the area of forests changed in the past.

5.3.3 Analyze Deforestation/Degradation Agents and Drivers

5.3.3.1 Assessing Impacts from Drivers of Deforestation/Degradation

The relative contribution to deforestation and degradation of each driver present in the reference region was calculated using VM0006 equations 1, 2, 4, and 8 in Table 8 of the methodology. A combination of data from the LULC analysis are described in Section **5.3.2.3** and inventory data were used to calculate the relative driver contribution to deforestation and degradation, which is summarized in Table 26 below. These estimates were incorporated into the carbon accounting models, found in **Annex V**.

Driver Category	Annual Carbon Loss (tC/yr)	Proportion DF	Proportion DG	Contribution DF	Contribution DG
Conversion of forestland to cropland for subsistence farming	29,064	100%	0%	100%	0%
Conversion of forestland to settlements	19	%100.0	%0.0	%0.1	0%
Conversion of forestland to infrastructure such as roads, cell phone towers, power lines	0	%100.0	%0.0	%0.0	0%
Logging of timber for commercial sale	320,855	%0.0	%100.0	%0.0	100%
Logging of timber for local enterprises and domestic uses	0	%0.0	%100.0	%0.0	0%
Wood collection for commercial on-sale of fuelwood and charcoal	0	%5.0	%95.0	%0.0	0%
Fuelwood collection for domestic and local industrial energy needs	0	%5.0	%95.0	%0.0	0%
Grazing	0	%5.0	%95.0	%0.0	0%
Understory vegetation collection	0	%50.0	%50.0	%0.0	0%
Forest fires	0	%0.0	%100.0	%0.0	0%

Table 26. Relative importance of drivers based on LULC and carbon stock data per the requirements of VM0006 (DF = deforestation, DG = degradation).

Driver	Total Change in Carbon Stocks (Mg DM yr^{-1})	Contribution of Carbon Loss (fraction)
Conversion of forestland to cropland for subsistence farming	58,127	8.3%
Conversion of forestland to settlements	39	0.0%
Conversion of forestland to infrastructure such as roads, cell phone towers, power lines	0	0.0%
Logging of timber for commercial sale	641,710	91.7%
Logging of timber for local enterprises and domestic uses	0	0.0%
Wood collection for commercial on-sale of fuelwood and charcoal	0	0.0%
Fuelwood collection for domestic and local industrial energy needs	0	0.0%
Grazing	0	0.0%
Understory vegetation collection	0	0.0%
Forest fires	0	0.0%

Table 27. Relative contribution per driver to annual deforestation.

5.3.3.2 Analyzing Mobility of Agents

The ability of agents of deforestation and degradation to conduct logging activities is related to their mobility, and the geographic conditions of harvesting areas including terrain, and location. These factors determine the agent's willingness to travel to extract timber and carry out other activities causing deforestation and degradation. Modes of transportation are dependent on the agents and drivers of deforestation and degradation and include: (1) on foot, (2) mule, (3) motorcycle, (4) car, (5) truck, and (6) boat. These modes were identified by the timber study which is included as **Annex X**. The only methods of transportation used for the particular drivers and agents relevant to the project were traveling on foot, by mule, or by boat (see Table 28).

Driver	On Foot	Mule	Motorcycle	Car	Truck	Boat
1. Conversion of forest land to settlements	X					X
2. Conversion of forest land to cropland	X					X
3. Cattle grazing (i.e., in-forest grazing)	X					
4. Wood collection for commercial on-sale of fuelwood and charcoal.	X	X				X
5a. Small forest fires to the extent that they are not part of natural ecosystem dynamics						
5b. Large crown fires to the extent that they are not part of natural ecosystem dynamics.						
6a. Logging for commercial sale by selection cutting	X	X				X
6b. Logging for commercial sale by clear cutting (removing more than 75% of trees)	X	X				X
7. Fuelwood collection for domestic and local industrial energy needs	X					
8a. Logging for domestic use by selection cutting	X					X
8b. Logging for domestic use as clear cutting.						
9. Conversion of forest land to infrastructure						
10. Understory vegetation extraction (i.e., thatch grass collection for roof and livestock bedding materials, shrubs and small trees for straw fences)	X					X
Mobility by average speeds (km/hr)	**2.5**	**3-5**	**5-12**	**5-60**	**5-40**	**7-18**

Table 28. Mobility of agents related to driver.

5.3.3.3 Identifying Driving Variables of Deforestation/Degradation

There are variables, also known as "predisposing factors" that explain the location of the areas where deforestation and degradation are occurring. The main variables can be classified into two types: (i) spatial and (ii) non-spatial. Variables were chosen based on the results of the analysis in Section **5.3.3.1**. These variables were identified based on expert opinion documented in the community REDD Plan as well as the timber study (see as **Annex X** and **Annex Y**).

The non-spatial variables include:

Economic Activity. There are internal and external factors related to the variable of economic activity. A factor that is external to the community is economic growth in Colombia and the world, which generates demand for wood products. An example of an internal factor is the economic poverty of local communities, which creates incentives to meet the national and global demand for wood products through illegal logging activities, which offer higher returns in a short time-frame. These activities are especially relevant for families who are not engaged in full-time logging.

Increased population. Population growth, which is offset by the migration process to other cities for education or income, results in the need for people to generate additional income from logging activities.

Demand for firewood and charcoal. Remote communities without electricity and propane supplies depend on firewood and charcoal for cooking, which results in localized forest degradation. The demand for charcoal generated by the nearby urban area Tumaco also puts pressure on forests, especially mangroves.

Spatial variables are listed in the table below.

Driver	Spatial Driving Variable	Predisposing Factors
Logging of timber for commercial sale	Proximity to land or waterways	Access to forest is necessary for anthropogenic deforestation as waterways are required to transport harvested timber. Mobility of agents is increased.
Logging of timber for commercial sale	Population density.	Generates agents and consumption centers.
Logging of timber for commercial sale	Forest type	Certain types of forest have more high-value timber, which attracts loggers seeking to extract and sell that timber.
Logging of timber for commercial sale	Proximity to the forest	Closer proximity to forest results in easier access and extraction of timber.
Logging of timber for commercial sale	Slope	Steep slopes restrict the ability of agents to access the forest and extract timber.
Logging of timber for commercial sale	Proximity to populations	Settlements or urban centers are potential markets for timber and charcoal products.
Logging of timber for commercial sale	Proximity to processing centers	Processing centers attract more logging activities because of the ability to add value to timber products.
Subsistence Agriculture	Population density.	A higher population density results in the need for more land for subsistence agriculture purposes in order to sustain that population.

Table 29. Spatial driver variables.

5.3.4 Determining Emissions Factors

5.3.4.1 Data Sources

The data described in Table 30 below wereused to estimate ex-ante GHG emissions reductions and removals. The project area is not currently registered under an existing JNR program, therefore data on biomass stocks on a jurisdictional scale is not a selected data source.

Data Source	Methodology	Application
Field Sample – Calibration plots within lidar transects	Randomly selected plots within lidar transects.	Plot-based measurements within the LULC class or forest stratum that are used for both calibrating and validating remote sensing sampling unit data (RSSU) and measurements of carbon pools.
Field Sample – Plots within LULC classes	See section **5.3.4.2**, randomly selected plots in LULC classes.	Applied to estimate carbon stocks in all LULC classes.
IPCC	Defaults allowed by VCS and VM0006.	Root-to-shoot ratios for estimation of below-ground biomass.
Locally developed allometric equations	Trees representing species, diameter, and height classes for forests in the region were harvested in order to develop the allometric equations.	These equations were used to calculate the forest above ground biomass from field data that in turn were used to calibrate and validate remote sensing estimates of forest biomass.
Remote sensing based carbon estimates	Airborne lidar data random samples in forest strata and LULC classes.	Used to estimate above ground forest biomass and to develop models to extrapolate over other carbon pools.
Literature based estimates	Existing data from literature on non-tree vegetation	Applied to estimate the carbon pool in non-tree vegetation and litter

Table 30. Selected data sources for ex-ante estimates.

The carbon stocks and the standard errors shown below in Tables 31 and 32 were estimated using the data sources in Table 30.

LULC Class	AGT (tC/ha)	AGNT (tC/ha)	BG (tC/ha)	LDW (tC/ha)	SDW (tC/ha)	DTS (tC/ha)
Primary Forest	154.29	3.24	43.34	12.79	3.66	2.06
Degraded Forest	53.98	2.67	16.88	17.80	6.26	2.90
Pastureland	15.78	1.67	8.75	11.16	1.33	1.80
Cropland	20.51	1.67	10.16	11.10	1.02	1.78
Wetland	15.96	1.98	5.71	0.00	0.00	0.00
Settlement	6.56	0.80	2.59	0.00	0.00	0.00
Other	17.96	0.54	6.34	0.00	0.00	0.00
Water	0	0	0	0	0	0

Table 31. Carbon stock estimates (see VM0006 for pool designations).

LULC Class	AGT (tC/ha)	AGNT (tC/ha)	BG (tC/ha)	LDW (tC/ha)	SDW (tC/ha)	DTS (tC/ha)
Primary Forest	2.71	0.34	2.16	0.54	0.29	0.45
Degraded Forest	3.71	0.42	2.76	1.11	0.73	0.94
Pastureland	4.47	0.50	3.43	1.34	0.79	1.12
Cropland	2.48	0.28	1.92	0.74	0.40	0.62
Wetland	4.33	0.49	3.36	0.00	0.00	0.00
Settlement	0.91	0.10	0.77	0.00	0.00	0.00
Other	1.31	0.15	1.16	0.00	0.00	0.00
Water	0	0	0	0	0	0

Table 32. Standard errors of carbon stock estimates (see VM0006 for pool designations).

5.3.4.2 Sampling Design

5.3.4.2.1 Sample Size & Plot Allocation

The field survey and data collection occurred in summer of 2013 and ended in early 2014 using the RAINFOR measurement protocol as described in **Annex Z**). Plot-based measurements were taken within the LULC class or forest stratum and used for both calibrating and validating remote sensing sampling unit data (RSSU) and measurements of carbon pools (see Figure 24 in section **5.3.2.3.2**). Overall, the following numbers of plots were established throughout the project region and used to evaluate the lidarmodel:

1. **Calibration plots:** 15 1-ha calibration plots within the lidar transects; each plot was divided into four 0.25 ha plots to increase the number of plots for calibration and validation, which resulted in 60 plots at 0.25ha.

2. **Cluster plots:** 15 sets of satellite plots falling in the lidar transects with each set having 8 satellite plots at 0.25 ha for a total number of 120 with 109 plots accurately located in lidar images (see Figure 25).

3. **Systematic plots:** 45 plots collected in 0.25 ha systematically within one lidar transect.

Overall, there were 214 plots at 0.25 ha in size used to develop and test the accuracy of the lidar predictive model (see Table 33). These plots were located in different forest types as indicated by the field observation and compared with remote sensing data. All plots are located in or near the lidar transects which are identified in **Annex Z**.

Forest inventory plots	Size and shape	Number of plots in Lidar transects	Number of plots at 0.25 ha size	Number of 0.25 ha in lidar transects
16 calibration plots	1-ha, 100 m x 100 m	15	64	60
16 cluster of satellite plots	0.25 ha (50 m x 50 m)	15	128	109
1 set of systematic sampling plots	0.25 ha (50 m x 50 m)	45	45	45
Total	-	**75**	**237**	**214**

Table 33. Number of plots established in the region and used in developing and testing the accuracy of Lidar biomass model.

5.3.4.2.2 Sample Framework for Field Data, including Size, Layout, and Location

In the project region, the average carbon stock density on both forest and non-forest LULC classes was assessed using non-permanent sampling plots. Conservative defaults gathered from scientific literature were used to quantify the carbon stock density on non-forest land. Within a LULC class or forest stratum, the location of sample plots was selected randomly. The randomization was done *ex-ante* by a computer program as in the GIS NOAA tools. All random points fall in lidar image data and therefore will avoid any subjective choice of plot locations for both carbon calculation and calibrating and validating the remote sensing data. For each sample plot, the observed LULC class and forest type was recorded, and the forest canopy closure was estimated using lidar data and the field survey, if that information was recorded by the field crew.

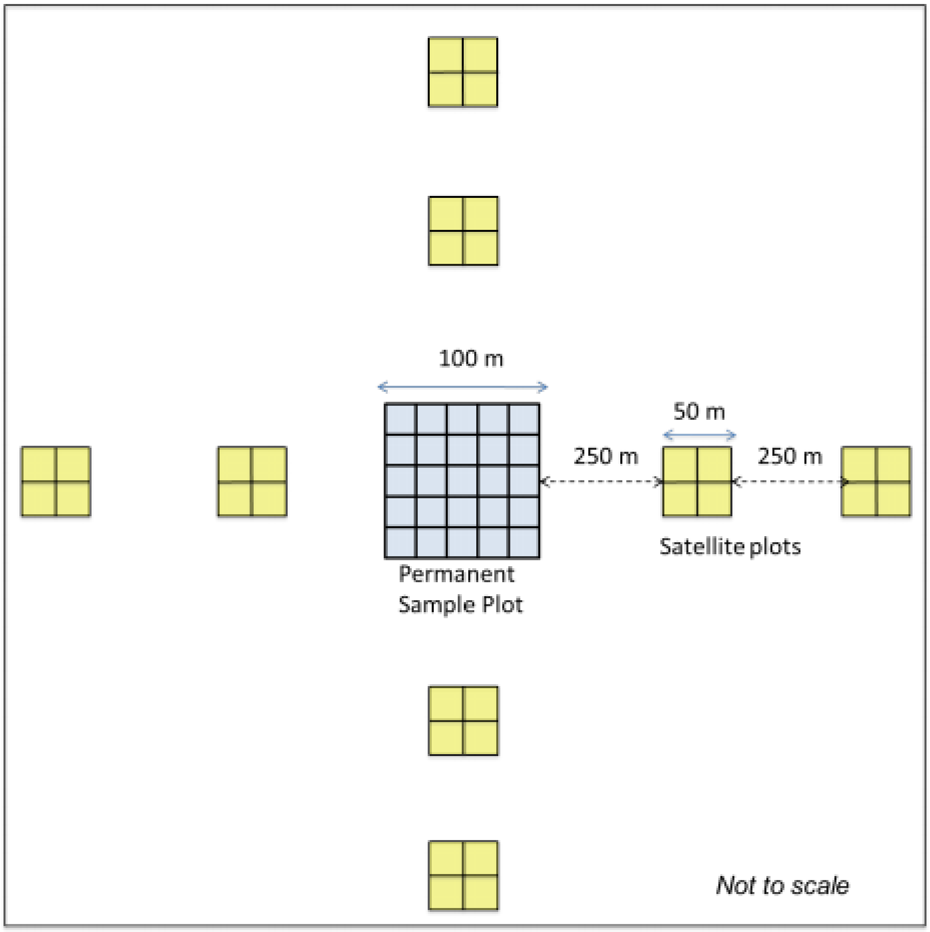


Figure 25. Map of cluster plots relative to calibration plots in RAINFOR configuration.

5.3.4.3 Measure and Calculate Carbon Stock Density

Plot-based measurements within the LULC class and/or forest stratum were used to calibrate and validate remote sensing sampling unit data (RSSU) and carbon pool measurements. As described in Section **5.3.4.2**, the forest inventory plots consisted of 1-ha calibration plots which were divided into 0.25 ha plots, clusters of 0.25 ha satellite plots, and a set of systematically sampled 0.25 ha plots. All 214 plots were located within the lidar transect, but in various forest types, which were determined based on field observation and remote sensing data.

The VM0006 methodology was followed in allocating plots and biomass values within LULC classes. The LULC class of each specific biomass plot was determined using the LULC map closest in time to the time of measurement. Since degradation was included, biomass inventory plots in the forest area were assigned the appropriate forest stratum or LULC class using the forest stratification model and map developed for this project as described in Sections **5.3.2.3.2** and **5.3.4.2**. Several plots were sampled for each LULC class, and no plots were measured multiple times: instead multiple plots within each LULC class were used to calculate the mean and variance of biomass. Details of the carbon stock measurement protocol can be found in **Annex Z** while calculations in **Annex AA**.

Aboveground organic tree matter

New allometric equations were developed for trees of the Pacific coastal forests. Three models were developed, for terra firme (Colinas), inundated forests (Guandal), and mangrove forests (Manglar), as well as two models to estimate the biomass of palm trees. These models all take in valid tree measurements such as diameter (at breast height), height, and wood density. While all the models are solid statistically, they must be validated with independently collected data to determine which best measures biomass.

The models shared uncertainty analysis and comparisons with Chave et al (2005, 2014) and are presented in Table 34:

Forest Stratification	Model
Terra firme / Colinas	ln(AGB) = -2.130+2.015*ln(D)+0.724*ln(H)+1.002*ln(WD)
Inundated forests / Gunadal	ln(AGB) = -2.328+1.833*ln(D)+0.724*ln(H)+0.151*ln(WD)
Mangroves / Manglar	ln(AGB) = -2.818+2.185*ln(D)+0.724*ln(H)+0.650*ln(WD)
Palms*	ln(AGB) = -0.173+0.700*ln(D^2*H*WD)

Table 34. Allomeric models by forest stratum for aboveground organic tree matter where AGB is aboveground biomass (Mg ha^{-1} dry weight), D is diameter (cm), H is height (m) and WD is wood density (g cm^{-3}). * Saldarriaga's model for palm tree biomasses in all types of forests (2014).

To estimate the biomass of trees smaller than the measurement threshold of 10 cm in diameter, a model was built around literature values for plot data from Panama, Colombia (Chave et al., 2003; Sierra et al., 2007; Usuga et al., 2010). The following model and equation were used to estimate the ratio (R_t) of biomass

$$\square_{\square} = 1.483 \times \square\square\square^{-0.061310}$$

With a sample size of 65 and an R^2 = 0.91.

Aboveground non-tree organic matter

Mean carbon stocks in this carbon pool are typically estimated based on literature value or field measurements. While non-tree vegetation can be sampled using destructive sampling methods, in this case data from climatically similar locations including Panama (BCI; Condit et al. 2000), Costa Rica (La Selva; Clark et al., 2000), and Peru (Manu National Park; Malhi et al. 2010) with collected shrubs and lianas was used to develop a relationship between the biomass of shrubs and the biomass of trees > 10 cm, which was applied to the project. The model was tested against various values from ground sampling in the literature (Philips et al. 1998; Brown and Lugo 1992). The ratio of shrub aboveground biomass to forest biomass (trees > 10cm) is:

$$\square_{\square} = 0.832 \times \square\square\square^{-0.654}$$

With a sample size of 31 and an $R^2 = 0.76$.

A carbon fraction value of 0.47 was used as recommended by the methodology for the non-tree carbon pool.

Belowground biomass

Belowground biomass was initially calculated using an existing root: shoot model (Mokany et al. 2006; also reported in the IPCC 2006 GL), however, it was found that many of the degraded and secondary forests had different roots: shoots ratios than terra firme forests. Therefore, the following new equation was developed using literature data and project data:

$$\square\square\square = 0.489 \times \square\square\square$$

Where BGB is belowground biomassin units of Mg ha^{-1} dry weight. For more detailed information on belowground biomass equations and uncertainty calculations, see **Annex AC**.

Dead Wood

Lying organic deadwood matter (LDW) was sampled with the line intersect method within each 1-ha plot. Standing dead trees (SDW) were measured using the same procedure as live trees, with the exception of an added decomposition class and an appropriate biomass reduction factor of 0.975 for trees which had lost leaves and twigs and 0.80 for trees which had lost leaves, twigs, and small branches (diameter < 10cm). All deadwood individuals and samples (excepting those from Chigorodo and Buenavista plots) were assigned a decomposition class of sound, intermediate, or rotten by virtue of a machete test. Instead of using the default density reduction factors of 1, .8, and .45 for sound, intermediate, and rotten organic matter to estimate wood density, wood density values of 0.564, 0.411, and 0.258 (g cm^{-3}) were directly calculated from collected logs and multiplied by the dead wood volume to estimate the biomass. See **Annex AC** for more details.

Litter or Dead Tree Stump Organic Matter (DTS)

Four separate litter samples were collected from randomly selected points within a plot and combined into a single sample for the plot. A dry-to-wet weight ratio was determined from the litter samples and used to estimate the dry weight of the entire composite sample.

Models for the amount of litter biomass were also developed from the literature for use in this BioREDD project, particularly Sierra et al. (2007) as presented in Table 35 below.

Forest Class	Model	Standard Error (Mg ha^{-1})
Primary Forest	$AGB_{litter} = 0.01528 * AGB_{10\ cm}$	1.337
Degraded Forest	$AGB_{litter} = 0.09438 * AGB_{10\ cm}$	0.3417

Table 35. Models used to estimate litter by forested LULC class where $AGB_{10\ cm}$ is aboveground biomass in trees (Mg ha^{-1} dry weight) and AGB_{litter} is litter biomass.

5.3.4.4 Calculating Emission Factors

Emissions factors were calculated to include emissions from the carbon pool-related sources due to changes in carbon stock densities between the LULC classes and forest strata. Using the carbon stock densities described in Section **5.3.4.3**, the emissions factors were calculated using equations 26 through 32 of the methodology. For each emissions factor, estimates of carbon stock precision from Section **5.3.4.3** were applied to determine transition uncertainty using equation 34 of the methodology. The inventory was not iteratively expended to attain transition uncertainties greater than 0.75 as forest strata could not be aggregated any further within LULC classes. There are only two forest strata (primary forest and degraded forest) and their carbon stock densities differ by at least 10% of the carbon stock of the strata with the lower level of carbon stock. Calculations for emissions factors can be found in **Annex W** and are presented in Table 36.

Per the methodology and VCS requirement, emissions from aboveground deadwood and belowground plant organic matter are gradually spread over time. For aboveground deadwood and belowground plant organic matter, emissions were spread over a ten-year period per the default component from the VCS as required by the methodology. No other temporal components are proposed (such as an exponential loss function).

Per the methodology, nitrous oxide and methane emissions from forest fires are conservatively omitted from emissions factors.

LULC Transition	AGL (tCO2e/ha)	AGD (tCO2e/ha)	BG (tCO2e/ha)	CE_transition	U_transition
Primary Forest to Primary Forest	0.00	0.00	0.00	0.00	0.00
Primary Forest to Degraded Forest	369.84	-3.10	9.70	0.73	0.14
Primary Forest to Pastureland	513.58	1.55	12.69	3.17	0.10
Primary Forest to Cropland	496.28	1.69	12.17	2.24	0.10
Primary Forest to Wetland	511.78	6.79	13.80	5.42	0.08
Primary Forest to Settlement	550.60	6.79	14.94	4.14	0.07
Primary Forest to Other	509.74	6.79	13.57	10.83	0.05
Primary Forest to Water	577.57	6.79	15.89	14.09	0.04
Degraded Forest to Primary Forest	-369.84	3.10	-9.70	-0.73	0.14
Degraded Forest to Degraded Forest	0.00	0.00	0.00	0.00	0.00
Degraded Forest to Pastureland	143.74	4.65	2.98	2.44	0.27
Degraded Forest to Cropland	126.44	4.79	2.47	1.51	0.28
Degraded Forest to Wetland	141.94	9.88	4.10	4.69	0.18
Degraded Forest to Settlement	180.76	9.88	5.24	3.41	0.14
Degraded Forest to Other	139.89	9.88	3.87	10.09	0.10
Degraded Forest to Water	207.73	9.88	6.19	13.36	0.07
Pastureland to Primary Forest	-513.58	-1.55	-12.69	-3.17	0.10

Pastureland to Degraded Forest	-143.74	-4.65	-2.98	-2.44	0.27
Pastureland to Pastureland	0.00	0.00	0.00	0.00	N/A
Pastureland to Cropland	-17.30	0.14	-0.52	-0.93	1.83
Pastureland to Wetland	-1.80	5.24	1.11	2.25	0.71
Pastureland to Settlement	37.02	5.24	2.26	0.96	0.49
Pastureland to Other	-3.85	5.24	0.88	7.65	0.28
Pastureland to Water	63.99	5.24	3.21	10.92	0.15
Cropland to Primary Forest	-496.28	-1.69	-12.17	-2.24	0.10
Cropland to Degraded Forest	-126.44	-4.79	-2.47	-1.51	0.28
Cropland to Pastureland	17.30	-0.14	0.52	0.93	1.83
Cropland to Cropland	0.00	0.00	0.00	0.00	N/A
Cropland to Wetland	15.50	5.09	1.63	3.18	0.46
Cropland to Settlement	54.32	5.09	2.78	1.90	0.32
Cropland to Other	13.45	5.09	1.40	8.58	0.19
Cropland to Water	81.29	5.09	3.72	11.85	0.11
Wetland to Primary Forest	-511.78	-6.79	-13.80	-5.42	0.08
Wetland to Degraded Forest	-141.94	-9.88	-4.10	-4.69	0.18
Wetland to Pastureland	1.80	-5.24	-1.11	-2.25	0.71
Wetland to Cropland	-15.50	-5.09	-1.63	-3.18	0.46
Wetland to Wetland	0.00	0.00	0.00	0.00	N/A
Wetland to Settlement	38.82	0.00	1.14	-1.28	2.40
Wetland to Other	-2.05	0.00	-0.23	5.40	0.51

Wetland to Water	65.79	0.00	2.09	8.67	0.19
Settlement to Primary Forest	-550.60	-6.79	-14.94	-4.14	0.07
Settlement to Degraded Forest	-180.76	-9.88	-5.24	-3.41	0.14
Settlement to Pastureland	-37.02	-5.24	-2.26	-0.96	0.49
Settlement to Cropland	-54.32	-5.09	-2.78	-1.90	0.32
Settlement to Wetland	-38.82	0.00	-1.14	1.28	2.40
Settlement to Settlement	0.00	0.00	0.00	0.00	N/A
Settlement to Other	-40.86	0.00	-1.38	6.69	0.44
Settlement to Water	26.98	0.00	0.95	9.95	0.13
Other to Primary Forest	-509.74	-6.79	-13.57	-10.83	0.05
Other to Degraded Forest	-139.89	-9.88	-3.87	-10.09	0.10
Other to Pastureland	3.85	-5.24	-0.88	-7.65	0.28
Other to Cropland	-13.45	-5.09	-1.40	-8.58	0.19
Other to Wetland	2.05	0.00	0.23	-5.40	0.51
Other to Settlement	40.86	0.00	1.38	-6.69	0.44
Other to Other	0.00	0.00	0.00	0.00	0.00
Other to Water	67.84	0.00	2.32	3.27	0.11
Water to Primary Forest	-577.57	-6.79	-15.89	-14.09	0.04
Water to Degraded Forest	-207.73	-9.88	-6.19	-13.36	0.07
Water to Pastureland	-63.99	-5.24	-3.21	-10.92	0.15
Water to Cropland	-81.29	-5.09	-3.72	-11.85	0.11
Water to Wetland	-65.79	0.00	-2.09	-8.67	0.19

Water to Settlement	-26.98	0.00	-0.95	-9.95	0.13
Water to Other	-67.84	0.00	-2.32	-3.27	0.11
Water to Water	0.00	0.00	0.00	0.00	0.00

Table 36. Emissions factors and uncertainties for LULC transitions over one year of decay (see VM0006 for pool designations).

5.3.5 Rates of Deforestation/Degradation

Baseline rates of deforestation and degradation were estimated for the reference, project and leakage areas as described in Section **5.3.5.1**. These deforestation and degradation rates were then applied to deplete pixels in a spatial model of the baseline scenario for the project and leakage areas per the requirements of the methodology as described in Section **5.3.5.3.1**. To inform the depletion, deforestation and degradation probabilities (also called potentials) were estimated using the IDRISI Land Change Modeler. The depletion processes accounts for the effects of forest scarcity in project and leakage areas over time. Finally, the most likely end LULC classes as predicted by the IDRISI Land Change Modeler were assigned to depleted pixels over time to determine the baseline LULC transitions in the project and leakage areas after accounting for regeneration rates (see Section **5.3.5.2**). Tables 37 and 38 show the final predicted changes in baseline LULC class in the project and leakage areas, respectively, over time.

LULC Class	Primary Forest	Degraded Forest	Pastureland	Cropland	Wetland	Settlement	Other	Water
Project Start	49,763	34,295	1,424	954	276	0	0	97
2013	48,945	34,801	1,549	1,140	276	0	0	97
2014	46,606	36,241	1,778	1,810	277	0	0	97
2015	44,400	37,547	2,090	2,396	277	0	0	98
2016	42,235	38,812	2,454	2,930	277	0	0	100
2017	40,109	40,039	2,865	3,416	278	0	0	102
2018	38,009	41,240	3,315	3,863	278	0	0	103
2019	35,915	42,435	3,795	4,281	278	0	0	105
2020	33,819	43,632	4,279	4,695	278	0	0	106
2021	31,710	44,841	4,759	5,113	279	0	0	107
2022	29,595	46,057	5,240	5,529	279	0	0	108
2023	27,473	47,280	5,709	5,958	279	0	0	109
2024	25,358	48,496	6,174	6,392	280	0	0	109
2025	23,257	49,697	6,633	6,831	280	0	0	110
2026	21,179	50,876	7,093	7,269	280	0	0	111
2027	19,112	52,044	7,539	7,722	280	0	0	112
2028	17,063	53,194	7,984	8,176	280	0	0	112

2029	15,042	54,315	8,421	8,637	280	0	0	112
2030	13,028	55,430	8,852	9,105	280	0	0	113
2031	11,038	56,520	9,277	9,579	281	0	0	113
2032	9,072	57,587	9,701	10,054	281	0	0	114
2033	7,127	58,633	10,127	10,527	281	0	0	114
2034	5,207	59,654	10,544	11,008	281	0	0	115
2035	3,316	60,646	10,950	11,502	281	0	0	115
2036	1,447	61,616	11,354	11,997	281	0	0	115
2037	0	61,763	11,944	12,704	281	0	0	116
2038	0	59,038	13,180	14,192	281	0	0	117
2039	0	56,313	14,429	15,667	282	0	0	118
2040	0	53,588	15,638	17,182	282	0	0	118
2041	0	50,863	16,688	18,856	283	0	0	119
2042	0	48,138	17,788	20,480	283	0	0	119
2043	0	46,368	18,532	21,505	284	0	0	120

Table 37. Predicted change in baseline LULC class in the project area over time (ha).

LULC Class	Primary Forest	Degraded Forest	Pastureland	Cropland	Wetland	Settlement	Other	Water
Project Start	4,746	5,170	1,086	951	75	1	0	3,260
2013	4,600	5,261	1,111	981	75	1	0	3,261

2014	4,198	5,504	1,145	1,104	75	1	0	3,262
2015	3,817	5,726	1,193	1,213	75	1	0	3,264
2016	3,436	5,948	1,249	1,315	75	1	0	3,264
2017	3,065	6,161	1,313	1,409	75	1	0	3,265
2018	2,699	6,369	1,384	1,496	75	1	0	3,265
2019	2,342	6,568	1,470	1,568	76	1	0	3,265
2020	1,983	6,768	1,564	1,632	76	1	0	3,265
2021	1,634	6,958	1,663	1,691	76	1	0	3,266
2022	1,291	7,143	1,773	1,740	76	1	0	3,266
2023	953	7,322	1,881	1,790	76	1	0	3,266
2024	622	7,495	1,986	1,843	76	1	0	3,266
2025	292	7,666	2,093	1,895	76	1	0	3,267
2026	0	7,767	2,223	1,956	76	1	0	3,267
2027	0	7,286	2,541	2,117	76	1	0	3,268
2028	0	6,806	2,855	2,281	76	1	0	3,269
2029	0	6,326	3,155	2,461	76	1	0	3,270
2030	0	5,846	3,437	2,658	76	1	0	3,270
2031	0	5,366	3,676	2,899	77	1	0	3,271
2032	0	4,886	3,827	3,228	77	1	0	3,271
2033	0	4,406	3,989	3,545	77	1	0	3,272
2034	0	3,925	4,204	3,809	77	1	0	3,273
2035	0	3,445	4,475	4,018	77	1	0	3,273

2036	0	2,965	4,714	4,259	77	1	0	3,273
2037	0	2,485	4,898	4,555	77	1	0	3,273
2038	0	2,005	5,164	4,769	77	1	0	3,273
2039	0	1,525	5,430	4,983	77	1	0	3,273
2040	0	1,044	5,659	5,235	77	1	0	3,273
2041	60	631	5,957	5,278	79	1	0	3,283
2042	174	281	6,079	5,370	83	1	0	3,300
2043	195	219	6,100	5,386	84	1	0	3,305

Table 38. Predicted change in baseline LULC class in the leakage area over time (ha).

5.3.5.1 Calculating Rates of Deforestation/Degradation

As noted in Section **5.3.2.1**, only three scenes were included in the historical analysis and therefore only two deforestation and degradation rates were available. As a result, per the requirements of the methodology, the average deforestation and degradation rates were used instead of extrapolating the rate using the Beta regression equation. Please see Figures 26 and 27 for graphs of the historical deforestation and degradation respectively, respectively, in the reference region. Tables 42 and 43 provide the observed deforestation and regeneration rates in the reference area during the historical reference period.

Because the average rates were used, consideration was not given to whether there was a clear break in the historical trend. Likewise no outliers could be identified. As demonstrated in Section **5.3.5.1.2**, all non-forest to forest transitions were explicitly included in the baseline to achieve a correct representation of the forest cover dynamics. Detailed deforestation and degradation rate calculations can be found in Annex V.

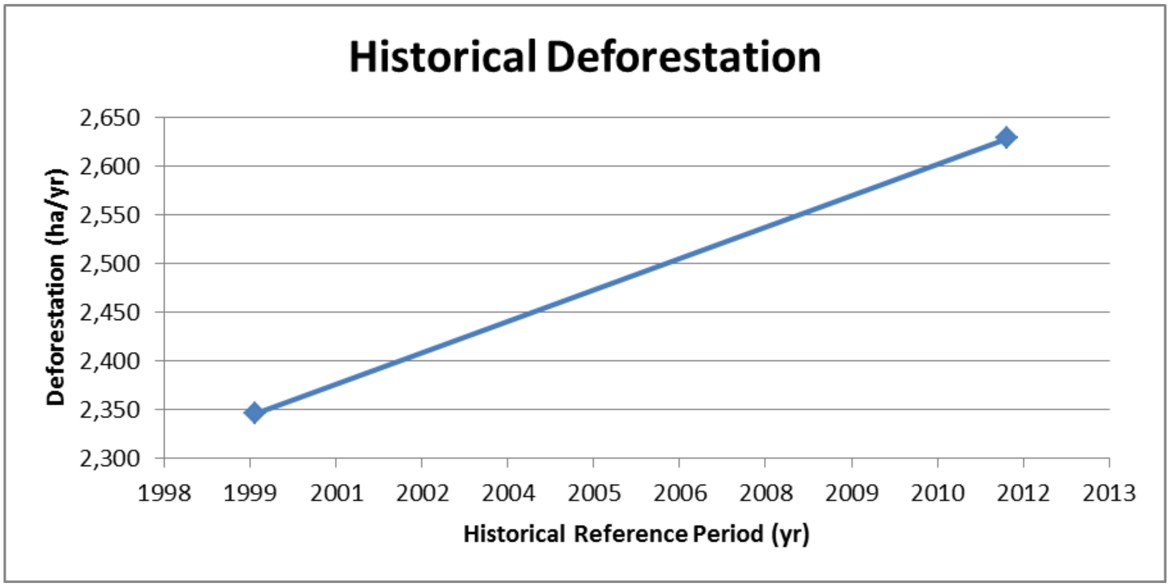


Figure 26. Historical deforestation rates in reference region (ha/yr) versus time (yr) for each consecutive pair of images in the historical reference period.

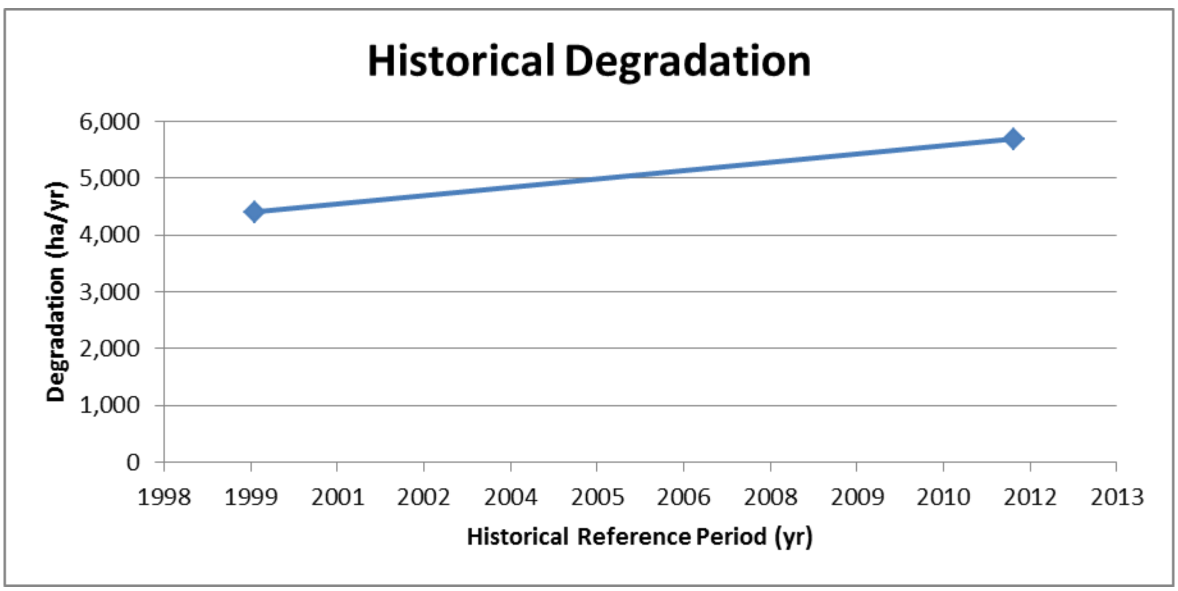


Figure 27. Historical degradation rates in reference region (ha/yr) versus time (yr) for each consecutive pair of images in the historical reference period.

5.3.5.1.1 Summarize Historical Land Use

Historical land use in the reference area is summarized in the table below. This table shows a loss of primary forest cover and increase in non-forest land use over time. It also demonstrates the relatively high area of degraded forest in the reference region.

LULC Class	1990	2000	2012
Primary Forest	188,588	122,126	50,368
Degraded Forest	42,050	85,088	125,301
Pastureland	1,776	21,480	26,617
Cropland	6,910	10,013	36,345
Wetland	2,306	2,911	2,911
Settlement	7	12	12
Other	116	123	199
Water	13,631	13,631	13,631

Table 39. Reference region LULC classifications (hectares) for each scene in the reference period.

5.3.5.1.2 Summarize Historical Land Transitions

Historical LULC transitions are presented in the tables below. Table 40 contains the overall areas of deforestation, increased forest cover, degradation and regeneration for each sub period. The tables also demonstrate the trend of deforestation and degradation of primary forest in the reference region over time.

LULC Transition	1990 - 2000	2000 - 2012
Primary Forest to Primary Forest	122,103	50,368
Primary Forest to Degraded Forest	44,071	68,322
Primary Forest to Pastureland	19,485	2,541
Primary Forest to Cropland	2,263	818
Primary Forest to Wetland	605	0

Primary Forest to Settlement	5	0
Primary Forest to Other	56	76
Primary Forest to Water	0	0
Degraded Forest to Primary Forest	0	0
Degraded Forest to Degraded Forest	41,006	56,979
Degraded Forest to Pastureland	261	4,803
Degraded Forest to Cropland	783	23,306
Degraded Forest to Wetland	0	0
Degraded Forest to Settlement	1	0
Degraded Forest to Other	0	0
Degraded Forest to Water	0	0
Pastureland to Primary Forest	0	0
Pastureland to Degraded Forest	0	0
Pastureland to Pastureland	1,683	19,047
Pastureland to Cropland	93	2,433
Pastureland to Wetland	0	0
Pastureland to Settlement	0	0
Pastureland to Other	0	0
Pastureland to Water	0	0
Cropland to Primary Forest	0	0
Cropland to Degraded Forest	0	0
Cropland to Pastureland	36	226

Cropland to Cropland	6,874	9,787
Cropland to Wetland	0	0
Cropland to Settlement	0	0
Cropland to Other	0	0
Cropland to Water	0	0
Wetland to Primary Forest	0	0
Wetland to Degraded Forest	0	0
Wetland to Pastureland	0	0
Wetland to Cropland	0	0
Wetland to Wetland	2,306	2,911
Wetland to Settlement	0	0
Wetland to Other	0	0
Wetland to Water	0	0
Settlement to Primary Forest	0	0
Settlement to Degraded Forest	0	0
Settlement to Pastureland	0	0
Settlement to Cropland	0	0
Settlement to Wetland	0	0
Settlement to Settlement	6	12
Settlement to Other	0	0
Settlement to Water	0	0
Other to Primary Forest	23	0

Other to Degraded Forest	11	0
Other to Pastureland	15	0
Other to Cropland	0	0
Other to Wetland	0	0
Other to Settlement	0	0
Other to Other	67	123
Other to Water	0	0
Water to Primary Forest	0	0
Water to Degraded Forest	0	0
Water to Pastureland	0	0
Water to Cropland	0	0
Water to Wetland	0	0
Water to Settlement	0	0
Water to Other	0	0
Water to Water	13,631	13,631

Table 40. LULC transitions (hectares) in the reference region during the reference period.

LULC Transition	1990 - 2000	2000 - 2012
Primary Forest to Primary Forest	12,210	4,197
Primary Forest to Degraded Forest	4,407	5,694
Primary Forest to Pastureland	1,948	212
Primary Forest to Cropland	226	68

LULC Transition	1990 - 2000	2000 - 2012
Primary Forest to Wetland	61	0
Primary Forest to Settlement	0	0
Primary Forest to Other	6	6
Primary Forest to Water	0	0
Degraded Forest to Primary Forest	0	0
Degraded Forest to Degraded Forest	4,101	4,748
Degraded Forest to Pastureland	26	400
Degraded Forest to Cropland	78	1,942
Degraded Forest to Wetland	0	0
Degraded Forest to Settlement	0	0
Degraded Forest to Other	0	0
Degraded Forest to Water	0	0
Pastureland to Primary Forest	0	0
Pastureland to Degraded Forest	0	0
Pastureland to Pastureland	168	1,587
Pastureland to Cropland	9	203
Pastureland to Wetland	0	0
Pastureland to Settlement	0	0
Pastureland to Other	0	0
Pastureland to Water	0	0

LULC Transition	1990 - 2000	2000 - 2012
Cropland to Primary Forest	0	0
Cropland to Degraded Forest	0	0
Cropland to Pastureland	4	19
Cropland to Cropland	687	816
Cropland to Wetland	0	0
Cropland to Settlement	0	0
Cropland to Other	0	0
Cropland to Water	0	0
Wetland to Primary Forest	0	0
Wetland to Degraded Forest	0	0
Wetland to Pastureland	0	0
Wetland to Cropland	0	0
Wetland to Wetland	231	243
Wetland to Settlement	0	0
Wetland to Other	0	0
Wetland to Water	0	0
Settlement to Primary Forest	0	0
Settlement to Degraded Forest	0	0
Settlement to Pastureland	0	0
Settlement to Cropland	0	0

LULC Transition	1990 - 2000	2000 - 2012
Settlement to Wetland	0	0
Settlement to Settlement	1	1
Settlement to Other	0	0
Settlement to Water	0	0
Other to Primary Forest	2	0
Other to Degraded Forest	1	0
Other to Pastureland	2	0
Other to Cropland	0	0
Other to Wetland	0	0
Other to Settlement	0	0
Other to Other	7	10
Other to Water	0	0
Water to Primary Forest	0	0
Water to Degraded Forest	0	0
Water to Pastureland	0	0
Water to Cropland	0	0
Water to Wetland	0	0
Water to Settlement	0	0
Water to Other	0	0
Water to Water	1,363	1,136

Table 41. LULC transition rates (hectares per year) in the reference region during the reference period.

Rate Type	LULC Transition(s)	Period Average	2000	2012
Deforestation	Primary Forest to Pastureland, Primary Forest to Cropland, Primary Forest to Wetland, Primary Forest to Settlement, Primary Forest to Other, Primary Forest to Water, Degraded Forest to Pastureland, Degraded Forest to Cropland, Degraded Forest to Wetland, Degraded Forest to Settlement, Degraded Forest to Other, Degraded Forest to Water	2,487	2,346	2,629
Degradation	Primary Forest to Degraded Forest	5,050	4,407	5,694
Regeneration	Degraded Forest to Primary Forest	0	0	0
Regeneration	Pastureland to Primary Forest	0	0	0
Regeneration	Pastureland to Degraded Forest	0	0	0
Regeneration	Pastureland to Cropland	106	9	203
Regeneration	Cropland to Primary Forest	0	0	0
Regeneration	Cropland to Degraded Forest	0	0	0
Regeneration	Wetland to Primary Forest	0	0	0
Regeneration	Wetland to Degraded Forest	0	0	0
Regeneration	Wetland to Pastureland	0	0	0
Regeneration	Wetland to Cropland	0	0	0
Regeneration	Settlement to Primary Forest	0	0	0
Regeneration	Settlement to Degraded Forest	0	0	0
Regeneration	Settlement to Pastureland	0	0	0
Regeneration	Settlement to Cropland	0	0	0

Regeneration	Settlement to Wetland	0	0	0
Regeneration	Other to Primary Forest	0	0	0
Regeneration	Other to Degraded Forest	0	0	0
Regeneration	Other to Pastureland	1	2	0
Regeneration	Other to Cropland	1	1	0
Regeneration	Other to Wetland	1	2	0
Regeneration	Other to Settlement	0	0	0
Regeneration	Water to Primary Forest	0	0	0
Regeneration	Water to Degraded Forest	0	0	0
Regeneration	Water to Pastureland	0	0	0
Regeneration	Water to Cropland	0	0	0
Regeneration	Water to Wetland	0	0	0
Regeneration	Water to Settlement	0	0	0
Regeneration	Water to Other	0	0	0

Table 42: Anthropogenic deforestation and regeneration rates (ha/yr) in the reference region during the reference period.

Rate Type	LULC Transition(s)	Period Average	2000	2012
Deforestation	Primary Forest to Pastureland, Primary Forest to Cropland, Primary Forest to Wetland, Primary Forest to Settlement, Primary Forest to Other, Primary Forest to Water, Degraded Forest to Pastureland, Degraded Forest to Cropland, Degraded Forest to Wetland, Degraded Forest to Settlement, Degraded Forest to Other, Degraded Forest to Water	%1.1	%1.0	%1.1

Degradation	Primary Forest to Degraded Forest	%2.2	%1.9	%2.5
Regeneration	Degraded Forest to Primary Forest	%0.0	%0.0	%0.0
Regeneration	Pastureland to Primary Forest	%0.0	%0.0	%0.0
Regeneration	Pastureland to Degraded Forest	%0.0	%0.0	%0.0
Regeneration	Pastureland to Cropland	%0.0	%0.0	%0.1
Regeneration	Cropland to Primary Forest	%0.0	%0.0	%0.0
Regeneration	Cropland to Degraded Forest	%0.0	%0.0	%0.0
Regeneration	Wetland to Primary Forest	%0.0	%0.0	%0.0
Regeneration	Wetland to Degraded Forest	%0.0	%0.0	%0.0
Regeneration	Wetland to Pastureland	%0.0	%0.0	%0.0
Regeneration	Wetland to Cropland	%0.0	%0.0	%0.0
Regeneration	Settlement to Primary Forest	%0.0	%0.0	%0.0
Regeneration	Settlement to Degraded Forest	%0.0	%0.0	%0.0
Regeneration	Settlement to Pastureland	%0.0	%0.0	%0.0
Regeneration	Settlement to Cropland	%0.0	%0.0	%0.0
Regeneration	Settlement to Wetland	%0.0	%0.0	%0.0
Regeneration	Other to Primary Forest	%0.0	%0.0	%0.0
Regeneration	Other to Degraded Forest	%0.0	%0.0	%0.0
Regeneration	Other to Pastureland	%0.0	%0.0	%0.0
Regeneration	Other to Cropland	%0.0	%0.0	%0.0
Regeneration	Other to Wetland	%0.0	%0.0	%0.0
Regeneration	Other to Settlement	%0.0	%0.0	%0.0

Regeneration	Water to Primary Forest	%0.0	%0.0	%0.0
Regeneration	Water to Degraded Forest	%0.0	%0.0	%0.0
Regeneration	Water to Pastureland	%0.0	%0.0	%0.0
Regeneration	Water to Cropland	%0.0	%0.0	%0.0
Regeneration	Water to Wetland	%0.0	%0.0	%0.0
Regeneration	Water to Settlement	%0.0	%0.0	%0.0
Regeneration	Water to Other	%0.0	%0.0	%0.0

Table 43: Anthropogenic deforestation and regeneration rates (%/yr) in the reference region during the reference period.

5.3.5.2 Calculating Regeneration Rates

Regeneration rates were calculated for each LULC transition from non-forest to forest or where the carbon stocks in the "to" class were greater than the carbon stocks in the "from" class. The LULC class regeneration or forest cover increase rates for every pair of subsequent images in the historical reference period are reported in the tables of Section **5.3.5.1.2**. Generally, the reference region demonstrates very little regeneration or forest cover increase relative to deforestation and degradation. Detailed regeneration rate calculations can be found in Annex V.

5.3.5.3 The Spatial Model

The Land Change Modeler (LCM) module of IDRISI describes, characterizes and models transitions between LULC classes. The procedure establishes relationships between dynamic or static explanatory variables (drivers) and LULC classes or transitions by using the neural network approach. The LULC transitions with the largest areas and highest likelihood of transition over the simulation period were selected. In theory, these selected LULC transitions have the greatest potential to affect changes in forest cover in the future. The transitions that were selected were:

- Forest to degraded forest
- Forest to pasture
- Forest to crops
- Degraded forest to crops
- Degraded forest to pasture

Each selected LULC transition was characterized by the following explanatory variables:

- Slope map
- Distance to urban cores
- Distance to roads
- Distance to timber routes and areas of influence

- Distance to the collection centers and areas of influence
- Distance to the hydrographic network (rivers and sea)

The potential transition is then evaluated either by multiple logistic regression or neural networks (Multi-Layer Perceptron, MLP). The use of artificial intelligence algorithms (including neural networks) can usually get better results and has more advantages than the statistical approximation of probability, especially with respect to time series (Bishop, 1995; Lai and Wong, 2001; Li and Gar-On, 2002; Parlitz and Merkwirth, 2000).

The quantity and location of the change estimated by LCM is obtained from a Markov matrix probabilistic method (Metropolis and Ulam, 1949; Coquillard and Hill, 1997), which calculates the areas (number of pixels) and the transition probabilities between two land use maps. These maps (t0 and t1), which constitute the data of the calibration phase, are the starting point for predicting the estimated changes at a later time.

After calculating the estimated quantity of land use change, the location of these changes is determined by choosing those pixels with the most potential for change. A multiobjective evaluation algorithm solves the problems of incompatibility between different land uses or transitions.

Once the transition potential has been modeled in LCM, the prediction is based, by default, on the aforementioned Markov matrix. There are two different types of prediction models: the *soft* prediction model, which is equivalent to a map of sensitivity to change and indicates how likely a pixel is to change each year; and the *hard* prediction *model,* which is part of the multiobjective evaluation mentioned above, and predicts the state of the same categories of land use in the calibration phase (t0 and t1) at time T. Ultimately, the analyses determine the transition potentials for each pixel and predict the end land use within the project and leakage areas at each time step. The deforestation and degradation rates are applied using the transition potentials to deplete the pixels at each time step as further described in Section **5.3.5.4**. A detailed explanation of the Spatial Model including the IDRISI LCM, pixel depletion, regeneration, and the calculation of the scarcity factor can be found in Annex BF.

5.3.5.4 Calculate Transition Rates

Historical deforestation and degradation rates observed in the reference region were adjusted by the proportion of forest area at the beginning of the historical reference period relative to the size of the project and leakage areas. These adjusted rates are provided in Tables 44 and 45 for project and leakage areas, respectively.

As described in Section **5.3.5.3**, the pixels in the reference area were depleted using the transition potential and the adjusted rates for deforestation and degradation. At each iterative time step, the forest scarcity factor was calculated and applied to limit the depletion process per the requirements of the methodology. For each depleted pixel, the end LULC class for that pixel was assigned as predicted by IDRISI. Finally, the resultant baseline LULC transitions for the project and leakage areas were adjusted using the relative regeneration rates as described in **5.3.5.2**. The resultant baseline LULC transitions over time are presented in Annex V for the project and leakage areas.

Rate Type	LULC Transition(s)	Period Average	2000	2012
Deforestation	Primary Forest to Pastureland, Primary Forest to Cropland, Primary Forest to Wetland, Primary Forest to Settlement, Primary Forest to Other, Primary Forest to Water, Degraded Forest to Pastureland, Degraded Forest to Cropland, Degraded Forest to Wetland, Degraded Forest to Settlement, Degraded Forest to Other, Degraded Forest to Water	900	849	951
Degradation	Primary Forest to Degraded Forest	1,827	1,595	2,060

Table 44: Baseline deforestation and degradation rates (ha/yr) in the project area.

Rate Type	LULC Transition(s)	Period Average	2000	2012
Deforestation	Primary Forest to Pastureland, Primary Forest to Cropland, Primary Forest to Wetland, Primary Forest to Settlement, Primary Forest to Other, Primary Forest to Water, Degraded Forest to Pastureland, Degraded Forest to Cropland, Degraded Forest to Wetland, Degraded Forest to Settlement, Degraded Forest to Other, Degraded Forest to Water	133	126	141
Degradation	Primary Forest to Degraded Forest	271	236	306

Table 45: Baseline deforestation and degradation rates (ha/yr) in the leakage area.

5.3.6 Calculate Baseline Emissions from ANR activities

ANR is not an included project activity, thus there are no baseline emissions from ANR activities.

5.3.7 Calculate Baseline Emissions

Emissions factors were applied to the predicted baseline LULC transitions, as summarized in Section **5.3.4.1**, to estimate baseline emissions per equations 107 – 110 of the methodology. The baseline emissions are calculated in Annex V and are reported in the table below. Project area emissions are based on equations 107 and 109 of the methodology while leakage area emissions are based on equations 108 and 110 of the methodology.

Year	Baseline Emissions in Project Area (tCO2e)	Baseline Emissions in Leakage Area (tCO2e)
2013	286,568	407
2014	514,662	10,162
2015	240,578	20,159
2016	158,809	29,688
2017	84,929	29,074
2018	55,084	24,963
2019	54,635	21,553
2020	56,395	21,658
2021	59,350	21,260
2022	60,528	22,065
2023	54,792	22,212
2024	44,833	23,401
2025	40,645	23,036
2026	38,605	22,194
2027	37,910	21,023
2028	38,011	124
2029	38,358	0
2030	38,526	19,837
2031	38,837	18,559
2032	38,822	17,568

2033	39,523	18,244
2034	38,722	20,134
2035	38,597	21,238
2036	38,497	20,959
2037	39,865	20,732
2038	38,600	21,452
2039	39,379	18,947
2040	39,894	17,203
2041	38,978	0
2042	38,424	0
2043	24,955	0

Table 46. Estimated emissions or removals in the baseline scenario for the project area and leakage area (note negative emissions imply removals as a result of compounding regeneration as required by VM0006).

5.4 Project Emissions (CL1)

The drivers of deforestation described in Section **4.5.3.2** must be mitigated through particular project activities in order to reduce emissions that would be released without mitigation. The continuing success of these project activities is especially reliant on the consistent and active participation of all stakeholders, especially those living in local communities around the project, in the implementation as well as the preparation of all project activities.

5.4.1 Quantifying the Effectiveness of Project Activities

The mitigation of drivers of deforestation by project activities was evaluated through the use of effectiveness factors. Effectiveness factors represent the maximal efficiency (how maximally successful the project activity was with mitigating deforestation). Effectiveness factors are very much affected by local circumstances and the involvement of the project proponents.

Although the values for effectiveness factors can be difficult to enumerate, the approximation of these values is essential for estimating the volume of emission reductions/removals that the project will generate. Effectiveness factors of project activities were estimated through communal self-observation of what the project communities felt would be expected impacts of activities in preventing deforestation while improving quality of life. These interpretations were then evaluated through the lens of VM0006 in order to establish quantified values representing the effectiveness of project activities in preventing and mitigating deforestation and forest degradation. The table below describes the liaison between project activities and deforestation in outlining the reasoning as to how specific project activities address drivers which enable deforestation to occur. Sections **5.4.1.1** through **5.4.1.8** describe the rational for the selected effectiveness factors. The final effectiveness factors are presented in Section **5.4.1.9**.

		DRIVERS		
		Conversion of forest to subsistence food crops	**Conversion of forest to settlements**	**Selective logging and forest thinning for commercial sale of timber**
PROJECT ACTIVITIES	**Strengthen Land-Tenure Status and Forest Governance**	Stronger forest governance requires improving communication among community members	Reinforced forest governance works to allocate appropriate areas for settlement conversion and protect forests that are not permitted to be converted	Strengthened land tenure status protects land from encroachment by people outside the community that may try to log without the consent of community members
		Improved communication creates understanding of how the forest is used by each member and what each member needs from the land		Improved forest governance helps to maintain land tenure status by enforcing laws which do not permit illegal commercial logging
		Clarity when understanding each member’s needs allows for proper land planning to balance the need for crops while limiting forest conversion		
	Support the Development and Implementation of Sustainable Forest and Land Use Management	Implementing sustainable forest and land use management plans can be designed to directly address forest conversion to cropland by limiting how much land can be	If made a focal point, the improper conversion of forests to settlement can be lessened though explicit mention within the land	Forest and land use management plans can prescribe exactly how much timber can be extracted in a given period of time

	DRIVERS		
	Conversion of forest to subsistence food crops	**Conversion of forest to settlements**	**Selective logging and forest thinning for commercial sale of timber**
Plans	converted from forest to cropland	management plans of how much land is allowed to be converted Strengthened land use management plans can encourage more practical settlement designs that avoid forest conversion and provide safe and suitable settlements	Forest and land use management plans can distinguish areas where logging is not allowed
Demarcating Forest, Tenure and Ownership Boundaries, and Areas of Forest Protection	Demarcating forest boundaries makes clear which areas can be converted for subsistence farming Demarcating ownership boundaries can reduce conflict among community members through making clear and final distinctions about what parcels of land belong to each person or group Clearly demarcating areas of protected forests discourages the conversion of forest to	Boundary demarcations and defining areas of protection provide clarity within the communities concerning whether or not settlements can be created in certain areas	Forest patrols support boundary demarcation by being present throughout the property and enforcing ownership laws on those who illegally log within the project area

	DRIVERS		
	Conversion of forest to subsistence food crops	**Conversion of forest to settlements**	**Selective logging and forest thinning for commercial sale of timber**
	subsistence cropland by actors outside the communities		
Sustainable Intensification of Agriculture on Existing Agricultural Land	Sustainably intensified agricultural practices increase agricultural productivity on existing land thus eliminating the need to further deforest for new (nutrient rich) cropland	Sustainable intensification of agriculture is not an applicable project activity for this driver	Sustainable intensification of agriculture is not an applicable project activity for this driver
Providing Alternative Livelihoods to the Agents of Deforestation	If alternative livelihoods provide community members with [physical and financial] access to markets or crops not sourced from subsistence cropland inside the project area then there will be a decreased need to use existing cropland or further clear forest for new cropland	If an alternative livelihood opportunity is something directly related to settlements, such as land use planning, forest management, infrastructural constructions etc., then there will be a decreased need to further clear forests without specificity because the creation of settlements will already be planned within a predetermined management scheme whose goal is to limit, if not eradicate, the clearing of forests for settlement	If alternative livelihoods provide secure income with greater financial return, then they will discourage illegal commercial logging within the project area because they are more stable and generate more income than illegal commercial logging would
	If the alternative livelihood opportunity itself is something directly related to agriculture, such as agroforestry, high yield crop usage, conservation		

		DRIVERS		
		Conversion of forest to subsistence food crops	**Conversion of forest to settlements**	**Selective logging and forest thinning for commercial sale of timber**
		agriculture etc., then there will be a decreased need to further clear forests because crop productivity will be increased on already existing cropland	purposes	

Table 47. An analysis demonstrating how project activities address relevant drivers of deforestation.

5.4.1.1 Effectiveness of Strengthening Land Tenure Status

Legal arrangements between participating communities, project developers and government bodies are the primary step in securing land tenure status. In strengthening land tenure status and forest governance, communities not only protect their land from encroachment by people outside the community, they create clarity concerning allowable land use within the community. Furthermore, legal acknowledgement of land tenure status and strengthening forest governance eliminates possible intersections of authorities from various administrative sectors. In doing so, potential miscommunications in land use development and management, such as concession logging without proper consent of participating communities, can be avoided.

While strengthening land tenure and forest government alone does not directly lead to reductions in deforestation, it is the first step in a series of actions which have a major influence on decreasing deforestation and forest degradation. Specifically, strengthened land tenure status helps to enact forest governance strategies that help to reduce deforestation through minimizing the actions of drivers such as cattle grazing within forests, conversion for subsistence agriculture or settlements and selective logging or thinning for commercial timber sale.Solidifying the legal right to govern their own lands may act as a catalyst for communities to actively implement new forest governance since they are more aware and capable of doing so.

5.4.1.2 Effectiveness of Sustainable Land Use Plans

Creating forest and land use management plans is an essential activity for reducing drivers of deforestation. Most notably, it is an activity which could not be completed without the active participation and elected input of the communities involved. Community experience with the land provides invaluable insight with matters such as areas of fuelwood extraction, volumes of extracted timber, planned or current pastureland for livestock, locations of NTFPs, human settlement patterns as well as community and biodiversity HCV areas.

When creating management plans, designs must be attuned with the community's usage rights and land tenure status in order to be effective in the long term. Likewise management plans were designed according to both the current and future need for forest products and forest land so that the efficiency of land use could be increased while unplanned conversion of forest patches which hasten forest degradation could be avoided. In interpreting the community's observations per VM0006, it has been found that sustainable land use planning is an effective project activity in mitigating the effects of several drivers of deforestation such as forest conversion for cropland, settlement and grazing as well as illegal logging.

5.4.1.3 Effectiveness of Property Demarcation

Demarcating project area boundaries through the installment of physical boundaries such as gates, posts, fences and informational signs is a project activity which substantially reinforces the primary project activity of strengthening land tenure status. In establishing an officially fixed and recognizable boundary, community members are reminded of the legal status of the land and thus may be more inclined to contribute to safeguard demarcated protected forests through social fencing and patrols.

Physical reminders of the laws and ownership statuses regarding the property not only help to reinforce the determined land use practices to community members, but they also make public the land tenure status of the property to anyone outside the community who, in the absence of the physical boundary or sign, would not have known the ownership status of the land (and may have violated the forest out of this lack of knowledge). After consulting with the community and interpreting their feedback in terms of VM0006, it has been exemplified that property demarcation is an effective project activity in addressing several drivers of deforestation including forest conversion for cropland, settlement and grazing as well as illegal timber harvesting.

5.4.1.4 Effectiveness of Fire Prevention

Fire prevention is not a current project activity being employed to target the relevant drivers of deforestation and forest degradation.

5.4.1.5 Effectiveness of Increased Energy Efficiency

Increased energy efficiency is not a current project activity being employed to target the relevant drivers of deforestation and forest degradation.

5.4.1.6 Effectiveness of Alternative Fuelwood Sources

The development of alternative fuelwood sources is not a current project activity being employed to target the relevant drivers of deforestation and forest degradation.

5.4.1.7 Effectiveness of Agricultural Intensification

Sustainable intensification of agriculture on existing cropland is an important project activity in addressing drivers of deforestation based around land use for crops, livestock and fuel. Because forests are often deforested or degraded for subsistence farming or grazing, project activities which increase productivity and stocking rates on existing cleared lands have been the most effective in reducing continued forest conversion.

Specific actions such as introducing high yielding crops, creating access to mechanized technology and installing agroforestry techniques have shown effectiveness in responding to drivers of deforestations. Demonstrative workshops and strengthened connections with local institutions have been proven as the most effective approach to integrate sustainable intensification with communal agricultural practices.

5.4.1.8 Effectiveness of Alternative Livelihoods

In providing alternative livelihoods to the agents of deforestation, many drivers of deforestation can be addressed directly at their source. Alternative livelihood choices present agents of deforestation with ways to collect income without having to clear forests. Notably, in order for alternative livelihoods to be feasible for community members, it is essential that they have a substantially greater financial return than an individual's current livelihood.

Possible alternative livelihoods can stem from project activities themselves. Forest patrols, boundary construction, NTFP extraction and intensified agriculture can all act as ways to generate income without clearing forests. Community members' participation in planned project activities not only provides employment and a greater financial return for the individual but it increases the project's overall progress while strengthening the community's unity in accomplishing project goals. After consulting with the community and interpreting their responses in terms of VM0006, it has been demonstrated that creating alternative livelihoods is an effective project activity in addressing many drivers of deforestation including forest conversion for cropland, settlement and grazing as well as illegal timber harvesting.

5.4.1.9 Maximal Effectiveness of Project Activities

Based on consultations with the communities identified in the REDD plan, the maximal effectiveness of project activities was determined and summarized in Table 48 below.

Driver	VM0006 - 8.2.1.1	VM0006 - 8.2.1.2	VM0006 - 8.2.1.3	VM0006 - 8.2.1.4	VM0006 - 8.2.1.5	VM0006 - 8.2.1.6	VM0006 - 8.2.1.7	VM0006 - 8.2.1.8
Conversion of forestland to cropland for subsistence farming	5%	17%	33%	0%	0%	0%	29%	6%
Conversion of forestland to settlements	5%	25%	43%	0%	0%	0%	0%	0%
Conversion of forestland to infrastruture such as roads, cell phone towers, power lines	5%	0%	0%	0%	0%	0%	0%	0%

Logging of timber for commercial sale	5%	16%	36%	0%	0%	0%	0%	43%
Logging of timber for local enterprises and domestic uses	0%	15%	0%	0%	0%	0%	0%	8%
Wood collection for commercial on-sale of fuelwood and charcoal	0%	0%	0%	0%	0%	0%	0%	0%
Fuelwood collection for domesetic and local industrial energy needs	0%	17%	0%	0%	0%	0%	0%	0%
Grazing	0%	0%	0%	0%	0%	0%	0%	0%
Understory vegetation collection	0%	0%	0%	0%	0%	0%	0%	0%
Forest fires	0%	0%	0%	0%	0%	0%	0%	0%

Table 48. Maximal effectiveness of project activities to drivers.

5.4.1.10 Adoption Rates for Project Activities

Based on consultations with the communities identified in the REDD plan, the adoption rates of project activities was determined and summarized in Table 49 below.

	VM0006 - 8.2.1.1	**VM0006 - 8.2.1.2**	**VM0006 - 8.2.1.3**	**VM0006 - 8.2.1.4**	**VM0006 - 8.2.1.5**	**VM0006 - 8.2.1.6**	**VM0006 - 8.2.1.7**	**VM0006 - 8.2.1.8**
Adoption Rate (%/yr)	50%	50%	40%	0%	0%	0%	20%	20%

Table 49. Adoption rates of project activities.

5.4.1.11 Effectiveness of Project Activities over Time

The total effectiveness of project activities is calculated using equations 64 and 66 of VM0006. The calculated total effectiveness for all drivers over time is presented in Table 50 below.

Driver	Conversion of forestland to cropland for subsistence farming	Conversion of forestland to settlements	Conversion of forestland to infrastruture such as roads, cell phone towers, power	Logging of timber for commercial sale	Logging of timber for local enterprises and domestic uses	Fuelwood collection for domesetic and local industrial energy needs	All Drivers	Conversion of forestland to cropland for subsistence farming	Conversion of forestland to settlements	Conversion of forestland to infrastruture such as roads, cell phone towers, power	Logging of timber for commercial sale	Logging of timber for local enterprises and domestic uses	Fuelwood collection for domesetic and local industrial energy needs	All Drivers
Source	Deforestation	Deforestation	Deforestation	Deforestation	Deforestation	Deforestation	Deforestation	Degradation	Degradation	Degradation	Degradation	Degradation	Degradation	Degradation
2013	%15.1	%0.0	%0.0	%0.0	%0.0	%0.0	%15.1	%0.0	%0.0	%0.0	%12.2	%0.0	%0.0	%12.2
2014	%45.7	%0.0	%0.0	%0.0	%0.0	%0.0	%45.7	%0.0	%0.0	%0.0	%37.9	%0.0	%0.0	%37.9
2015	%71.4	%0.1	%0.0	%0.0	%0.0	%0.0	%71.4	%0.0	%0.0	%0.0	%58.9	%0.0	%0.0	%58.9
2016	%78.1	%0.1	%0.0	%0.0	%0.0	%0.0	%78.2	%0.0	%0.0	%0.0	%60.1	%0.0	%0.0	%60.1
2017	%84.5	%0.1	%0.0	%0.0	%0.0	%0.0	%84.6	%0.0	%0.0	%0.0	%60.9	%0.0	%0.0	%60.9
2018	%87.4	%0.1	%0.0	%0.0	%0.0	%0.0	%87.5	%0.0	%0.0	%0.0	%61.7	%0.0	%0.0	%61.7
2019	%88.0	%0.1	%0.0	%0.0	%0.0	%0.0	%88.1	%0.0	%0.0	%0.0	%62.5	%0.0	%0.0	%62.5
2020	%88.6	%0.1	%0.0	%0.0	%0.0	%0.0	%88.7	%0.0	%0.0	%0.0	%63.3	%0.0	%0.0	%63.3
2021	%89.2	%0.1	%0.0	%0.0	%0.0	%0.0	%89.3	%0.0	%0.0	%0.0	%64.1	%0.0	%0.0	%64.1
2022	%89.8	%0.1	%0.0	%0.0	%0.0	%0.0	%89.9	%0.0	%0.0	%0.0	%64.9	%0.0	%0.0	%64.9

2023	%89.9	%0.1	%0.0	%0.0	%0.0	%0.0	%90.0	%0.0	%0.0	%0.0	%65.0	%0.0	%0.0	%65.0
2024	%89.9	%0.1	%0.0	%0.0	%0.0	%0.0	%90.0	%0.0	%0.0	%0.0	%65.0	%0.0	%0.0	%65.0
2025	%89.9	%0.1	%0.0	%0.0	%0.0	%0.0	%90.0	%0.0	%0.0	%0.0	%65.0	%0.0	%0.0	%65.0
2026	%89.9	%0.1	%0.0	%0.0	%0.0	%0.0	%90.0	%0.0	%0.0	%0.0	%65.0	%0.0	%0.0	%65.0
2027	%89.9	%0.1	%0.0	%0.0	%0.0	%0.0	%90.0	%0.0	%0.0	%0.0	%65.0	%0.0	%0.0	%65.0
2028	%89.9	%0.1	%0.0	%0.0	%0.0	%0.0	%90.0	%0.0	%0.0	%0.0	%65.0	%0.0	%0.0	%65.0
2029	%89.9	%0.1	%0.0	%0.0	%0.0	%0.0	%90.0	%0.0	%0.0	%0.0	%65.0	%0.0	%0.0	%65.0
2030	%89.9	%0.1	%0.0	%0.0	%0.0	%0.0	%90.0	%0.0	%0.0	%0.0	%65.0	%0.0	%0.0	%65.0
2031	%89.9	%0.1	%0.0	%0.0	%0.0	%0.0	%90.0	%0.0	%0.0	%0.0	%65.0	%0.0	%0.0	%65.0
2032	%89.9	%0.1	%0.0	%0.0	%0.0	%0.0	%90.0	%0.0	%0.0	%0.0	%65.0	%0.0	%0.0	%65.0
2033	%89.9	%0.1	%0.0	%0.0	%0.0	%0.0	%90.0	%0.0	%0.0	%0.0	%65.0	%0.0	%0.0	%65.0
2034	%89.9	%0.1	%0.0	%0.0	%0.0	%0.0	%90.0	%0.0	%0.0	%0.0	%65.0	%0.0	%0.0	%65.0
2035	%89.9	%0.1	%0.0	%0.0	%0.0	%0.0	%90.0	%0.0	%0.0	%0.0	%65.0	%0.0	%0.0	%65.0
2036	%89.9	%0.1	%0.0	%0.0	%0.0	%0.0	%90.0	%0.0	%0.0	%0.0	%65.0	%0.0	%0.0	%65.0
2037	%89.9	%0.1	%0.0	%0.0	%0.0	%0.0	%90.0	%0.0	%0.0	%0.0	%65.0	%0.0	%0.0	%65.0
2038	%89.9	%0.1	%0.0	%0.0	%0.0	%0.0	%90.0	%0.0	%0.0	%0.0	%65.0	%0.0	%0.0	%65.0

2039	%89.9	%0.1	%0.0	%0.0	%0.0	%0.0	%90.0	%0.0	%0.0	%0.0	%65.0	%0.0	%0.0	%65.0
2040	%89.9	%0.1	%0.0	%0.0	%0.0	%0.0	%90.0	%0.0	%0.0	%0.0	%65.0	%0.0	%0.0	%65.0
2041	%89.9	%0.1	%0.0	%0.0	%0.0	%0.0	%90.0	%0.0	%0.0	%0.0	%65.0	%0.0	%0.0	%65.0
2042	%89.9	%0.1	%0.0	%0.0	%0.0	%0.0	%90.0	%0.0	%0.0	%0.0	%65.0	%0.0	%0.0	%65.0
2043	%89.9	%0.1	%0.0	%0.0	%0.0	%0.0	%90.0	%0.0	%0.0	%0.0	%65.0	%0.0	%0.0	%65.0

Table 50. Effectiveness of project activities to applicable drivers over time.

As previously mentioned above, effectiveness factors were determined based on community input which was then analyzed though the VM0006 methodology, specifically using equations 64 and 66. It is important to be aware that effectiveness of project activities may change during the crediting period and that this rate of change must be integrated in order to calculate overall effectiveness for a given project activity during a given year.

5.4.2 Calculating Deforestation/Degradation Rates

Deforestation and degradation rates in the project scenario were calculated as a function of relative project impact per equations 68 and 69 of the methodology. Relative project impact is a function of effectiveness factors and adoption rates (see equations 66 and 67 in VM0006). These deforestation and degradation rates were then used to deplete pixels per the transition potentials as described in Section **5.3.5**. The projected changes in LULC class over time are presented in the table below while LULC transitions and calculations are Annex V.

LULC Class	Primary Forest	Degraded Forest	Pastureland	Cropland	Wetland	Settlement	Other	Water
Project Start	49,763	34,295	1,424	954	276	0	0	97
2013	49,086	34,708	1,538	1,104	276	0	0	97
2014	47,906	35,407	1,651	1,471	277	0	0	97
2015	47,407	35,662	1,710	1,656	277	0	0	97
2016	47,110	35,781	1,765	1,780	277	0	0	97
2017	46,998	35,777	1,800	1,860	277	0	0	97
2018	46,962	35,723	1,830	1,920	277	0	0	97
2019	46,924	35,671	1,858	1,982	277	0	0	97
2020	46,882	35,623	1,887	2,043	277	0	0	97
2021	46,838	35,576	1,917	2,103	277	0	0	97
2022	46,796	35,529	1,948	2,162	277	0	0	97
2023	46,754	35,480	1,981	2,219	277	0	0	97
2024	46,710	35,435	2,016	2,274	277	0	0	98
2025	46,667	35,388	2,049	2,330	277	0	0	98
2026	46,624	35,341	2,084	2,386	277	0	0	98
2027	46,580	35,294	2,120	2,440	277	0	0	98
2028	46,534	35,250	2,155	2,494	277	0	0	98

2029	46,488	35,206	2,188	2,551	277	0	0	99
2030	46,445	35,159	2,225	2,604	277	0	0	99
2031	46,397	35,117	2,259	2,659	277	0	0	100
2032	46,349	35,074	2,294	2,714	277	0	0	100
2033	46,305	35,029	2,330	2,768	277	0	0	100
2034	46,257	34,986	2,369	2,819	277	0	0	100
2035	46,210	34,943	2,407	2,871	277	0	0	100
2036	46,168	34,895	2,447	2,921	277	0	0	100
2037	46,122	34,851	2,486	2,972	277	0	0	100
2038	46,074	34,809	2,526	3,022	277	0	0	100
2039	46,029	34,764	2,565	3,072	277	0	0	101
2040	45,985	34,718	2,608	3,119	277	0	0	101
2041	45,938	34,675	2,648	3,169	278	0	0	101
2042	45,892	34,630	2,691	3,217	278	0	0	101
2043	45,861	34,603	2,718	3,248	278	0	0	101

Table 51. Predicted change in project-scenario LULC class in the project area over time (ha).

5.4.3 Estimating GHG Emissions from Fire Breaks

Fire breaks are not included as a project activity.

5.4.4 Estimating Net GHG Sequestration from ANR Activities

ANR is not an included project activity.

5.4.4.1 General Quantification (ANR Activities)

ANR is not an included project activity.

5.4.4.2 Estimating Carbon Stock Increases (ANR Activities)

ANR is not an included project activity.

5.4.4.3 Calculating Emission Sources (ANR Activities)

ANR is not an included project activity.

5.4.5 Estimating Net GHG Emissions from CFE Activities

CFE is not an included project activity.

5.4.6 Estimating Net GHG Emissions from Harvesting

Harvesting and IFM activities are omitted from the project area.

5.4.6.1 Harvest Plan

Harvesting and IFM activities are not included in the project area.

5.4.6.2 Calculating Long-term Average Carbon Stock

Harvesting and IFM activities are not included in the project area.

5.4.6.3 Calculating Emissions or Sinks on Land with Harvesting Activities

Harvesting and IFM activities are not included in the project area.

5.4.6.4 Quantification of Emissions from Harvesting

Harvesting and IFM activities are not included in the project area.

5.4.7 Quantifying Emissions from ARR/IFM Activities

ARR and IFM are not included project activities.

5.5 Leakage(CL2)

As the baseline scenario is primarily driven by illegal commercial logging there is potential activity –shifting and market-effects leakage. As identified by the timber study, the activity-shifting leakage is geographically constrained by proximity to transportation routes and accessibility.

5.5.1 Estimating Emissions From Leakage

Emissions from leakage are quantified two approaches for the purposes of ex-ante estimates. First, leakage is quantified by defining a leakage area and adjusting baseline rates of deforestation and degradation in the leakage area using leakage cancellation rates. And second, by making reasonable assumptions about the proportion of merchantable biomass in the project region based on the results of the timber study to apply a conservative market-effects leakage discount. The first approach is summarized in Section **5.5.2** while the second in Section **5.5.5**. All calculations are provided in Annex V.

For the purposes of ex-post estimates, the leakage area is monitored for increases in deforestation and degradation relative to predicted baseline levels. The market-effects discount factor is applied until the time of baseline reassessment.

5.5.2 Estimate Leakage from Geographically Constrained Drivers

Ex-ante leakage from geographically unconstrained drivers is estimated by estimating the leakage-induced increase in deforestation and degradation rates as a result of project activities and then adding this increase to the predicted baseline rates of deforestation and degradation for the leakage area. The baseline rates of deforestation and degradation are presented in Section **5.3.5** while the leakage-induced increase is described in Section **5.5.2.1**.

5.5.2.1 Calculating Effects of Leakage on Deforestation/Degradation Rates

The leakage-induced increase in deforestation and degradation rates was calculated per equations 81 and 82 of the methodology as the product of the relative leakage impact and the baseline rates of deforestation and degradation in the project area. The relative leakage impact is a function of the leakage cancellation rates and the relative driver impacts (see Sections **5.5.2.2** and **5.3.3**, respectively). Because the relative driver impact is a function of adoption rate and time, the relative leakage impact increases over time as project activities are adopted and therefore the leakage-induced increase in deforestation and degradation rates increases over time. This effect is evident in the table presented in Section **5.5.2.4**.

5.5.2.2 Calculating Leakage Cancellation Rates

Leakage cancellation rates were the three relevant drivers of deforestation and degradation as described in Sections **5.5.2.2.1**, **5.5.2.2.2**and **5.5.2.2.3**.

5.5.2.2.1 Calculation of Cancellation Rates for Subsistence Agriculture

Based on observations made in the reference region and adjusted for the size of the project area as described in Section **5.3.5.1** and presented in Table 44, the historical conversion rate of forest (primary and degraded) to cropland is 419 ha/yr. Provided that the REDD Plan does not allow for any conversion of forest to cropland, the leakage cancelation rate for subsistence agriculture is 13% per equation 85 of the methodology.

5.5.2.2.2 Calculation of Cancellation Rates for Conversion to Settlement

Based on observations made in the reference region and adjusted for the size of the project area as described in Section **5.3.5.1** and presented in Table 44, the historical conversion rate of forest (primary and degraded) to settlement is 0.10 ha/yr. Provided that the REDD Plan does not allow for any conversion of forest to settlement, the leakage cancelation rate for conversion to settlement is 13% per equation 86 of the methodology.

5.5.2.2.3 Calculation of Cancellation Rates for Logging

By default, a cancellation rate of 100% is selected per the requirements of the methodology.

5.5.2.2.4 Calculation of Cancellation Rate for Fuelwood Collection

Fuelwood collection is not a driver and therefor no cancellation rate can be applied.

5.5.2.2.5 Calculation of Cancellation Rate for Cattle Grazing

Cattle grazing is not a driver and therefor no cancellation rate can be applied.

5.5.2.2.6 Calculation of Cancellation Rate for Extraction of Understory Vegetation

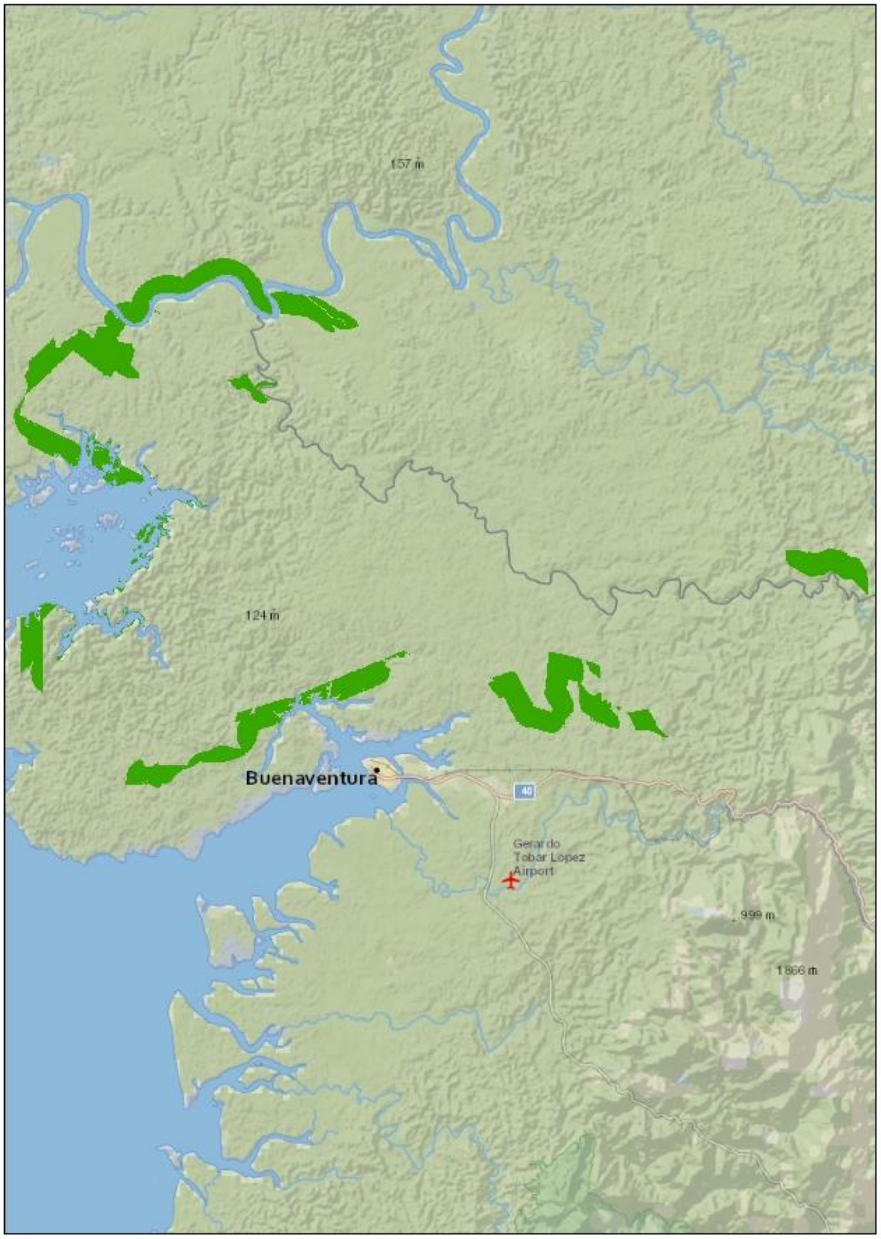
Extraction of understory vegetation is not a driver and therefor no cancellation rate can be applied.

5.5.2.2.7 Calculation of Cancellation Rate for Human-Induced Forest Fires

Human-induced forest fires are not a driver and therefor no cancellation rate can be applied.

5.5.2.3 Delineating the Leakage Area and Leakage Belts

Based on the results provided in Section 5.3.3.2 and the Timber Study (Annex X) an economic cost-distance GIS approach was used to define the leakage belts. Areas of influence in the project area including rivers, logging roads, and log yards were mapped using data collected from the Timber Study. Using the areas of influence falling within the project area a 30-meter resolution raster map was created, where each cell was an estimate of the economic cost for each mode of transportation in terms of cubic meters per kilometer. To define the cost, information collected in the Timber Study through focus groups and interviews was used to calculate the average cost of transporting 1-cubic meter of timber per kilometer for three modes of transportation including by foot, mule, and boat. The cost calculation included data based on wages, consumption of gasoline, and food for field crews. The economic “willingness” to travel was assumed to be the point where the costs of harvesting are equal to the revenues (i.e. there is no economic gain from travelling further). Applying this economic distance to the raster map of costs for each mode of transportation the leakage area was calculated to be 12,392 ha (see Figure 28). The leakage area is the sum of all leakage belts. See Annex BG for more details concerning how the leakage area was determined.



BCBM_Leakage_April6

Last Edited: 4/7/2015

Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Projection: Mercator Auxiliary Sphere
Datum: WGS 1984

N

0 1.5 3 6 9 12 Kilometers

Figure 28. Map of leakage area.

5.5.2.4 Calculating Deforestation/Degradation Rates in the Leakage Belts

Upon applying the leakage-induced increase in deforestation and degradation over time (see Section **5.5.2.1**) to the baseline rates of deforestation and degradation in the leakage area (see Section **5.3.5**) the rates of deforestation and degradation in the leakage area were determined for the project-scenario. These deforestation and degradation rates were then used to deplete pixels per the transition potentials as described in Section **5.3.5**. The projected changes in LULC class over time are presented in the table below while LULC transitions and calculations are in Annex V.

LULC Class	Primary Forest	Degraded Forest	Pastureland	Cropland	Wetland	Settlement	Other	Water
Project Start	4,746	5,170	1,086	951	75	1	0	3,260
2013	4,599	5,260	1,111	982	75	1	0	3,261
2014	4,184	5,491	1,153	1,122	75	1	0	3,262
2015	3,769	5,684	1,224	1,272	75	1	0	3,264
2016	3,352	5,867	1,315	1,414	75	1	0	3,265
2017	2,962	6,008	1,435	1,542	76	1	0	3,265
2018	2,582	6,133	1,586	1,646	76	1	0	3,265
2019	2,212	6,248	1,754	1,732	76	1	0	3,266
2020	1,851	6,355	1,925	1,816	76	1	0	3,266
2021	1,497	6,454	2,097	1,897	76	1	0	3,267
2022	1,148	6,548	2,273	1,976	76	1	0	3,267
2023	806	6,635	2,439	2,064	76	1	0	3,268
2024	468	6,719	2,608	2,149	76	1	0	3,268
2025	138	6,794	2,773	2,238	76	1	0	3,269
2026	0	6,492	3,054	2,397	76	1	0	3,269
2027	0	5,916	3,400	2,626	76	1	0	3,270
2028	0	5,339	3,687	2,914	77	1	0	3,271

LULC Class	Primary Forest	Degraded Forest	Pastureland	Cropland	Wetland	Settlement	Other	Water
2029	0	4,763	3,866	3,310	77	1	0	3,272
2030	0	4,187	4,074	3,677	77	1	0	3,273
2031	0	3,610	4,377	3,951	77	1	0	3,273
2032	0	3,034	4,679	4,225	77	1	0	3,273
2033	0	2,458	4,911	4,570	77	1	0	3,273
2034	0	1,881	5,236	4,820	77	1	0	3,273
2035	0	1,305	5,531	5,102	77	1	0	3,273
2036	19	751	5,916	5,249	78	1	0	3,276
2037	157	332	6,062	5,356	83	1	0	3,298
2038	195	219	6,100	5,386	84	1	0	3,305
2039	195	219	6,100	5,386	84	1	0	3,305
2040	195	219	6,100	5,386	84	1	0	3,305
2041	195	219	6,100	5,386	84	1	0	3,305
2042	195	219	6,100	5,386	84	1	0	3,305
2043	195	219	6,100	5,386	84	1	0	3,305

Table 52. Predicted change in project-scenario LULC class in the leakage area over time (ha).

5.5.3 Estimate Leakage from Geographically Unconstrained Drivers

No geographically unconstrained drivers have been identified. Although VM0006 lists logging of timber for commercial on-sale as geographically unconstrained, it has been determined to be a geographically constrained driver as described in Section **5.5.1**. Further, market-effects from logging of timber for commercial on-sale are accounted for as described in Section **5.5.5**

5.5.4 Quantifying Emissions from Project Activities

5.5.4.1 Quantifying Emissions from Agricultural Intensification

Per the methodology, emissions from the intensification of annual cropping systems are zero.

5.5.4.2 Quantifying Emissions from Flooded Rice Production

Flooded rice production is not a project activity and therefor no emissions will occur.

5.5.4.3 Quantifying Emissions from Livestock Stocking

Live stocking is not a project activity and therefor no emissions will occur.

5.5.5 Determining Market Effects Leakage (IFM/REDD)

Based on VCS requirements, a market-effects leakage discount factor of 0.2 was applied to the net change in carbon stock (baseline minus project emissions less carbon stored in long-lived wood products in the project area).

5.6 Summary of GHG Emission Reductions and Removals(CL1 & CL2)

Net Emissions Reductions are calculated using equation 105 from VM0006. The terms of equation 105 and their values are described in Table 53 below.

Individual Term of Equation 105	Description	Value (tCo2e)	Explanation
1	ΔGHG from avoided deforestation excluding ANR and harvest areas	-5,934,417	Included, major source of emissions reductions.
2	ΔGHG from deforestation due to leakage	309,305	Included as described in Section 5.5.
3	ΔGHG from avoided degradation	-14,066,184	Emissions from degradation are included as discussed in Section **5.3.3**.
4	ΔGHG from degradation due to leakage	-63,523	Emissions from degradation are included as discussed in Section **5.3.3**.
5	ΔGHG from leakage by unconstrained geographic drivers	3,837,762	Included as described in Section **5.5.3**.
6	ΔGHG from assisted natural regeneration	0	Omitted as ANR is not an included project activity.
7	ΔGHG from changes in long-lived wood products	811,791	Included per calculations in Section **5.6.2**.
8	ΔGHG from improved cookstoves	0	Omitted as CFE is not an included project activity.
9	ΔGHG from other and secondary sources	0	No other secondary sources exist.
10	ΔGHG from avoided deforestation from areas under harvest	0	Omitted as harvesting is not an included project activity.
N/A	Adjustment for avoided emissions in leakage area	143,691	Per the VM0006 methodology positive leakage is not allowed (VM0006 Section 8.4.4)
NERs		**14,961,575**	**Over entire crediting period**

Table 53. Terms of equation 105 in VM0006, for the entire crediting period.

5.6.1 Summarize Projected Land Use Change

Projected land use change is quantified in Sections **5.3.5** for the baseline and Section **5.4.2** for the project scenario. The projected land use change as a result of project activities is a greater level of forest relative to the baseline scenario.

5.6.2 Carbon Stocks in Wood Products

Carbon stocks in wood products were calculated for the baseline scenario and conservatively excluded for the project scenario. Due to the fact that timber extraction and commercial logging is largely illegal in baseline scenario, little objective evidence is available from which to quantify carbon stored in wood products. As a result, the timber study provides a wide range of estimates based on a limited sample size of families in the project region and the socio-economic study appears to under estimate the importance of illegal logging in the project zone when comparted to the results of the timber study and LULC analysis.

Compared to the varying results of the timber study, the most reliable and objective information about timber extraction and wood products is from the historical LULC analysis (see Section **5.3.2**). Therefore, the results from the historical LULC analysis were used to estimate wood products as the most accurate approach available. The results from analysis were converted from area-based measurements to wood products-based measurements using conservative assumptions and expert opinion. Therefore, the amount of carbon stored in long-lived wood products in the baseline scenario is likely over estimated.

The analysis of wood products converts predicted changes in area from LULC transitions that generate wood product products in the baseline scenario in the project area: Primary Forest to Degraded Forest, Primary Forest to Pastureland, Primary Forest to Cropland, Degraded Forest to Pastureland and Degraded Forest to Cropland. The conversion from an area-basis to standing biomass basis is made per the following equation:

$$AGL = AREA \times EF_{AGL} \times 12/44$$

where AGL is the metric tonnes of carbon in aboveground living organic matter, AREA is the predicted transition in hectares. EF_{AGL} is the emissions factor for aboveground living biomass (tCO2e/ha) and 12/44 is the conversion from tCO2e to metric tonnes of carbon. This conversion approach is conservative because AGL contains all above-ground biomass including non-tree biomass which is likely not merchantable.

The value for AGL is then adjusted to represent the proportion of above-ground living biomass in merchantable trees. This adjustment was made using a factor of 0.4 which corresponds to 40% of biomass in merchantable trees. This factor is conservative as most of the project area is degraded and likely most of the merchantable biomass has already been extracted with very little low-value product remaining.

Finally, the inverse of the biomass expansion factor (BEF) is applied to attain the carbon in harvested wood products. The selected BEF is 3.4 and is based on IPCC default for large trees in broadleaf tropical forests (see Table 3A.1.10 of IPCC GPG 2006). Finally, the resultant estimate of harvested wood is converted to long-lived wood products per equation 102 of the methodology assuming that all harvested wood products are sawnwood. The selected wood waste fraction is 0.24, oxidization factor is 0.850 and short-lived fraction is 0.2. Assuming that all harvested wood products are sawnwood is conservative because sawnwood provides that greatest estimates of long-lived wood products of any wood product category and likely not all wood products from the project area are sawnwood.

The average carbon stored in long-lived wood products is approximately estimated as 26,187 tCO2e per year. These calculations are presented in Annex V.

5.6.3 Test the Significance of GHG Emissions

No emissions sources are being claimed as de-minimis and therefore significance cannot be tested.

5.6.4 Quantifying Net Emissions Reductions

Net Emissions Reductions (NERs) are quantified in Annex V and are shown in Table 54 below. NERs do not include the buffer allocation or release.

Years	Estimated baseline emissions or removals (tCO2e)	Estimated project emissions or removals (tCO2e)	Estimated leakage emissions (tCO2e)	Estimated net GHG emission reductions or removals (tCO2e)
2013	344,257	286,568	407	26,564
2014	1,012,418	514,662	10,162	276,879
2015	987,851	240,578	20,159	419,725
2016	992,623	158,809	29,688	462,957
2017	1,000,106	84,929	29,074	512,364
2018	1,011,419	55,084	24,963	540,709
2019	1,026,033	54,635	21,553	552,525
2020	1,048,052	56,395	21,658	564,962
2021	1,070,113	59,350	21,260	576,923
2022	1,093,613	60,528	22,065	590,295
2023	1,109,720	54,792	22,212	604,337
2024	1,108,615	44,833	23,401	608,412

2025	1,102,818	40,645	23,036	606,988
2026	1,097,182	38,605	22,194	604,938
2027	1,090,305	37,910	21,023	601,291
2028	1,084,193	38,011	124	611,199
2029	1,078,285	38,358	0	606,650
2030	1,072,269	38,526	19,837	588,097
2031	1,062,833	38,837	18,559	581,247
2032	1,053,619	38,822	17,568	574,684
2033	1,044,944	39,523	18,244	567,195
2034	1,035,787	38,722	20,134	560,067
2035	1,024,890	38,597	21,238	551,452
2036	1,016,466	38,497	20,959	545,227
2037	1,006,189	39,865	20,732	539,021
2038	791,157	38,600	21,452	413,164
2039	561,986	39,379	18,947	267,111
2040	562,556	39,894	17,203	268,060
2041	562,153	38,978	0	279,168
2042	558,627	38,424	0	277,612
2043	366,048	24,955	0	181,752
Total	**28,977,127**	**2,396,311**	**527,852**	**14,961,575**

Table 54. Estimated baseline, project and leakage emissions over time relative to estimated NERs.

The ex-ante Verified Carbon Units (VCUs) are calculated by adjusting the estimated NERs by the buffer allocation and release and can be found in Table 55 below. See Annex V for the calculation of VCUs.

Year	VCUs (tCO2e)
2013	21,852
2014	226,861
2015	343,271
2016	377,431
2017	418,420
2018	442,604
2019	452,996
2020	539,524
2021	473,242
2022	484,173
2023	495,776
2024	498,948
2025	497,842
2026	656,927
2027	493,514
2028	504,239
2029	500,486
2030	482,765
2031	477,207
2032	704,210
2033	465,635

2034	459,618
2035	452,436
2036	447,324
2037	442,222
2038	625,611
2039	218,018
2040	219,170
2041	230,314
2042	229,030
2043	149,945
Total	13,031,611

Table 55. Estimated VCUs as NERs less buffer allocation and plus buffer release.

5.6.4.1 Non-Permanence Risk

The effect of the non-permanence risk rating on NERs is given in the table below.

Year	NERs (tCO2e)	Buffer Allocation (tCO2e)	Buffer Release (tCO2e)	Buffer Account Balance (tCO2e)
2013	26,564	4,712	0	4,712
2014	276,879	50,017	0	54,729
2015	419,725	76,454	0	131,183
2016	462,957	85,526	0	216,709
2017	512,364	93,943	0	310,652
2018	540,709	98,105	0	408,758
2019	552,525	99,528	0	508,286
2020	564,962	101,681	76,243	533,724
2021	576,923	103,680	0	637,404
2022	590,295	106,122	0	743,526
2023	604,337	108,562	0	852,088
2024	608,412	109,464	0	961,552
2025	606,988	109,145	0	1,070,697
2026	604,938	108,616	160,605	1,018,709
2027	601,291	107,777	0	1,126,486
2028	611,199	106,960	0	1,233,445
2029	606,650	106,164	0	1,339,609
2030	588,097	105,332	0	1,444,941

2031	581,247	104,040	0	1,548,982
2032	574,684	102,822	232,347	1,419,456
2033	567,195	101,560	0	1,521,016
2034	560,067	100,449	0	1,621,465
2035	551,452	99,016	0	1,720,481
2036	545,227	97,903	0	1,818,384
2037	539,021	96,799	0	1,915,183
2038	413,164	74,830	287,277	1,702,735
2039	267,111	49,092	0	1,751,828
2040	268,060	48,890	0	1,800,717
2041	279,168	48,854	0	1,849,572
2042	277,612	48,582	0	1,898,154
2043	181,752	31,807	0	1,929,961

Table 56. Effect of non-permanence risk rating on buffer account allocation, release and balance.

5.7 Climate Change Adaptation Benefits (GL1)

Climate Gold for climate change adaption is not being sought at this time.

6 COMMUNITY

6.1 NET POSITIVE COMMUNITY IMPACTS

The project activities have been designed to transform impoverished communities that rely heavily on logging as a source of income to thriving communities that derive economic benefits from alternative activities.

The BioREDD+ program's main objective related to community well-being is to promote the sustainable development of local communities living in the project zone, through profitable productive activities, adapted to local cultural, geographic, infrastructure and access to markets. More specifically, the project aims to address community development by strengthening the following capacities:

- Human. through better health indicators (morbidity and mortality), resulting in a better provision of basic health care, drinking water, and sanitation;
- Social, strengthening the governance capacity of the territories; organizing for the procurement and distribution of inputs and benefits resulting from the project; and controlling forest degradation and deforestation;
- Natural, through the development and improvement of crops, and improvement of degraded forest areas through conservation efforts;
- Physical, through the improvement or creation of structures and capacity needed to add value to supply chains; and
- Financial, through assurance of capital flows from profitable productive activities, sale of carbon credits, and productive investment of public or private capital.

In order to estimate the impacts of project activities on the social and economic well-being of all community groupsin relation to the projected community baseline identified in Section **4.5.1**, BioREDD+ employed a theory of change approach.

The theory of change approach is organized according to the BioREDD+ Program Areas - i.e. Governance, Productive Activities, Capacity Building, and Social Investments – each of which has different community impacts (described below). See **Annex D** for the project's complete theory of change model.

Governance

While tenure is already reasonably secure for communities in the project zone (See Section 3), current land use management plans are unclear and individual property rights are not clearly defined resulting in limited awareness and control over natural resources. Given the lack of resources and capacity on the local level, current management plans are expected to continue in the projected baseline scenario. The project will improve governance over communal lands by undertaking a land rights mapping process, which will establish boundaries of family holdings. By helping to define the limits of family and community rights for natural resource use within each of the collective territories, family rights will be ensured and rules for use and exploitation of collective areas corresponding to forest areas will be clarified.

This activity will be undertaken with technical assistance and will be reflected in revisions to existing land allocation plans. Communities will benefit from enhanced decision-making regarding protection of private property rights and natural resource management.

Positive community impacts are also expected due to the increased participation of individuals and communities in decision-making regarding land use and local development.

The project will provide sufficient resources to ensure participation in decision-making ("veredales" committees and community meetings) and for the operation of representative bodies (Governing Board and Zonal Board).

The project will also provide sufficient resources for the review and adjustment of the management plan of the territory as part of a vision of ethno-development to ensure the collective rights are secure.

Finally, the project will conduct periodic reviews and adjustments of the internal rules (e.g. community by-laws) to ensure that the community norms, including within the context of the REDD+ project, are defined.

Additionally, reserves and conservation areas are currently not clearly demarcated, resulting in a limited awareness of allowable resource use areas. Again, this lack of clarity in land use zoning is expected to continue in the without-project scenario. The project will demarcate important reserve areas that have been subject to degradation, which will allow the forest to recover. Community members, particularly "corteros", will benefit from the employment opportunities provided. Communities will also indirectly benefit as the conservation of forest and mangrove ecosystems, which contain high conservation values, provide critical ecosystem services, fundamental community needs, and cultural identity.

Finally, compared to the projected baseline scenario, greater security in adaptation to climate change will result from the diversification of production and the conservation of mangrove ecosystems, which are essential to protecting coastal areas from changes in sea levels.

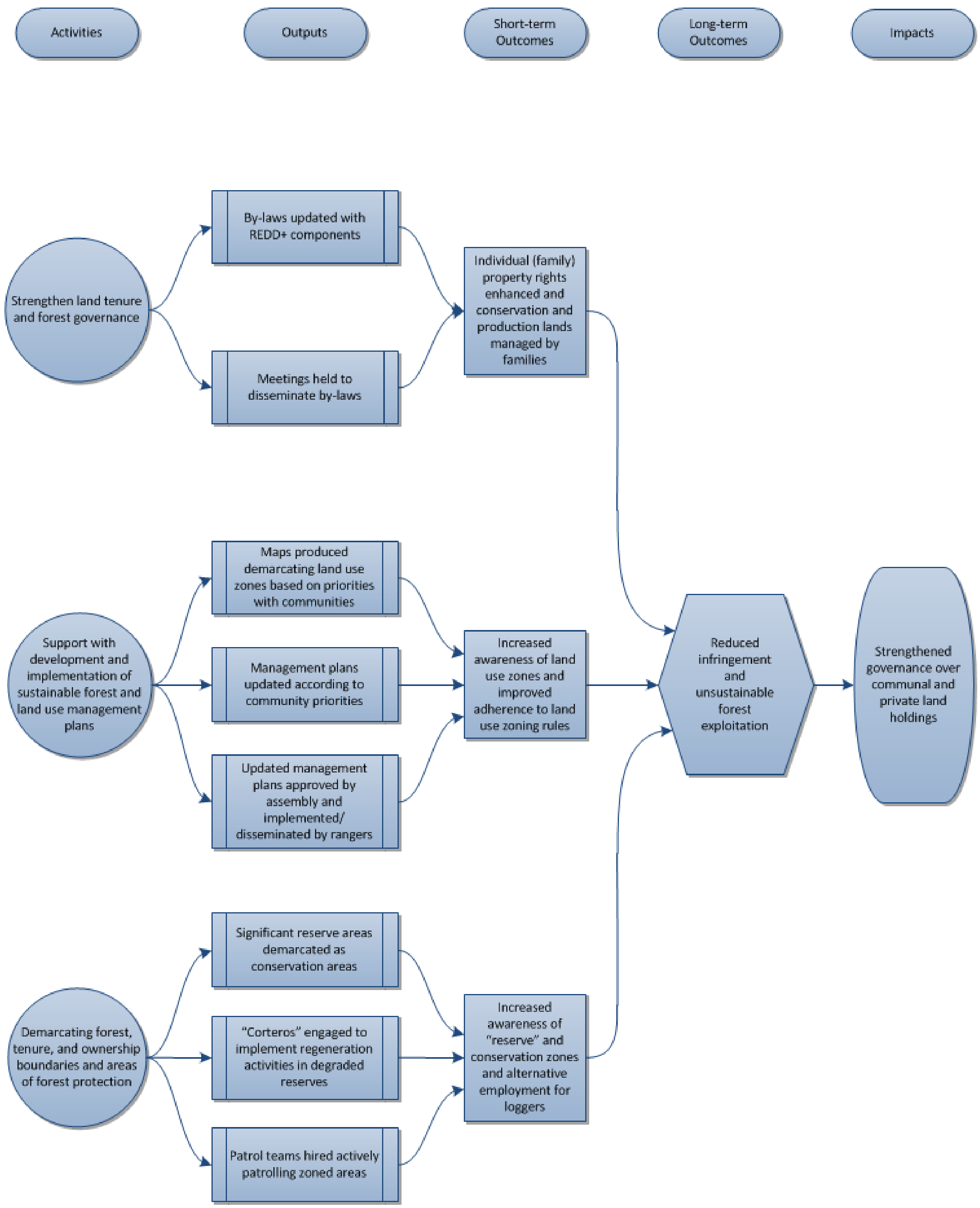

Activities
Outputs
Short-term Outcomes
Long-term Outcomes
Impacts
Strengthen land tenure and forest governance
By-laws updated with REDD+ components
Meetings held to disseminate by-laws
Individual (family) property rights enhanced and conservation and production lands managed by families
Support with development and implementation of sustainable forest and land use management plans
Maps produced demarcating land use zones based on priorities with communities
Management plans updated according to community priorities
Updated management plans approved by assembly and implemented/ disseminated by rangers
Increased awareness of land use zones and improved adherence to land use zoning rules
Reduced infringement and unsustainable forest exploitation
Strengthened governance over communal and private land holdings
Demarcating forest, tenure, and ownership boundaries and areas of forest protection
Significant reserve areas demarcated as conservation areas
"Corteros" engaged to implement regeneration activities in degraded reserves
Patrol teams hired actively patrolling zoned areas
Increased awareness of "reserve" and conservation zones and alternative employment for loggers

Figure 29. Expected community impacts from governance activities.

Productive Activities

Currently, communities have very limited opportunities for "cash" generation other than logging, and government transfers to the communities are extremely limited. Community members also lack the capacity to technically produce income-generating crops and value added production. These factors, combined, result in a high dependency on logging as a source of household income. The productive activities described in Section 2.2 related to the establishment of cocoa, acai, chontaduro, and achiote, as well as the development of local ecotourism as a source of income, will constitute a major direct benefit to communities as they increase household incomes and reduce poverty in the areas.

The increase in household incomes will be realized through a suite of project activities related to sustainable intensification of agriculture and developing alternative livelihoods to logging, including: training communities on crop yield increasing techniques, pest management, and participation in value chain development; establishment of new crop areas in non-forest areas; technical assistance on yield and pest management, and all of the activities associated with the development of processing plants.

Within the ecotourism industry, activities will also include the updating and building the physical infrastructure necessary for the industry to be successful, as well as marketing.

The outcomes of the productive activities include an increase in income above the income that can be derived from logging. In order to calculate incomes derived from logging, the BioREDD Program hired UT CONIF ECONOMETRICS to estimate the opportunity cost of reducing the commercial exploitation of the forest resulting from the implementation of REDD+ projects. The resulting study was based on a combination of interviews and focus groups with community members and collected information on timber volumes, processes, and political and institutional dynamics of informal timber harvesting. Results showed a total annual income of $4,874,340 pesos (estimated US$2,583) from wood products, based on a survey of two families.[15] With limited employment opportunities and access to capital, community reliance on income from timber extraction is expected to continue in the projected baseline scenario.

Linking families, especially those who derive their income primarily from the commercial exploitation of timber, with productive chains of cocoa, acai, chontaduro and achiote, and generating revenues equivalent to the opportunity cost of timber provides more secure livelihoods.

Additionally an increase in family incomes linked to production through the purchase of raw materials, is also expected.

15The study was limited in that all data was collected within the span of one month (between November 2013 and December 2013). It is noted within the report that these months are considered atypical, as forest use is intensified on account of the economic requirements of families in the holiday season. Also, the duration of the field work was not sufficient to determine actual volumes, prices, charges levied by councils and families, so results should be taken with consideration.

In addition to an increase in income, there are many direct and indirect employment opportunities associated with developments of the supply chain for productive activities (e.g. technical assistance for crops, post-harvest handling, storage, transportation and commercialization of products).

Finally, the promotion of agroforestry and the recovery of traditional practices associated with agricultural production around the family dwelling for household consumption, the latter being a specific role for women, will enhance food security.

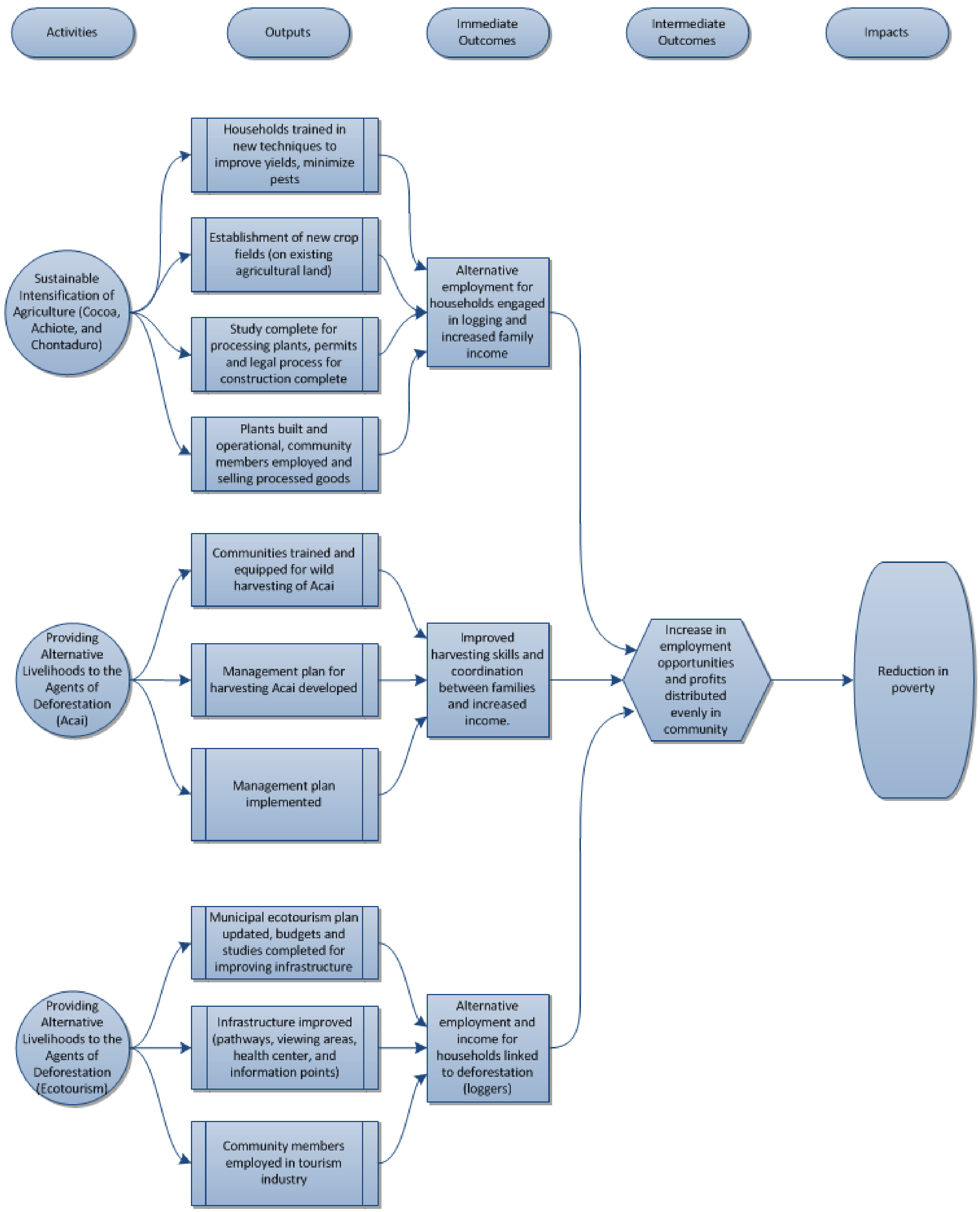

Activities
Outputs
Immediate Outcomes
Intermediate Outcomes
Impacts
Sustainable Intensification of Agriculture (Cocoa, Achiote, and Chontaduro)
Households trained in new techniques to improve yields, minimize pests
Establishment of new crop fields (on existing agricultural land)
Study complete for processing plants, permits and legal process for construction complete
Plants built and operational, community members employed and selling processed goods
Alternative employment for households engaged in logging and increased family income
Providing Alternative Livelihoods to the Agents of Deforestation (Acai)
Communities trained and equipped for wild harvesting of Acai
Management plan for harvesting Acai developed
Management plan implemented
Improved harvesting skills and coordination between families and increased income.
Increase in employment opportunities and profits distributed evenly in community
Reduction in poverty
Providing Alternative Livelihoods to the Agents of Deforestation (Ecotourism)
Municipal ecotourism plan updated, budgets and studies completed for improving infrastructure
Infrastructure improved (pathways, viewing areas, health center, and information points)
Community members employed in tourism industry
Alternative employment and income for households linked to deforestation (loggers)

Figure 30. Expected community impacts from productive activities.

Social Investments

As mentioned above, the extreme poverty in the communities, combined with the lack of government "transfers" to the communities, means that community needs are not being properly addressed. Food security is poor, houses are in poor condition, sanitary conditions are practically nonexistent, there are no water purification services, and energy is only present for hours with small diesel plants and is only available for a small portion of the population. There is also a high level of illiteracy due to lack of teachers and classrooms.

In Bahia Malaga, the community identified basic sanitation services, especially the management of solid waste and septic tanks as the highest priority for social investment, taking into account municipal plans and programs. The community of Bajo Calima prioritized food security, due low production rates for consumption. As a means to improving food security, Bajo Calima proposed that the project provide assistance in strengthening and improving the productivity of subsistence crops and animal husbandry for consumption and local commercialization. Other social investment priorities included sewage and solid waste disposal, and strengthening of sports, recreation and culture.

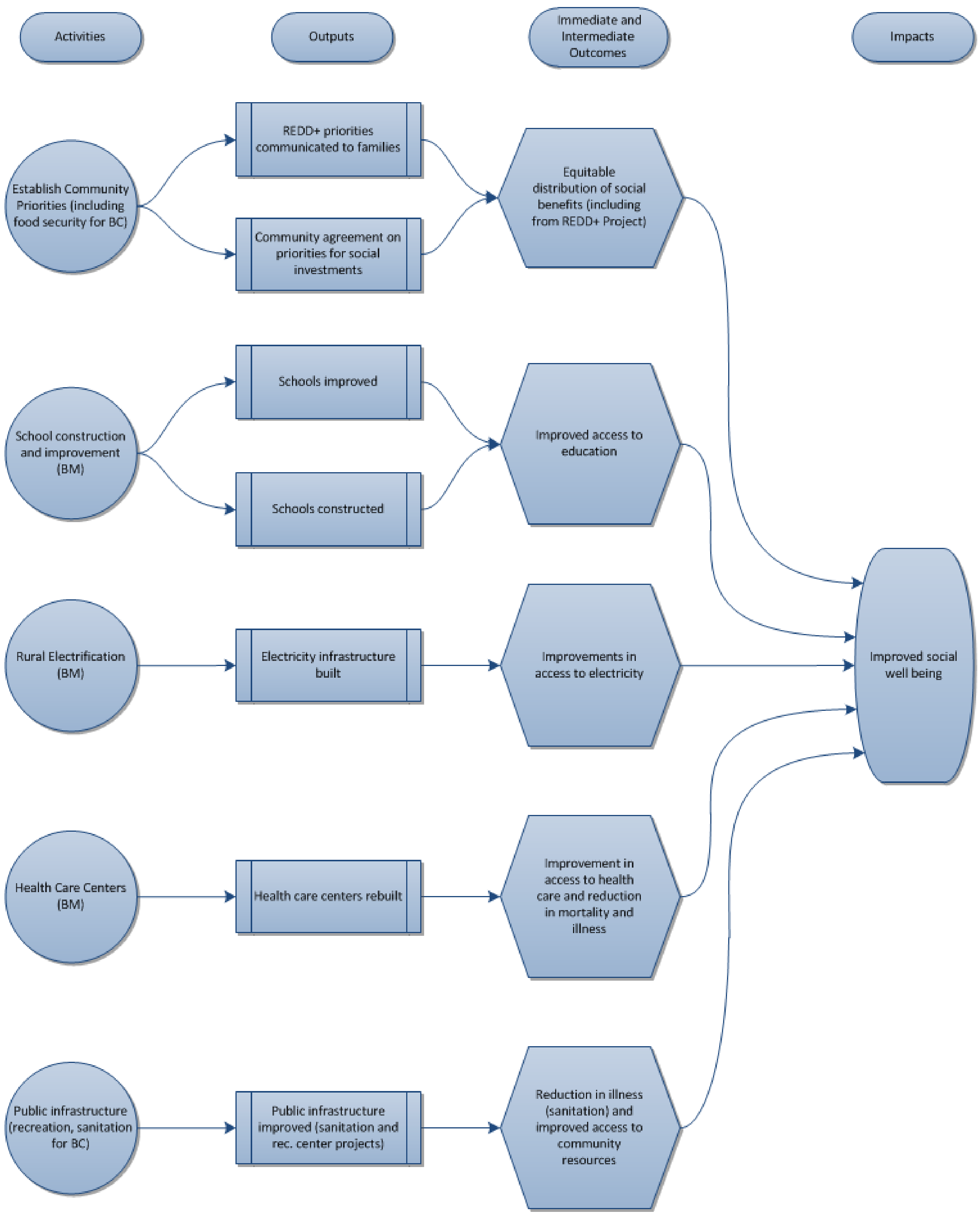

Activities
Outputs
Immediate and Intermediate Outcomes
Impacts
Establish Community Priorities (including food security for BC)
REDD+ priorities communicated to families
Community agreement on priorities for social investments
Equitable distribution of social benefits (including from REDD+ Project)
School construction and improvement (BM)
Schools improved
Schools constructed
Improved access to education
Rural Electrification (BM)
Electricity infrastructure built
Improvements in access to electricity
Improved social well being
Health Care Centers (BM)
Health care centers rebuilt
Improvement in access to health care and reduction in mortality and illness
Public infrastructure (recreation, sanitation for BC)
Public infrastructure improved (sanitation and rec. center projects)
Reduction in illness (sanitation) and improved access to community resources

Figure 31. Expected community impacts from social investment activities.

Training and Capacity Building

Training and capacity building activities are planned to allow the communities to take over the management of resources and implementation of the REDD+ project. This will ensure long-term ownership and sustainability of the project long after the crediting period. Additionally, the project will support on-going workshops and awareness campaigns to increase awareness about the project, as well as its scope and benefits. Included in these workshops will be community input in order to prioritize social investments based on community needs at the time. Workshops will also include environmental education modules that inform participants about the importance of conservation and natural resources and will be designed specifically to include and address the needs of women.

Increased capacity from these activities will lead to net positive community impacts by increasing community leadership and participation in the project. Fundamental business and management training and education is paramount in encouraging women and families to fully contribute to the project and economic development of the area as a whole. Without the project, no resources would exist to implement these programs. These skills will lead to more resilient and self-sufficient communities, ultimately reducing poverty in the project zone.

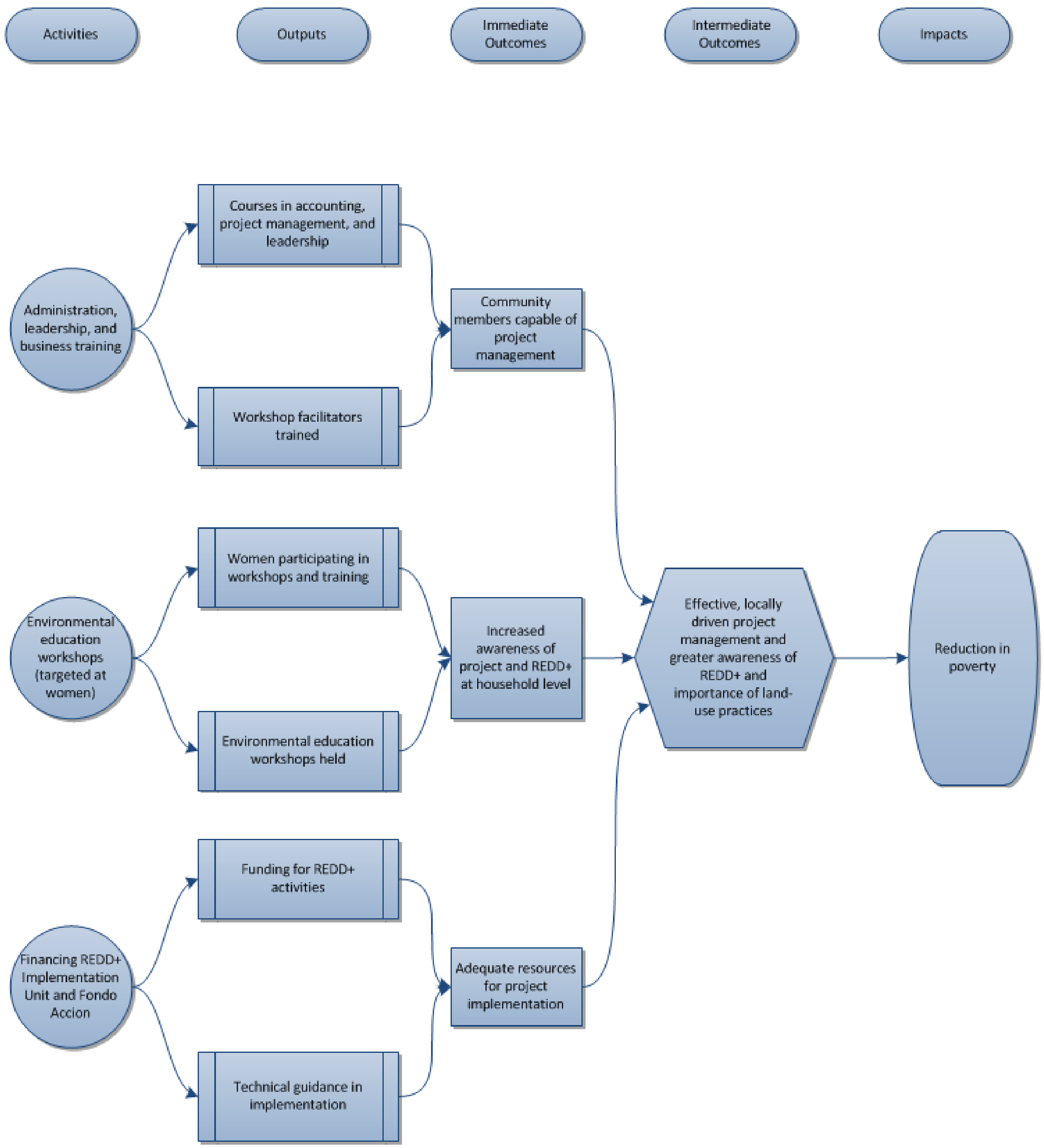


Figure 32. Expected community impacts from training and capacity building activities.

Demonstration that No HCV Areas will be Negatively Affected

Mangrove and dry land forests in various locations throughout the project zone were identified as having High Conservation Value (HCV) using the methodologies outlined by the HCV Resource Network. Three specific types of HCVs relating to community well-being were identified in mangroves and forests in the project area: areas that provide Critical Ecosystem Services (HCV-4), areas that meet fundamental needs (HCV-5), and areas that are vital for the preservation of cultural identity (HCV-6). See section 1.3.8 for detailed description of Community HCVs.

Given that forest conservation, including the protection and maintenance of HCV areas, is the key objective of the project, and multiple project activities are dedicated specifically to maintaining or enhancing forest and mangrove ecosystems, impacts on HCVs are expected to be positive. Project activities such as training and capacity building for improved governance, demarcation of degraded "reserve" and mangrove areas, and strengthening of land tenure for communities will all serve to protect community HCVs.

In addition, monitoring activities will be carried out for areas critical to ecosystem services (HCV-4), so that any threats to these areas will be detected and addressed and positive impacts on ecosystem services will be documented over time. Specifically, mangrove areas will be protected to ensure the maintenance or improvement of the HCV area. Mangroves serve as natural barriers against flooding due to climate change, sites for fish reproduction and other marine mammals, climate and temperature regulation.

Another important ecosystem service identified as important for communities is the protection against soil erosion and the resulting protection of water resources. In most cases, communities consume rainwater from aqueducts; however, when rainwater is limited, creeks and rivers serve as an important source of water for drinking, transport, and washing. By reducing degradation and deforestation, the project will reduce the threat posed by soil erosion on natural water sources.

Also important for communities is the protection of non-timber forest resources such as medicinal plans, seeds and sources of protein (sustainable hunting and gathering activities), construction materials, and materials for handicrafts.

Restrictions will be placed on hunting and fishing, allowing for only seasonal, local and non-commercial harvesting of species. Patrols will be put in place, and local community members will receive training in HCV monitoring, including species identification, data collection and reporting methodology.

Methodologies to Assess Impacts on Community Groups

Through the project, the BioREDD+ team has utilized appropriate methodologies to assess the predicted impacts, including direct and indirect benefits, costs, risks and changes in well-being, on each of the identified Community Groups (identified in Section **1.3.6**). The assessment of impacts has been carried out in a participatory manner with community stakeholders, and is based on clearly defined and defendable assumptions about changes in well-being of the Community Groups under the with-project scenario, including potential impacts of changes in all ecosystem services identified as important for the communities (including water and soil resources), over the project lifetime.

To establish an initial socio-economic baseline the BioREDD+ program engaged the Autonomous University of the Department of Valle, the University of Antioquia, and the Laurel Foundation (former professors from the University of Nariño) to develop socio-economic assessments.

The socio-economic assessment for BCBM was conducted by the Autonomous University of Occidente.

The first stage of the study consisted of a socio-economic and productive characterization of the populations, using a total of 565 household surveys, focusing on representatives of the productive activities. The second stage completed participatory workshops (focus groups) in the Community Councils, to strengthen the information collected in the household surveys. The third stage included the identification of profitable productive activities, which involved outside experts trained in various disciplines (e.g. economics, engineering, agricultural engineering, civil engineering) with experience in business and community work, visiting and communicating with local communities(Universidad Autonoma de Occidente).

In addition to undertaking the baseline socio-economic assessments, the BioREDD+ team undertook a timber study that highlights the opportunity cost to communities to give up timber extraction.

Also, the BioREDD+ team has been systematically engaged with stakeholders in socialization meetings from the start of the project. Through these meetings, community stakeholders have been participating in the identification of deforestation and degradation drivers, agents, and the best strategies to address and mitigate them. The project activities have resulted from these participatory meetings where stakeholders have set priorities with the support of the BioREDD+ team, including the climate change technical team and outside specialists.

Throughout the socialization process, emphasis has been placed on the development of appropriate community level engagement processes and materials to ensure complex issues are presented in a way that communities can understand. This included participatory mapping of the project area, identification of risks to the communities, prioritization of project activities, and role-playing to better understand potential financing and implications for the project. These have all been conducted in local languages, with translation. All of the socialization activities are finalized with a formal signing of meeting minutes (see **Annex G**).

Additionally, the workshops were performed to analyze REDD+ in order to identify the costs and risks to families associated with shifting activities from timber extraction to productive activities. And to develop business plans to evaluate the potential profitability of alternative productive activities. These studies will have social and environmental evaluations of activities related to the processing plants prior to installation.

More recently, Fondo Acción has continued to expand and deepen the social engagement exercise with additional materials and techniques that build upon the successful experience of the Choco-Darien Conservation Corridor, a REDD+ project it is involved in that includes the Acandi community. Fondo Acción is now working with Acandi community members to be part of the social engagement team for the BioREDD+ projects.

The organization of the social engagement agenda is planned and executed in line with the key milestones and agreements that the communities will sign at appropriate points in time. The process is initiated with a signed Letter of Intent granting BioREDD+ the rights to facilitate the negotiation process between the communities and any potential investors, and undertake the relevant social engagement activities. This process guarantees the legitimacy of any subsequent decisions taken related to the on-going REDD+ process.

In order to assess and continually monitor the impacts that the project is having on communities, the project developed a community-monitoring program that will use household surveys and Participatory Rural Appraisals (PRAs) in accordance with monitoring requirements contained in VM0006. The design of the surveys will contain key indicators related to family and community welfare, including impacts related to production levels, income generation, capacity building, community participation in decision-making and recognition of land use planning processes and internal regulations, along with the strengthening of territorial control and governance. The focus groups implemented as part the PRA will be designed to detect perceptions of significant changes due to project activities, as well as any difficulties faced in order to achieve project results based on defined strategies.

Measures to Mitigate any Negative Well-Being Impacts and Enhance HCV Attributes

The project is designed to improve the social and economic well-being of community groups and to enhance and maintain the HCV attributes of the project (identified in section 1.3.8). For example, it is anticipated that the income lost from a decrease in timber harvested will be more than compensated by income earned from the productive activities program (see section 6.1).

The equitable distribution of all types of project benefits will be ensured by a capacity building and training process undertaken by Fondo Acción, which will result in a transparent, community-driven benefits distribution system. Annual social surveys will further ensure equitable benefit sharing by monitoring social well-being and stakeholder satisfaction with project outcomes.

The project is expected to enhance the HCVs identified in section 1.3.8. As mentioned previously, three types of HCVs relating to community well-being were identified in mangroves and forests in the project zone: areas that provide Critical Ecosystem Services (HCV-4), areas that meet fundamental needs (HCV-5), and areas that are vital for the preservation of cultural identity (HCV-6)(see section 1.3.8 for a detailed description of Community HCVs). Given that forest conservation, including the protection and maintenance of HCV areas, is the key objective of the project, and multiple project activities are dedicated specifically to maintaining or enhancing forest and mangrove ecosystems, impacts on HCVs are expected to be positive. To ensure that any unanticipated impacts on HCV areas can be detected and mitigated, the project will carry out monitoring activities in each of the HCV areas.

In addition, any currently unanticipated negative community well-being impacts will be identified and addressed through established grievance procedures (see section 2.7.5). Specifically, the communities have their own grievance procedures, based on their established governance structure, which will be followed if there are negative well-being impacts. This includes a Grievance and Redress Mechanism, established within the REDD+ Unit of the Community Council, which will receive, respond to and solve any inquiries related to the REDD+ project.

Fondo Acción has also established a grievance mechanism, which provides an important line of defense against risks or costs incurred by communities over the course of the project cycle. Fondo Acción has a formal Complaints and Grievances Procedure as part of its Quality Control System (ISO 9000 – 2008). Under this procedure, the Board of Directors receives all complaints and these are registered in Board Meeting Minutes. The Executive Director is responsible for treating these complaints according to a second procedure that is also part of the Quality Control System (ISO 9000 – 2008, Corrective and Preventive Actions). A client satisfaction survey is also as part of the Complaints and Grievances Procedure. This survey inquires about the client's opinion regarding Fondo Acción's management, innovation, communication, internal reporting etc. Surveys are conducted once a year and results evaluated by the Board. If there is a low grade in a given survey (2 or less), the Executive Director has to address it through the Corrective and Preventive Actions Procedure.

Fondo Acción will develop Complaints and Grievances Protocols for all REDD+ projects where it is in charge of administering resources. The basic elements of such protocols are included in Section S of The Rain Forest Standard (http://cees.columbia.edu/the-rainforest-standard). For finalized protocols, see provided **Annex H**.

Finally in order to mitigate any potential negative well-being impacts on Community Groups, the project is following the World Bank and other donor safeguards, as well as the SBIA guidelines.

6.2 NEGATIVE OFFSITE STAKEHOLDER IMPACTS

It is expected that the net impact of the project on offsite stakeholders will be positive, as downstream value chain affects are felt. However, an analysis of potential negative impacts on offsite stakeholders was carried out by the BioREDD+ team with community stakeholders and potential negative impacts and mitigation measures were identified.

Inthe event that leakage is not managed adequately, offsite communities may experience an increase in unregulated logging in their forest. Negative impacts from this logging could be felt as a decrease in access to High Conservation Value areas including access to non-timber forest products and declining watershed health. These potential negative impacts can be mitigated by successfully adhering to the leakage management plan. See section **5.2**.

Transportation that takes wood out of the project zone also brings in daily commodities. Thus, the reduction in logging and transportation of materials may increase the cost of living for communities surrounding the project zone. To mitigate this potential impact, the Project is aiming to replace timber that is currently transported out of the project zone with agricultural commodities. Given the logistics and costs of transport in the remote Pacific Coast region, there is an obvious economic rationale for reducing overall costs by importing commodities using available space on boats and road transport, when available.

Loggers and others within the value chain located outside the project zone (who traditionally have logged within the project zone) could potentially see a reduction in revenue due to increased governance in the project zone. The project is mitigating this potential negative impact by involving those currently involved in logging in alternative livelihood activities, reducing the likelihood that they will move into other areas. Additionally, the participation of the municipality in developing appropriate regulations and regional environmental authorities in control measures (e.g. land use planning) serves to mitigate this impact, particularly because the bulk of people currently cutting mangroves are coming from just one community.

6.3 EXCEPTIONAL COMMUNITY BENEFITS [GOLD]

The project is explicitly pro-poor in terms of targeting benefits to globally poorer communities and the poorer, more vulnerable households and individuals within them.

According to the socio economic survey the population of BCBM has an average income of less than 400,000 pesos (approximately USD200) per month respectively. Specifically those involved in Agriculture, wood and collection of

Mollusks earn on average 300,000 pesos; hunters earn only 200,000 pesos; and fisherman earn roughly 400,000 pesos. These conditions of extremely low income, combined with food insecurity and a lack of social services, raise the levels of vulnerability of certain groups within the population such that they have a very low risk tolerance and are not able to adapt to changes.

The project is building capacity and creating opportunities for linkages to project activities and/or production chains other than logging, including agroforestry arrangements containing products for family consumption.

Additionally, the project allocates resources that positively impact the communities social well-being through, for example, basic sanitation services, especially the management of solid waste and septic tanks (Bahía Málaga), and assistance in assistance in strengthening and improving the productivity of subsistence crops (Bajo Calima), among other services that will be identified at a later date.

Within the project area, the communities collectively own the land and the forests and have “Right of Use” (see Section 3.2). Specifically, through the laws and policies detailed in Section 3.1— the Afro-Colombian Communities have the right to their ancestral territories; and this right has been recognized by the state through collective title to their territories. These territories are defined in the Constitution as *inalienable and unseizable.*[16]

Further, due to their ethnic status, the communities have the right to self-determination–i.e. to freely determine their political status and freely pursue their economic, social, and cultural development.[17]

Due to tradition and heritage, each family within the collective territories has usufruct rights that are respected by other families. According to Law 70 and Decree 1745, delineation of these areas is a function of the Community Council Governing Board. Thus, one of the planned project activities is to delineate family-owned areas, which will help to clarify family ownership and define the collective areas (generally forests) that are governed by land use agreements.

Additionally, according to the Colombian Constitution and several additional pieces of legislation, including Ley 70 de 1993 (Consejos Comunitarios), and Ley 21 de 1991 (Resguardos Indigenas)—the lands belong to the communities, and cannot be sold, transferred or have liens set upon them. The community lands are autonomous, and have their own governance structure. Specific titling is formalized through resolution bills issued by INCODER, the national agency in charge of land title issuance in Colombia. REDD+ territories are governed by Community Councils, in the case of the Afro-Colombian communities; and by Cabildos, in the case of indigenous peoples. According to the Law 70, the Afro-descendant communities have clear rights to their lands and forests, as long as the latter get managed according to their ecological function. In addition to granting land rights, Chapter IV of Law 70 given inalienable rights to the Communities to their renewable resources, forests, genetic materials and traditional knowledge.

ILO Convention 169, article 15 also provides a legal safeguard for the communities on their right to use, manage, and conserve the natural resources present in their territories. The government has recognized that the last right

[16] Article 63, Colombian Constitution.

[17] Item the 1st International Covenant on Civil and Political

to use or not use the forests in the REDD+ territories belong to the communities. Therefore, it is commonly understood that all carbon rights derived from the use or not use of the natural resources should pertain to the holders of the rights of use of the natural resources. Nonetheless the government is developing a decree to clarify the carbon rights and tenure, which is expected in the months to come.

Given the above, the community members have rights to claim that their activities will or did generate the project's climate, community and biodiversity benefits; and therefore they are the legal owners of any emissions reductions generated from the project activities.

6.3.1 SHORT- AND LONG-TERM BENEFITS

The project is expected to generate long-term net positive well-being benefits for community members, based on a theory of change model, as described in Section at the individual and/or family level, and at the community level.

The indicators of community well-being are included in both the theory of change model and the monitoring plan. See Section. Through the life of the project, assessment of impacts will include changes to well-being for community members due to project activities and will be carried out by the affected community members.

At the family level, examples of indicators include:

- Number of households trained on crop yield increasing techniques, pest management, and participation in value chain development;
- Number of households receiving technical assistance on yield and pest management;
- Number of people employed along value chain of productive activities;
- Sales volume of the Special Purpose Vehicle (SPV) companies; and
- Number of families beneficiated by social inversion

At the community level, examples of indicators include:

- Number of social facilities; and
- Percent of electricity coverage in rural areas / Number. of Houses with access to electricity (including alternative sources)

6.3.2 RISKS FOR SMALLHOLDERS/COMMUNITY MEMBERS

Through community socialization meetings, the BioREDD+ team undertook a participatory process, to identify any potential risks to community members.

With an understanding of all of the potential risks, community stakeholders identified what they considered to be risks to the project and designed the project in such a way to avoid such trade-offs and manage the identified risks.

Specifically, community members evaluated the possibility of natural risks: i.e. the occurrence of fire, pests, climate and geological risks based on historical events or studies showing the potential that each event will occur within 10 years, every 10-25 years, every 25-50 years, every 50-100 years or 100 years or more. Furthermore, the significance of the ability of each event, depending on the potential impact on carbon (stocks) was evaluated, ranging from over 70%, 50-70%, 25-50%, 5-25%, and 0-5%. Finally, each event was assigned a mitigation potential. See Annex AU.

They also examined any potential risks related to food security. Specifically, while forest conservation can often involve trade-offs with food security by limiting access to non-timber forest products or regulating against the clearing of new land for agriculture, the communities determined that this project will not involve any such trade-offs for them. Agricultural production, including the expansion of crops into non-forest/marginal lands, is a core objective of the project, as is the enhancement of sustainable fisheries. Thus, it is expected that project activities will increase food security and climate resilience.

Also the project helps to mitigate food security risks, while helping communities adapt to climate change. Specifically, the Acai crop is flood-tolerant, and can be planted in areas subject to inundation. This is a food source that also contributes to food security and income generation, improving community resilience. Other project activities related to generation of alternative income sources to help improve food security, crop yields, and adaptability, are also serving to mitigate the risks mentioned above.

In addition, the communities identified the potential risk that the income from the productive activities will not cover the loss of income (i.e. the opportunity cost) from the reduction in logging. This was true for both the families that derive their primary annual income from timber and for families that use timber as a source of emergency funds and may apply to a broad range of stakeholders involved in the timber supply chain, beyond those that cut wood. As a mitigation measure, when the communities agreed to participate in the REDD+ project, they did so with the understanding that individual families will not be constrained from using wood that they need for livelihoods or cultural traditions (e.g. wood to construct houses, etc.). Permits provided for wood that is used in family holdings specify species, sizes of trees, etc. that can be used. The main control on timber use will be in the communal areas, outside of individual family holdings; and internal zonification and land use management plans will be created and approved by the General Assembly so that the restrictions on resource use are clear to all members of the community.

An additional social risk relates to the management and sufficiency of resources – i.e. that there is not equitable distribution of benefits between the different communities that are part of the Community Councils and that, with current carbon market conditions, the project may not realize sufficient resources to provide adequate legal employment to a sufficient number of community members. Related to this is the potential conflict between families that are logging illegally and the beneficiaries of the carbon project. To mitigate this risk, the project is following specific grievance procedures that are understood by all members of the community and designing a benefits distribution mechanism with Fondo Acción that is fully transparent to all members of the community. See section 6.3.5. Additionally, the project is considering more flexible schemes to provide broader distribution of benefits, specifically to logging families and linked with the protection of certain areas. This distribution system will be based on a spatially explicit monitoring system that provides payments based on performance (i.e. a decrease in deforestation).

The communities also identified the risk that some families will not comply with community commitments for forest and natural resource management under the REDD+ project. To mitigate this risk the BioREDD+ team and communities are, through governance activities, strengthening land tenure and use rights, undertaking mapping activities of family areas, improving management plans, demarcating boundaries, implementing additional patrolling and improving coordination with local and community authorities. The BioREDD+ team has also developed agreements with communities that include REDD+ commitments and will have broad approval from the General Assembly.

Finally, there is the perceived risk that the communities implementing the project may have to bear the costs of implementing the project, including inputs to production of new crops, and generating emissions reductions on an on-going basis. For example, the communities perceive a risk that with the new productive activities they will have to pay for the inputs to production (i.e. fertilizer, pest control), while not realizing expected yields and obtaining sufficient income. These costs, including project implementation and carbon maintenance costs, are expected to be covered by the revenue generated from the sale of emissions reductions. The BioREDD+ team has been working to mitigate any potential risk that the communities bear these costs, by developing participatory budgets based on expected revenues for each of the participating communities. Additionally, the project is providing technical assistance with agro-ecology criteria and adaptation research based on local conditions, so that communities are able to use their own resources as inputs to production.

6.3.3 MARGINALIZED AND/OR VULNERABLE GROUPS

All of the REDD+ project activities are designed to ensure that vulnerability is reduced and benefits accrue to the most marginalized and vulnerable groups, including, for example: strengthening land tenure for these groups and reaffirming use rights over natural resources; developing alternative economic activities to reduce financial vulnerability; protecting natural resources to reduce environmental vulnerability; and increasing governance capacity enhances the relationship and contact with other institutions, which reduces the vulnerability of the community.

Additionally, the project activities are focused at the family or household level and decisions are being made at a local level, by "veredeles" and zonal boards, which guarantee that marginalized and vulnerable groups – such as women, children, and elderly – will benefit and be involved in decision-making and benefits distribution.

In order to identify community groups that are marginalized and/or vulnerable, the BioREDD+ team engaged the Autonomous University of the Department of Valle, the University of Antioquia, and the Laurel Foundation (former professors from the University of Nariño) to develop socio-economic assessments. The socio-economic assessment of the communities of BCBM determined that most of the families in this area are economically marginal and/or vulnerable, generating only roughly 200,000- 400,000 pesos per month, respectively from the sale of agricultural products, collection of Mollusks, fishing, forest use and hunting. These data demonstrate that most families are considered below the poverty line, with incomes below 482,352 pesos per nuclear family of four people (Universidad Autonoma de Occidente).

Barriers that could prevent the most marginalized and vulnerable groups from participating in the project have been identified and include, for example: members of the community are not able to attend meetings either because they do have access to transportation or because they are unable to forego daily subsistence livelihood activities; some may not have training for specific jobs within the value chain of productive activities; others might not be able to access benefits due to financial, educational, and other constraints.

There may also be specific barriers for women, for example: for those who want to engage in productive activities traditionally undertaken by men, or those who do not have the approval or support of their partners to attend meetings or trainings. Additionally the low level of education in the communities may be a barrier to ensuring new opportunities for a significant number of people.

To ensure that benefits (including employment opportunities) reach women and the most vulnerable and/or marginalized people in the community Fondo Acción has designed a benefits distribution scheme that has, as a key component, the selection of beneficiaries based on clearly established criteria (i.e. to support those with the greatest need and who request to be included in the project activities). Benefit distribution plans for REDD + projects with Afro-descendant or indigenous communities are rooted in locally developed development plans. For Fondo Acción to consider these plans as legitimate they have to must be developed with broad community participation. Once the key activities for the benefit distribution plans are agreed upon, the next key step is to determine who will be directly involved in implementation. This section of the distribution plan is the place to formally define equal opportunities for all community members.

There are also a number of activities in place to ensure that vulnerable and/or marginalized people are able to participate in project design and development activities such as participatory risk assessments and community meetings. Specifically:

- The project will provide transportation needed to attend project meetings, and other stipends, particularly for those who set aside basic daily subsistence activities to attend meetings;
- The “veredales” Committees and Zonal Boards will also have clear information about the project activities and have full participation in any decision-making, including individual cases that require special attention;
- The project is ensuring the most vulnerable groups have access to training that enhances their capacity to participate in productive chains;
- In cases where families do not have clear usufruct rights, the Community Council will advance procedures for assignment of such rights;
- The selection of personnel will be based on clear procedures that ensure equal opportunities for employment for vulnerable and marginalized groups; and
- The project considers the household as the basic unit of intervention, and has analyzed the different roles of men and women within the productive processes in order to address the needs of men and women differently, and improve conditions within households.

Indicators have been developed in the monitoring plan that will allow the project to identify risks of marginalized and/or vulnerable Smallholder/Community Members not receiving benefits.

6.3.4 PARTICIPATION AND IMPACTS ON WOMEN

The project is generating net positive impacts on the welfare of women and ensuring that women participate in decision-making. The project is working with the organizational structures that are already in place, rather than imposing external conditions on project activities (e.g. the number or percentage of women that will be involved in the project activities).

Traditionally, women are already involved in agricultural activities because they have access to land. Unlike in other cultures, Afro-Colombian women do not have an inherent barrier to be able to inherit land, which is the principle source of wealth transfer in rural areas. Both women and men have full rights to inheritance: "direct blood relatives have full rights; hence, women and men have the same right to claim their part [of their inheritance]"(Camacho 1999).

Since women have access to land, they are involved in productive activities and, due to the roles that women have been developing; they participate and have control over resources, and are not excluded from decision-making processes. Specifically, Barbary and Urrea claim that the economic participation of Afro-Colombian women in urban and rural areas of the Pacific has increased, especially in the primary sector, with 35% female employment overall, a rate that is slightly above the national rural average (Barbary 2004).

Additionally, the involvement of women in the organizational structures created by Law 70, such as the Community Council, is expected to increase. In the planning workshops for the REDD+ project, women represented 21.4% of the total workshop participants (131)(Andrade 2014).

6.3.5 BENEFIT SHARING MECHANISM

The design and implementation of a benefits sharing mechanism will be developed in a participatory manner with community members, based on existing Development Plans. If a legitimate Development Plan does not exist, Fondo Acción will invest in a broader planning exercise with community participation, to design the plan to reflect current needs of the community.

If an Integrated Development Plan does exist and is complete, the benefits sharing mechanism will need to be consistent with it. If the plan does not exist or does not reflect community priorities, Fondo Acción will work closely with community members to adjust the Integrated Development Plan.

The Integrated Development Plan will serve as a framework for all community development activities, including those funded by the REDD+ project. Within this framework, Fondo Acción will develop with the communities a REDD+ Investment Plan, which will serve as a starting point for benefits distribution and reflect communities' priorities on how REDD+ revenues will be distributed. Throughout this process, Fondo Acción will ensure that any policies protect and benefit the most marginalized and vulnerable members of the community, including women, children, and elderly.

With this plan in place, Fondo Acción will establish new and independent accounts within Fondo Acción's non-profit organizational structure, and governed by Fondo Acción's existing investment policies, for each project. Each account will have a committee that decides on investments and approves budgets on an annual basis, and receives reports from outside technical experts and Fondo Acción for administrative matters. Fondo Acción will establish an in-house team of REDD+ experts that will undertake the technical management of the project; advise the committee on expenditures based on spatially-explicit monitoring information and project needs; and ensure that the community and biodiversity objectives of the project are being met. The committee will be comprised of a Fondo Acción board member and representatives of the community.

6.3.6 COMMUNICATION OF RISKS AND COSTS

The BioREDD+ team's initial social engagement process with communities included a participatory discussion of the pros and cons of developing a REDD+ project with the communities. These included issues such as volatility in prices, the need to comply with commitments, how to manage disagreements within communities, among others. See section 2.7.

More recently, Fondo Acción has continued to expand and deepen the social engagement exercise with additional materials and techniques that build upon the successful experience of the Acandi REDD+ project, and include Acandi community members as part of the social engagement team. During these socialization meetings, the BioREDD+ team invited members of Cocomasur, an Afro-Colombian community association in the municipality of Acandí that has been engaged in a REDD+ project in Chocó-Darién Conservation Corridor that started in 2010. The community members explained the benefits, risks and costs of developing and marketing a REDD+ project. In the initial exercises they discussed the risks related to being able to achieve goals, benefits distribution, the price, inclusion of a broad number of families (the fact that not all families were committed to the process). For minutes of these socialization meetings, see **Annex G**.

6.3.7 PROJECT GOVERNANCE AND IMPLEMENTATION STRUCTURE

The project governance and implementation structure is guided by the existing self-governance structures in the Afro-Colombian communities. By definition, a Community Council is an Afro-Colombian community that decides to constitute legally; specifically that it is formally associated to the State to acquire "the maximum authority of Administration within the territory of the Afro-Colombian Community." The State then acknowledges by a Resolution of the Ministry of Interior, that this Council and every Community Council has right to its defined territory.

The Community Council follows both the laws stated by the Government and the internal laws that are assigned by each community, as long as they are not contrary to the Constitution. Internal laws (derecho propio) is the set of customs, traditions, norms and duties commonly accepted by all members that share an identity and serve to auto-regulate. These internal laws are only valid between members of the community within the territory.

The Community Council is constituted by the General Assembly and the Governing Board of the Community Council. The General Assembly consists of all members of the Council and is the highest authority of the Community Council. The Governing Board of the Community Council is the authority that provides direction, coordination, implementation and internal administration of the community and performs the duties of Act 70 of 1993 and Decree 1995 1745 (see below).

The law also creates the position of Legal Representative of the Community Council (Article 12) whose role is to legally represent the community in the efforts and actions before institutions or businesses. The legal representative is elected by the General Assembly but operates under the direction of the Governing Board of the Council.

The General Assembly normally meets once a year at which time it selects the Community Council Board, evaluates their performance and discusses issues of general interest. Special meetings are held when needed, as established in the bylaws and/or internal regulations of the Community Council. Decisions of the General Assembly are generally made by consensus or by most attendees. The Governing Board is elected for a period of three years from among the Community Council members.

With a large population spread over very large areas communities form sub-level local community-based organizations called Minor Councils (Consejos Menores), which in some cases are called Veredal Committees (local level), whose structures are established in the internal rules. In some cases, the General Assembly corresponds to an Assembly of Delegates of the Minor Councils, which solves the problem of making numerous Assemblies, which are impossible to fund and manage.

There are some general statutory minimum functions (See Articles 6, 11 Decree 1745/95) and limits on the authority of the Governing Board of the Community Council. Specifically, the law states that the scope of municipal authority is limited to administrative acts. The Governing Board then administers "based on the rules and regulations in force and the use and conservation of natural resources ... in the territories of afro-Colombian Communities" (Article 11, paragraph 10).[18]

The Community Council is required by law to make "the rules of territorial administration and management of natural resources, and ensure their compliance," which are only valid with the approval of the Assembly. The contents of the regulations depend on the system of each community's customary law and include, for example: the management of family and communal lands, zoning of the territory, including permitted and prohibited activities; conflict resolution; norms for use and exploitation of natural resources, regulation of commercial activities, management plans and internal authorizations; establishing companies based on the use of common goods; and creating regulations for implementing programs and budgets for community welfare.

Thus, most aspects of the REDD+ project will be written into law, and approved by the General Assembly. The law includes the economic governance of land and resources within the territory, including management plans and economic development projects.

In the case of a REDD+ project, it should be noted that the law does not exclude the possibility that the Councils are constituted in business development instruments or ventures which seek to produce, distribute and consume jointly and efficiently, goods and services to meet the needs economic conditions of its members. Additionally, under Colombian law non-profits are able to have surpluses so long as they are distributed amongst community members. Thus, the productive activities of the project will differentiate between the actions of individuals or families and those of the community, which have collective benefits, administered by the Community Council.

Neither of these options precludes the creation of new associations or businesses to meet the specific interests of groups within a Council so long as these activities are implemented on communal resources, such as forests.

6.3.8 SMALLHOLDER/COMMUNITY MEMBER CAPACITY

The measurement of current capacity is carried out using two indices: 1. Organizational strength; and 2. Administrative capacity. During implementation of the project, these variables will be measured to determine what the communities have gained throughout the capacity building process.

With their existing REDD+ project in Cocomasur, Fondo Acción also added a component of training called the HARMOS scheme (an organizational coaching strategy designed by Fondo Acción) that includes a module for "Practice in Context" oriented to develop particular skills necessary for a specific community enterprise. Contents and tools for capacity building activities are designed to be culturally appropriate. The "Practice in Context"

[18] http://www.alcaldiabogota.gov.co/sisjur/normas/Norma1.jsp?i=7389

component of the training includes, for example, administrative and financial management (e.g. petty cash policies, employment contracts, monthly tax reports, etc.), all of which was undertaken as part of the project activities.

For this REDD+ project, Fondo Acción will develop a similar training based on existing capacity and needs. Other capacity building efforts undertaken by Fondo Acción or subcontractors could include, for example, strategic project planning, development of results chains, monitoring, etc. Specific training to support project activities will include improved forest protection, creation of livelihood programs, crop diversification, and formal training from newly created SPVs to perform tasks such as agriculture techniques, harvesting of natural harvest acai, product processing, and packaging. Also, SPVs will provide training associated with post-harvest management and to the Community Council Governing Board members in disciplines such as leadership, accounting, and management.

In the case of staff turnover, training will be passed on to new workers so that local capacity is not lost. Procedures will be developed based on Fondo Acción's existing protocols. For example, Fondo Acción requires that all Tropical Forest Conservation Alliance (TFCA) project beneficiaries prepare and turn in written documentation of all protocols, procedures, methodologies developed with TFCA funds and that these materials are left in appropriate repositories in project sites. Training activities are also a well-received component of all TFCA projects.

7 BIODIVERSITY

7.1 NET POSITIVE BIODIVERSITY IMPACTS

Methods for Estimating Project Impacts as Compared to Baseline Scenario

In order to demonstrate the project's net biodiversity impact, changes in biodiversity in both the project scenario and the projected without-project scenario have been estimated using recommended methods. Predicted changes to biodiversity in the without-project scenario have been estimated in Section **4.5** through consideration of current biodiversity trends in the project zone, expected changes in natural vegetation cover as determined through climate baseline modelling, and through an analysis of causal factors via development of a biodiversity problem flow model (Richards and Panfil, 2011). A similar conceptual model approach incorporating conservation targets, direct threats, indirect threats (aka drivers) is recommended by the Conservation Measures Partnership[19] (2013).

A theory of change approach as recommended by Richards and Panfil is used to estimate impacts to biodiversity from activities prescribed in the project scenario. The theory of change, through a simple conceptual model, provides a structured approach to thinking about how project activities lead to a series of expected short and medium term outcomes, and eventually to the desired long-term biodiversity impacts. Development of the model has involved careful consideration of the assumptions inherent to the cause and effect logic, and provides a framework from which to evaluate potential risks to the success of specific project activities (e.g. Section 2.3.3), for example, what activities and outputs need to happen to produce desired outcomes, but might not happen due to risks that have been identified prior to and during the process of model development. If project outcomes are not achieved as intended the theory of change model will be revisited as a framework for considering which cause and effect assumptions are incorrect or need adjustment, how project activities can be revised to be more effective, and if additional factors or risks exist which were not previously considered. The theory of change model also provides the framework upon which the project's monitoring of biodiversity change is based. In order to evaluate biodiversity change and the effectiveness of biodiversity related activities, indicators in the monitoring plan intentionally reflect steps along the cause and effect chain from outputs to short and medium term outcomes, and longer term impacts. Indicators have been selected to represent critical points along the cause and effect chain.

An additional benefit we considered in selecting the theory of change approach is its ability to be incorporated within ongoing community engagement processes. The simplicity of the conceptual model as developed for the project facilitates small group and in-person discussion about how project activities are expected to result in the changes desired by project communities. We anticipate that the model will help facilitate open dialogue about why or why not project activities are working effectively, and opinions about additional factors that may not have been considered initially. For these reasons the theory of change model will be revisited during community engagement activities on an annual basis. We anticipate that, inherent to an adaptive management process, the theory of change will be revised over time. This process, accomplished with the direct involvement of community members, contributes to the empowerment and capacity building aspects of BioREDD through the development of strategic thinking, planning and decision making abilities.

[19] www.conservationmeasure.org

Since project activities are primarily designed to reduce levels of deforestation and forest degradation in the project area, the estimation of biodiversity impact is primarily linked to changes in measureable forest vegetation cover conditions. This strategy aligns with Richards and Panfil's (2011, **Annex AM**) view that biodiversity change correlates strongly to changes in vegetation cover, and with Pitman (2011), that size and connectedness of forest ecosystems correlate with levels of natural ecological function. Pitman notes that implementation of biodiversity focused project activities as prescribed, in parallel with a credible demonstration of a greater extent, and/or quality of natural vegetation, the demonstration of reduced anthropogenic impact, and maintenance of HCVs is sufficient to confirm a net positive biodiversity impact for carbon projects. Changes in forest condition also reflect biodiversity impacts most directly under the influence of the project and attributable to project activities.

The richness and abundance of fauna species is a key component of biodiversity in the project area, and the status of many or most of these will be affected by forest vegetation conditions. Methods for the estimation of biodiversity impact include transect-based monitoring of fauna species, however, the ongoing status of a component of these species will be affected to some extent by factors outside the project area and/or beyond the influence of the project activities, such as hunting pressure or habitat destruction outside the project zone. Also, as noted in Section 1, species and ecosystem dynamics are not well known, including data on the proportion of species-specific life-cycles dependent on habitat conditions within versus outside the project, and the sensitivity of fauna species to forest vegetation composition and structure. These difficulties limit the ability to reliably attributable trends in the status of all or particular fauna species directly to reduced levels of deforestation and forest degradation. They also make it impractical for the project to assure that all species and biodiversity attributes will be maintained in perpetuity in the project area as a result of the project activities. As noted already, the estimation of biodiversity impact is based primarily the central project activity of forest cover retention and its broader positive correlation with biodiversity.

An uncontrolled increase in fishing pressure could have negative and devastating ecological effects on marine ecosystems. If prolonged for a significant time, marine top predator stocks will be depleted, triggering a trophic cascade mechanism, which could result in ecosystem shifts, where small planktivorous fish will dominate. In order to avoid overfishing and overexploitation of resources, the project aims to promote the use of responsible fishing practices to prevent this scenario. Community member will be trained in the use of appropriate fishing gear and techniques to improve yields, respecting species life cycles and closures (Annex BA).

A Pressure-State-Response approach, described in more detail in the monitoring plan itself, has been used to facilitate consideration of how well project interventions have resulted in positive biodiversity impacts. Response indicators are located near the beginning of the logic model and reflect the immediate outputs from project activities. Pressure indicators tend to be linked to project outcomes, whereas state indicators tend to measure longer term outcomes and impacts, or how the status of particular biodiversity variables has changed. The measurement of response indicators, or the degree to which specific project activities and outputs have been implemented as planned, enables inferences about how effective project activities were in achieving desired biodiversity outcomes. If monitoring determines, for example, that illegal logging (a pressure variable) and forest or habitat fragmentation (a state variable) continued beyond expectations, yet project activities (responses to threats) were implemented as planned, then project managers will have information from which to determine if project activities should be revised. This approach recognizes the interconnectedness of biodiversity impacts with threats and supports our ability to differentiate between biodiversity conditions in the project scenario versus the without-project scenario.

Demonstration of Net-positive Biodiversity Impact

Demonstration of net-positive biodiversity impact is accomplished by comparing the expected project impacts as identified in the theory of change model to the biodiversity conditions predicted in the without-project scenario (Section 4.5.3). This is not a comparison of project conditions to biodiversity conditions that were present at the start of the project but rather a comparison of the project scenario conditions over time to projected biodiversity conditions that would have existed over time without the project. The contribution of each project activity area toward anticipated biodiversity impacts is summarized below and depicted within each corresponding theory of change model. Broadly, project activities are each designed in different ways and based on distinct cause and effect assumptions, to reduce rates of deforestation and forest degradation. As noted above, reduced deforestation and forest degradation will result in the improved maintenance of, and in many cases the recuperation (through natural regeneration) of forest biodiversity attributes as compared to conditions in the without-project scenario. Improvements to the amount (measured in hectares) of intact or semi-intact forest vegetation cover result in forest species composition and structural attributes including crown closure, height, diameter and density which better reflect natural conditions and support natural habitat for native fauna. Improvements to the amount of intact and partially intact forest vegetation cover also support the continuation of functional biodiversity attributes including ecosystem productivity and nutrient cycling, water purification and reduced erosion, and reduced vulnerability to invasive species. They also improve landscape connectivity which contributes to processes including seed dispersion, reproduction, gene flow and associated capacity to adapt to climate change. Together these changes correlate to a net biodiversity benefit for flora in the project area, and provide habitat conditions which are conducive to the well-being of a greater number of faunal species than would be the case in the without-project scenario. A comparison of project to without-project scenario is summarized in Table 57 based on the change theory associated with each of three biodiversity relevant project activity areas. See **Annex D** for the project's complete theory of change model.

Activities	Outputs	Immediate Outcomes	Intermediate Outcomes	Impacts
Governance	Management plans assessed, updated, approved and implemented.	Greater clarity and commitment re land-use and sustainable strategies.		
	Demarcation of titled properties, land-use zones, protected areas.	Greater awareness and respect for land title and land-use designations.		
	Bylaws updated to reflect REDD, and communicated.			
Support development of productive activities	Train communities on improved techniques for crop yield.	Increased yields		
	Establish new crops. Technical assistance for crops, sustainable fishing.	Local production and employment alternatives. Dividends to the community.	Reduced reliance on unsustainable timber extraction	
	Establish processing plants (for crops) and cold storage (fish). Training on value chain dev't.			
Capacity building, administration and management.	Courses in accounting, project management, marketing, leadership, environment.	Community members capable of project management Greater awareness and concern for biodiversity.	Effective, locally driven project mgt. Greater awareness of biodiversity, the importance of land-use practices	
	Funding for REDD+ activity execution	Adequate resources for implementation		

Table 57. Overview of biodiversity theory of change model.

Governance

Support for Development and Implementation of Sustainable Forest and Land Use Management Plans

In the without-project scenario, the ongoing trend in lack of support and resources for land-use planning is likely to continue. By working with the communities to develop and update forest and land-use management plans the theory of change projects several net benefits to biodiversity. By restricting productive activities to designated areas through land-use zoning, and the protection of highly degraded areas through the establishment of reserves, degraded forests will be allowed to recover and timber extraction will be more controlled and sustainable in other areas. Updates and implementation of land-use plans will lead to greater clarity and commitment with respect to land-use. The support for these processes was not available in the baseline scenario and not likely to become available given current trends in commitment and resources. Resulting improvements to natural forest ecosystem composition, structure, and function at the landscape level in the project scenario however, equate to a clear biodiversity benefit.

Demarcating Forest, Tenure and Ownership Boundaries, and Areas of Forest Protection

To further support the realization of land-use planning and titling benefits for biodiversity, the project provides resources for the demarcation of physical boundaries. In the without-project scenario, there is no sign of support for this type of initiative. In the project scenario, however, boundary demarcation will promote awareness and a reduction of infringement on private lands and conservation reserves.

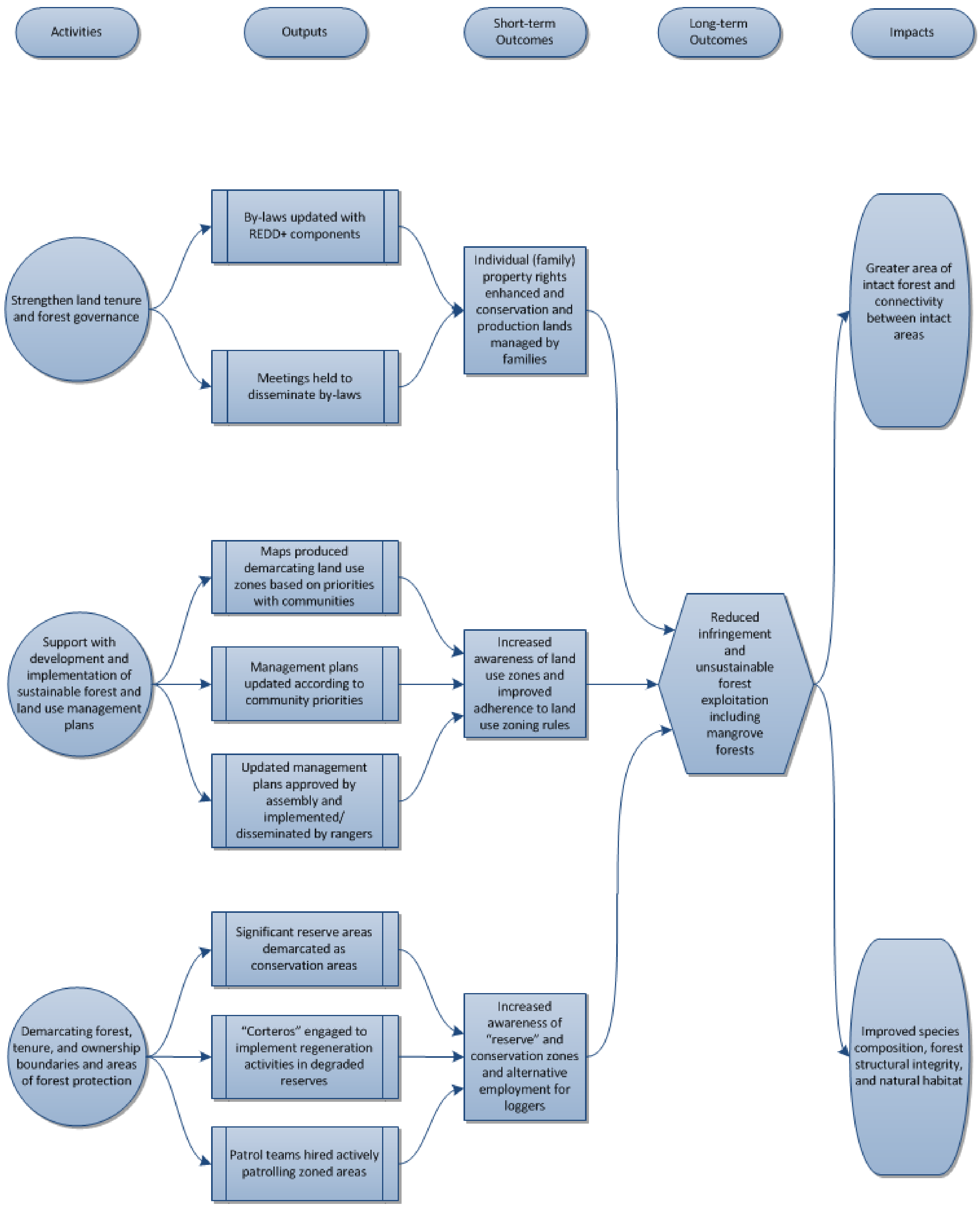

Activities
Outputs
Short-term Outcomes
Long-term Outcomes
Impacts
Strengthen land tenure and forest governance
By-laws updated with REDD+ components
Meetings held to disseminate by-laws
Individual (family) property rights enhanced and conservation and production lands managed by families
Greater area of intact forest and connectivity between intact areas
Support with development and implementation of sustainable forest and land use management plans
Maps produced demarcating land use zones based on priorities with communities
Management plans updated according to community priorities
Updated management plans approved by assembly and implemented/ disseminated by rangers
Increased awareness of land use zones and improved adherence to land use zoning rules
Reduced infringement and unsustainable forest exploitation including mangrove forests
Demarcating forest, tenure, and ownership boundaries and areas of forest protection
Significant reserve areas demarcated as conservation areas
“Corteros” engaged to implement regeneration activities in degraded reserves
Patrol teams hired actively patrolling zoned areas
Increased awareness of “reserve” and conservation zones and alternative employment for loggers
Improved species composition, forest structural integrity, and natural habitat

Figure 33. Expected biodiversity impacts from governance activities.

Productive Activitiesand Sustainable Intensification of Agriculture

Conditions at the project start, as well as projected future trends in the absence of the project, are pessimistic with respect to opportunities for development of economic and livelihood alternatives that reduce forest exploitation-based threats to biodiversity. A key component of the project's change theory is that training in improved crop (and fishing) techniques, coupled with technical assistance and the establishment of local production plants and cold storage capacity, will lead to increased yields and opportunities to generate income from sales to outside markets. Through the provision of these alternative livelihood options, the need for unsustainable forest exploitation will be reduced along with pressures on forest ecosystem integrity resulting in the biodiversity benefits described above.

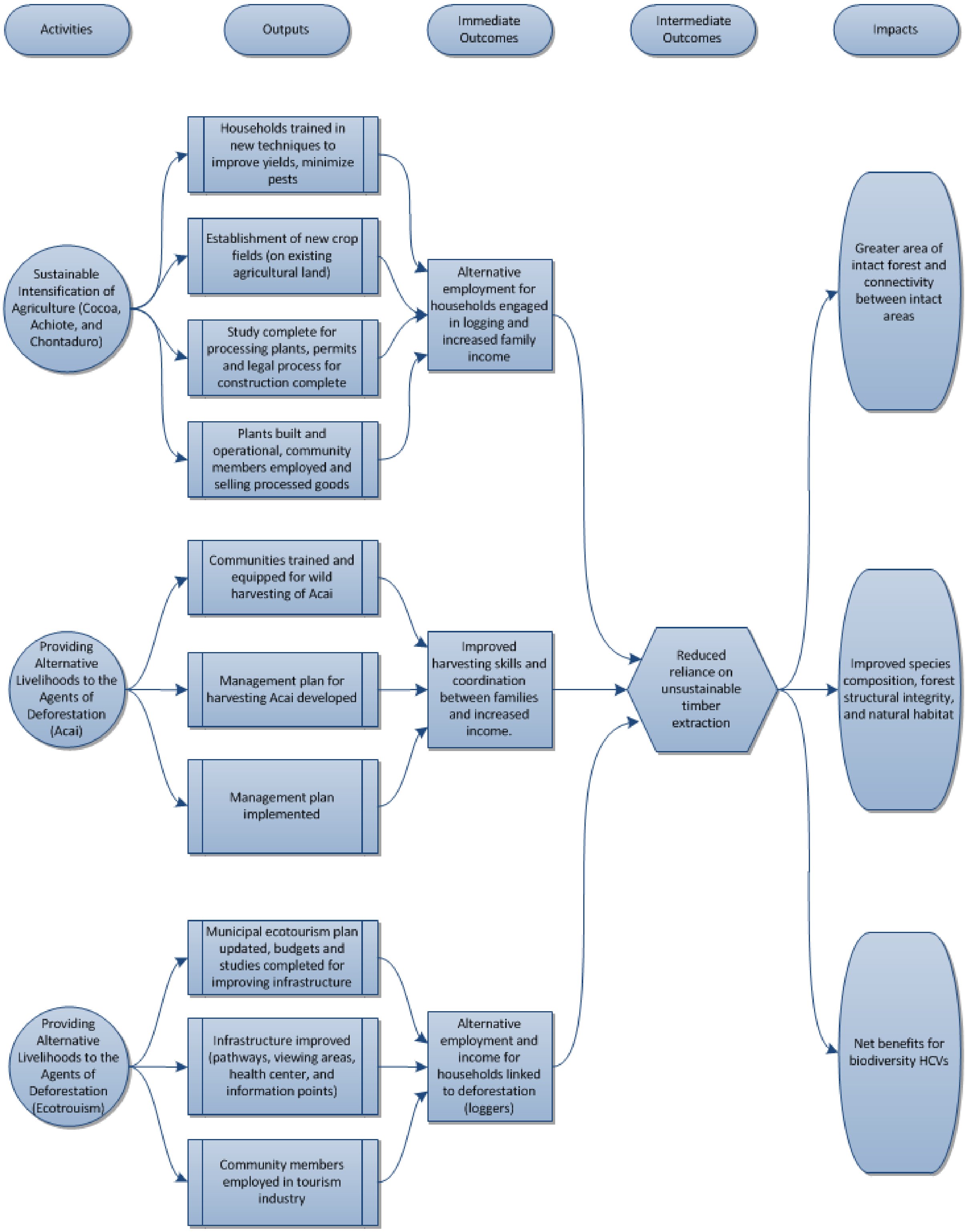

Activities
Outputs
Immediate Outcomes
Intermediate Outcomes
Impacts
Sustainable Intensification of Agriculture (Cocoa, Achiote, and Chontaduro)
Households trained in new techniques to improve yields, minimize pests
Establishment of new crop fields (on existing agricultural land)
Study complete for processing plants, permits and legal process for construction complete
Plants built and operational, community members employed and selling processed goods
Alternative employment for households engaged in logging and increased family income
Providing Alternative Livelihoods to the Agents of Deforestation (Acai)
Communities trained and equipped for wild harvesting of Acai
Management plan for harvesting Acai developed
Management plan implemented
Improved harvesting skills and coordination between families and increased income.
Reduced reliance on unsustainable timber extraction
Providing Alternative Livelihoods to the Agents of Deforestation (Ecotrouism)
Municipal ecotourism plan updated, budgets and studies completed for improving infrastructure
Infrastructure improved (pathways, viewing areas, health center, and information points)
Community members employed in tourism industry
Alternative employment and income for households linked to deforestation (loggers)
Greater area of intact forest and connectivity between intact areas
Improved species composition, forest structural integrity, and natural habitat
Net benefits for biodiversity HCVs

Figure 34. Expected biodiversity impacts of productive activities.

Capacity building, administration and management

These program areas will ensure that individuals in the project community are trained and capable to effectively manage REDD+ project activities. In doing this, the project again fills a void not addressed through other means or resources prior to project commencement, and for which there are no signs of plans in the without-project scenario. By building local management capacity the theory of change anticipates greater success in forest conservation initiatives and local leadership than would have been realized in the without-project scenario. Again, as noted above, success at reducing deforestation and degradation levels leads to greater quantity of intact forest, including structural, functional attributes, and correlated to biodiversity benefits as described above.

Improvements to local management capacity are augmented in the project scenario by investment in environmental education to raise awareness about the importance of conservation of natural resources. Training related outputs lead to short-term outcomes of increased awareness and longer-term outcomes of greater commitment toward sustainable management and conservation of forestss.

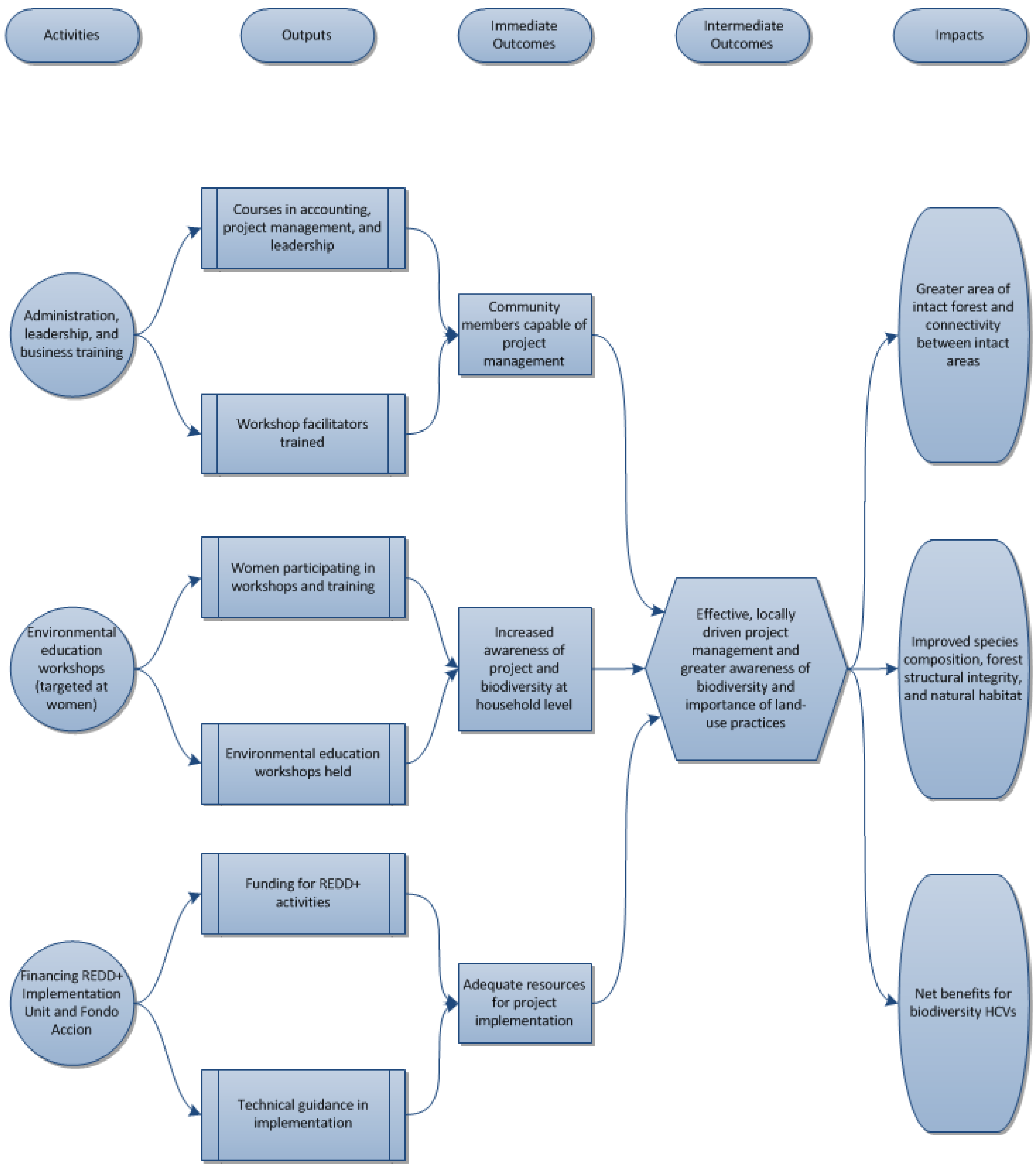


Figure 35. Expected biodiversity impacts from training and capacity building activities.

Consideration of Potential Negative and Indirect Biodiversity Impacts

Two potential negative biodiversity impacts most commonly associated with REDD projects are the displacement activities detrimental to biodiversity to offsite locations, and negative impacts associated with hunting pressure, particularly of large vertebrate species (Pitman, 2011). We address the displacement of activities to offsite locations in Section 7.2. With regard to the second, the project recognizes the potential for currently practiced hunting activities to have negative impacts on vertebrates and other species. This is the case both with and without the presence of planned project activities since hunting has been practiced traditional in the area for centuries.

Project interventions do not directly address hunting in the project area at this time, however, nor do we believe that project activities will result in increased hunting and any resulting negative biodiversity impacts. This is primarily due to the project's focus on development of alternative productive activities as identified above. Through improved crop yields and sustainable fishing activities as well as value added processing facilities community members will have increased access to locally produced agricultural products, expanded livelihood options, and greater economic means. While these and other project activities including support to land titling, land-use planning, environmental awareness and management capacity are not specifically designed with the goal of reducing hunting pressure, they are most likely to reduce reliance on hunting to meet basic needs.

Regardless of what is perceived to be a likely positive hunting-related biodiversity impact, ongoing monitoring will include the assessment of hunting trends through scheduled consultation with hunters and other stakeholders. Wildlife transects scheduled as a component of the project's monitoring plan will build existing knowledge of invertebrate population levels and form a basis from which to being monitoring future trends, and help further distinguish specific species groupings that are practical and relevant to monitor. In addition, the project has not excluded the possibility of wildlife management oriented interventions in the future such as the furthering of existing hunting regulation and controls. To be implemented effectively though more local planning and knowledge of local species and their life-cycles is required. As noted already though, the main focus for the achievement of and demonstration of positive biodiversity impact from the project is the improvement to and the assessment of forest vegetation conditions and the habitats they provide.

We considered additional negative biodiversity impacts associated with forest carbon projects (Pitman, 2011). These include species loss as a result of afforestation activities and the introduction of non-native species used for reforestation. Neither of these impacts apply to the BCBM REDD+ Project due its focus on the conservation of existing nature forest attributes. In other cases a loss of species associated with disturbed forest conditions can occur even when reforestation efforts are undertaken using native tree species. Again, this negative impact is not relevant to the project since disturbed forests are being left to recover via natural successional processes, and the result at a landscape level will better reflect natural compositional and structural conditions, habitat and biodiversity.

Net positive impact for Project area forest cover and associated biodiversity attributes

Problem flow analysis and land use change modelling as described in Section 4.5.2 estimate that in the absence of project interventions, pasture and cropland are anticipated to increase by approximately 7,900 ha and 6500 ha respectively over the next 30 years. In contrast, project activities are anticipated to reduce this forest conversion substantially. Figure 36 shows how as a result of project activities, the amount of pasture is expected to increase by only about 400 ha by 2043. Conversion of forest to cropland increases to a lesser degree as ell, i.e. by only 1467 ha in the project scenario. These values represent a significant decrease in anthropogenic impact as a result of the BCBM REDD+ Project.

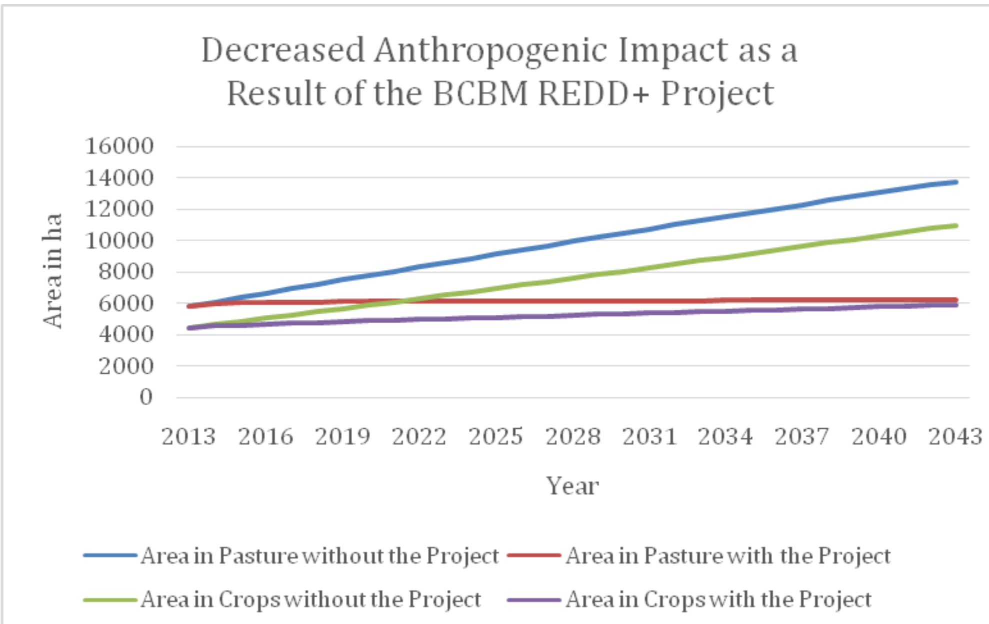


Figure 36. Decreased anthropogenic impact as a result of the BCBM REDD+ Project.

Project, biodiversity benefits ensuing from reduced levels of deforestation and forest degradation apply to approximately 38,000 hectares of currently intact tropical forest and approximately 42,500 ha of currently degraded forest in the BCBM REDD+ Project area. Land-use change projections based on current and expected future trends estimate that in the absence of project activities primary forest will disappear almost completely over the next 30 years to an area approximating only 500 ha (Figure 21). In contrast, as a result of interventions in the project scenario primary forest will decrease to a much lesser degree. In the year 2043 it will still cover an area of approximately 38,000 ha within the project area. This represents a net-positive difference of approximately 37,500 ha of primary tropical forest as a result of the project, with inherent and substantial associated biodiversity benefits as described earlier. A further benefit from project interventions is the reduction in the total amount of degraded forest from approximated 77,000 ha without the project, to approximate 47,000 ha in the project scenario. This represents an additional net-positive benefit to natural forest vegetation in the project area.

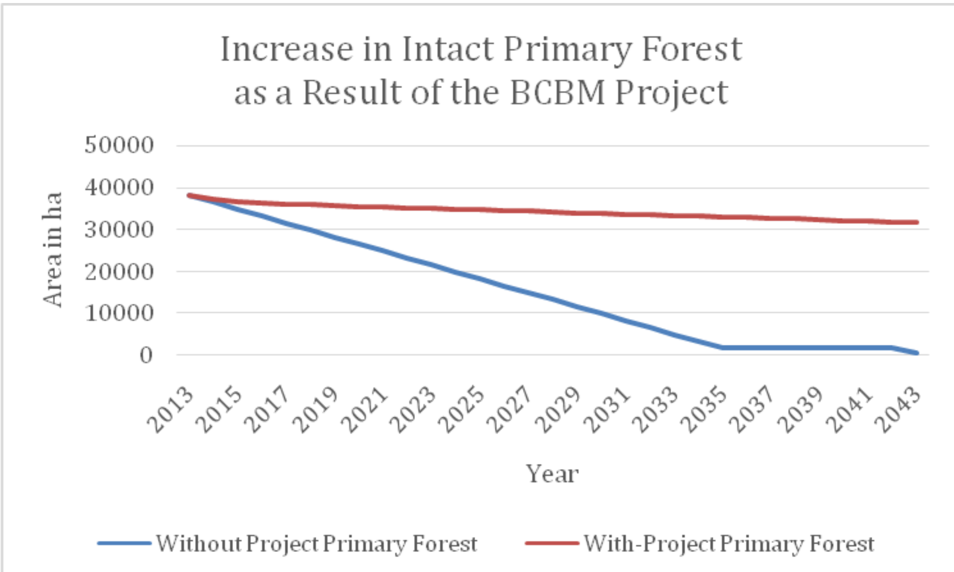


Figure 37. Increase in intact primary forest as a result of the BCBM project.

Together, demonstrated reduction to anthropogenic impact, and demonstrated increase in the quantity andquality of natural vegetation and associated biodiversity benefits in the project area signify a substantial net-positive biodiversity impact as a result of the project. These estimations are based on both situational analysis including trends, threats and contributing factors (Section 4.5.3), as well as change theory analysis and the results of LULC modelling. Additional means for the ongoing measurement of biodiversity impact will be developed and implemented as the project further develops the data base of starting condition biodiversity information and the specific methods for its ongoing measurement.

7.1.1 MAINTENANCE AND ENHANCEMENT OF HIGH CONSERVATION VALUES

Biodiversity High Conservation Values for the Project as detailed in Section 1.3.8 are:

HCV 1: Concentrations of biological diversity:

La Sierpe regional nature park
Threatened species: numerous RTE species
Endemic species: high endemism in the region, associated forest types and identified on site
Mangrove forests

HCV 2: Landscape level ecosystems and mosaics

Intact and partially intact forest area sufficient to support naturally occurring species in natural patterns of distribution and abundance.

HCV 3: Rare, threatened or endangered ecosystems

Mangroves

By improving the natural condition of forest ecosystems and reducing anthropogenic impact through the reduction of forest degradation and deforestation levels the project substantially improves the maintenance and protection of biodiversity High Conservation Values compared to the without-project scenario. As noted earlier, the maintenance of natural forest attributes, including structure, composition and function is favourable to and correlates well to better overall outcomes for biodiversity. The cause and effect theory behind the achievement of improved natural forest conditions is documented in the project's biodiversity theory of change in Section 7.1. While it is not possible to guarantee the outcome of HCVs on a species by species level due both to the impracticality of monitoring each of the many HCV species likely present, and the influence of factors outside the control of the project such as unrelated hunting and habitat destruction outside the project zone, it is clear that the project provides improved conditions, including species habitat, at a broad level for HCVs throughout the project area and zone.

On a more specific level it is possible to say that for HCV 1, barring other regional factors outside the influence of the project, the biodiversity outcome for La Sierpe nature park will be improved due to the improved forest ecosystem and habitat conditions outcomes within the project area adjacent to it, and improved landscape connectivity overall. Outcomes for threatened and endemic species will be improved in comparison to baseline conditions due to improved habitat conditions (see indicator suggestions by Pitman, 2011, p. 33), but this will not necessarily be the case for each and every species due to other factors mentioned already. Improved outcomes for the landscape and ecosystem orientated HCVs 2 and 3 (and to a significant extent HCV 1 as well) are demonstrated in the Section 7.1 discussion and graphical depiction of reduced anthropogenic impact and increase in primary forest area in the project compared to the without-project scenario.

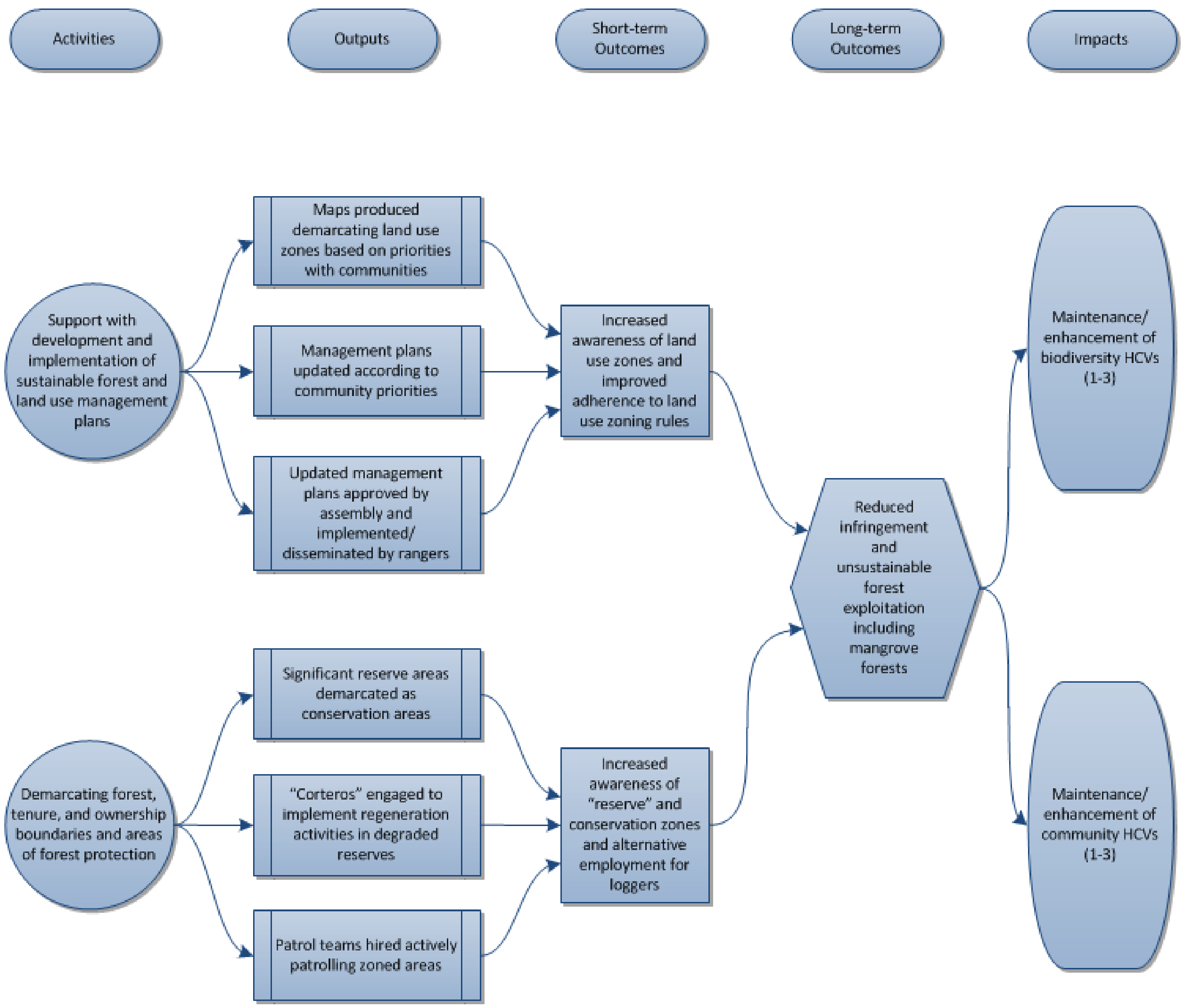


Figure 38. Expected impacts on HCVs.

7.1.2 SPECIES USED IN PROJECT

Species designated for use within project activities at this time are: Cocoa, Coconut and Acai. Cocoa is already commonly used in the project area and the region, and is widely considered to be non-invasive. Coconut is also non-invasive. Acai occurs naturally in the project area. Documentation about the non-invasive and/or local nature of these species is kept on file by BioREDD+ and the Project. If additional species are considered for use by the project they will be similarly assessed. In addition, by conserving and restoring natural forest conditions including forest vegetation cover and crown closure, project activities that reduce deforestation and forest degradation levels promote conditions for natural species and reduce the favourability of conditions for common invasive species, e.g. by restoring shade and minimizing exposed soil.

No GMOs will be used by the project.

Only organic fertilization and pest control methods will be used since these are the methods which community members are currently accustomed to using and which will be further promoted by the project. Chemical methods have historically been beyond the economic means of community members and will not be promoted by the project. If the project encounters a need for the use of any chemical methods at a future date then there will be a prior assessment of possible adverse effects and standard operating procedures produced to ensure their safety to the environment and employees. Any chemicals in use and associated safe operating procedures will be made available during subsequent project verifications.

Standard operating procedures for identifying, classifying and managing all waste products resulting from project activities (e.g. agricultural waste, processing facilities waste), will be developed during the detailed design stage of each relevant project activities. These procedures will be implemented, including adequate training of workers, prior to operations commencement and will be made available during subsequent project verifications.

Offsite Biodiversity Impacts

Potential negative impacts on biodiversity outside the project zone can be linked to project leakage, i.e. the displacement of deforestation or forest degradation related activities outside the project zone. They can also be linked to the displacement of activities such as mining, to locations outside the project zone that have limited or no existing forest cover. In this case, the displacement of these activities would not be tied to GHG leakage since forest cover would not be removed outside the project zone, yet biodiversity could still be negatively impacted.

In the case of the latter example of potential negative impact, mining activities are not important in the project area and are not a focus of project activities. Therefore it is not likely that any negative impacts will result offsite form mining activity displacement. The same is true for potential agricultural displacement but for different reasons. It is unlikely that any areas outside the project zone already devoid of forest cover would still be suitable for agricultural activities, or that their implementation would result in negative impact beyond what has already occurred.

In addition to offsite impacts linked to project activity leakage there are factors which will have an influence toward neutral and positive biodiversity impacts outside the project zone. First, project activities do not currently limit hunting activity inside the project zone. This limits the possibility that hunters will move their activities offsite as a result of the project. If the project considers implementing hunting related interventions in the future then potential offsite impacts will be considered, addressed and presented during subsequent verifications. Beyond this low likelihood of hunting related impacts offsite, the improvement to natural forest conditions and associated habitat in the project area will result in benefits to species which spend a portion of their life-cycle offsite but depend on forest ecosystems in the project for one or more life-cycle stages, migratory birds being one example. An additional offsite benefit will be the improved connectivity that project area forests provide with adjacent and nearby ecosystems. This also brings potential climate adaptation benefits through improved seed dispersal as mentioned in more detail previously.

8 MONITORING

8.1 DESCRIPTION OF THE MONITORING PLAN

8.1.1 ORGANIZATION

As the project's implementation partner, Fondo Acción will coordinate and manage monitoring procedures over the project lifetime (see **Annex Q**). The project liaison will coordinate with monitoring experts to ensure that all monitoring SOPs are followed and oversee training of the forest, community, and biodiversity monitoring teams. Fondo Acción will fill the monitoring expert positions with qualified subcontractors or internal staff according to the qualifications listed below. As staff and contractors will inevitably change over the course of the project lifetime, current names and qualifications of individuals involved in monitoring and implementation will be listed in the Monitoring and Implementation Report prior to verification.

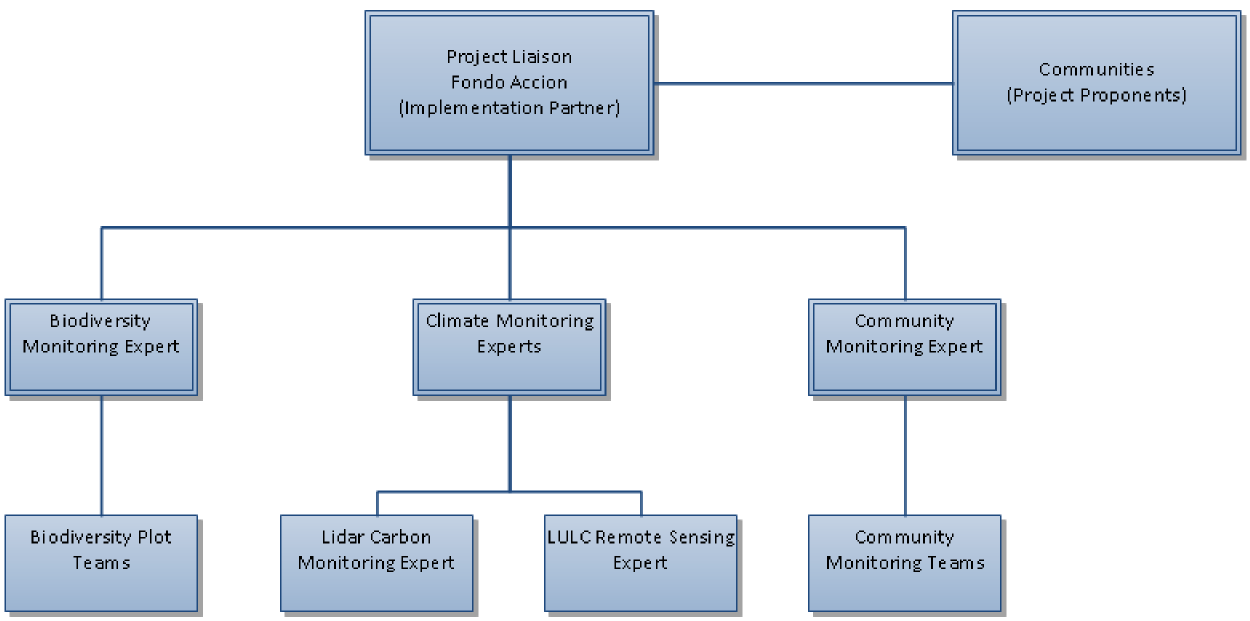


Figure 39. Monitoring organizational chart.

<table>
<tr><th>Role</th><th>Responsibilities</th><th>Competencies</th></tr>
<tr><td>Project Liaison</td><td>Oversight of the project

Direction of remote sensing, community, and monitoring experts

Oversight of monitoring team training

Review compliance with QA/QC procedures

Report monitoring results to project proponents and assist in preparing monitoring and implementation reports</td><td>At least a bachelor’s degree or equivalent

Experience managing teams

Experience working in the same region or country as the project

Has a language in common with all subordinate managers</td></tr>
<tr><td>Biodiversity Monitoring Expert</td><td>Direct subordinate biodiversity monitoring teams

Train biodiversity monitoring teams

Consolidate and prepare biodiversity monitoring reports

Develop permanent biodiversity plots and monitoring methodology</td><td>At least a bachelor’s degree or equivalent

Experience managing teams and conducting faunal and floral biodiversity surveys

Experience working in the same region or country as the project</td></tr>
<tr><td>Lidar Carbon Monitoring Expert</td><td>Direct lidar analysts with statistical carbon calculation expertise

Train lidar and carbon monitoring teams if necessary

Consolidate data carbon estimates and update of baseline carbon emission factors, prepare measurement data, estimates, and reports</td><td>At least a master degree with extensive lidar remote sensing and forest biometry skills with extensive experience in statistical analysis on carbon estimates and uncertainty analysis.

Experience managing teams and leading airborne lidar inventory</td></tr>
<tr><td>LULC Remote Sensing Expert</td><td>Direct remote sensing analysts and Lidar flight operations

Consolidate and prepare LULC change</td><td>At least a bachelor’s degree in remote sensing (preferably master’s degree) with extensive remote</td></tr>
</table>

	monitoring reports Perform technical remote sensing analysis	sensing experience Experience managing teams
Community Monitoring Expert	Direct subordinate community monitoring teams Train community monitoring teams Consolidate and prepare community monitoring reports	At least a bachelor's degree or equivalent Experience managing teams and conducting socio-economic surveys and participatory rural appraisals Extensive experience working in the same region or country as the project

Table 58. Roles, responsibilities and competencies for experts implementing monitoring plan.

8.1.2 DATA

Methods for generating and storing data are described in the relevant monitoring SOPs and in the Climate Monitoring Plan (GeoEcoMap task 14, Annex U). Fondo Acción's project liaison will ensure that data is properly collected, stored, and reported in the Monitoring and Implementation Report prior to verification.

8.1.3 MANAGEMENT SYSTEM

Each parameter measured will have an associated measurement SOP for each monitoring period, created by the Expert for each sector. If an SOP is adapted from one monitoring period to the next, the documents should be versioned and archived and the monitoring report reference the version and title of the SOP used for that monitoring period. All updates to SOPs shall be approved by the sector expert and the Project Liaison. The project liaison is responsible for ensuring that all SOPs are adhered to by the team managers.

8.1.3.1 Quality Assurance and Control

The project liaison is responsible for creation and adaption of QA/QC protocols as required, and for any technical direction of the sector experts or teams. The project liaison is responsible to make sure the QA/QC protocols are carried out by the sector experts.

All data will be reported to project proponents and local stakeholders and any discrepancies or disagreements will be rectified by explanation or joint visitation of activities in question. All publically available satellite data used in monitoring, validation, verification and certification will be archived and made available to auditors.

8.1.3.1.1 Calibration

All measurement and monitoring equipment shall be calibrated per the relevant SOP and the manufacturer's manual for that equipment.

8.1.3.1.2 Managing Data Quality

Internal audits

The community, biodiversity and remote sensing experts are responsible for an internal audit of approximately 10% of the measurements for data and parameters monitored, using a risk-based assessment for selection. If there is a deviation of more than 5% in the measurement and re-measurement of the parameter, the deviation is to be investigated and resolved. When updating data stored electronically, the file should be versioned.

8.1.3.1.3 Data Handling

Data handling is subject to Fondo Acción's internal procedures. Data entered on data sheets shall be archived using redundant electronic copies and in hard copy. All data entry shall be reviewed using a risk-based sampling approach by another party than the person originally doing the data entry. The SOP for each set of measurements shall specify the spreadsheet template used for data collation with a description of the fields for each template. Data checks shall be performed per the relevant SOP. Values recorded or estimated shall be compared with those in other comparable areas or in the literature to verify reasonableness.

8.1.3.1.4 Remote Sensing

The remote sensing and Lidar experts will implement all relevant procedures contained in the Climate MRV (GeoEcoMap Task 14, Annex U) and include results in the Monitoring and Implementation Report prior to verification.

8.1.4 INITIAL MONITORING PLAN

The initial monitoring follows the requirements for a REDD project including those stated in ISO 14065-2, CCBA Standard v3.0, VCS Standard, AFOLU requirements, and VM0006 v2.1. Data and parameters available at validation are included in Section **8.2**.

8.1.4.1 Community

The project expects to generate net-positive community impacts through an array of project activities described in Section **2.2** above. This expectation is based on the theory of change casual models presented in Section **6.1**. As such, community monitoring is based on measuring outputs, outcomes, and impacts of project activities over the project lifetime. Initially, only outputs are monitored, as outcomes and impacts will only be evident once the project activities have been fully implemented. Initial community monitoring parameters are listed in Section **8.3**.2 below.

Given the conservation-oriented nature of the project, there is a relatively low risk that the project will have a negative impact on the community HCVs identified in Section **1.3.8**. The community monitoring parameters include measures to detect any unintended negative impacts on community HCVs. Detailed community monitoring procedures including frequency, training, and types of measurements are included in the Community Monitoring SOP (**Annex S**).

8.1.4.2 Biodiversity

As stated above, the project is expected to have net-positive impacts on biodiversity and HCVs in the project zone as a result of project activities and the project's theory of change causal model. By monitoring outputs, outcomes, and impacts of project activities, the project will demonstrate long-term impacts on biodiversity. The pressure-state-response method is used to determine the effectiveness of project activities at protecting and enhancing biodiversity in project zone at the ecosystem and species level.

At the ecosystem level, forest biomass monitoring will demonstrate the efficacy of activities designed to reduce degradation and deforestation—resulting in increased forest structure and composition. This will be done using the same remote sensing monitoring techniques described in the Climate Monitoring Plan (GeoEcoMap Report 14, Annex U)). Biodiversity impacts will also be monitored at the species level using permanent plots according to the Biodiversity Monitoring SOP (**Annex T**).

8.1.4.3 Climate

Climate benefits will be determined and monitored using remote sensing techniques. Details on these procedures are included in the Climate Monitoring Plan (GeoEcoMap Report 14, Annex U).

Selected pools included and excluded in the project scenario and a justification for that decision are as follows:

Included/ excluded	Included/ excluded	Justification
Above-ground tree biomass	Yes	Major carbon pool affected by project activities.
Above-ground non-tree biomass	Yes	Expected to increase from project activities. Must be included when the land cover under the baseline scenario is perennial tree crop.
Below-ground biomass	Yes	Major carbon pool affected by project activities.
Dead Wood	Yes	Potentially affected by project activities.
Litter	No	Excluded as per VCS *AFOLU Requirements*.
Soil	No	SOM has been conservatively excluded as it is expected to decrease in the baseline.

Wood Products	Yes	Major carbon pool affected by project activities

Table 59. Selected pools monitored.

8.1.4.3.1 Carbon Stocks and Remote Sensing

Carbon stocks are measured through the use of calibrated Lidar before every baseline update. For verification events where Lidar flights aren't planned, a conservative model to update the carbon stocks for primary forests will be applied to account for degradation that may have occurred but cannot be captured through the LULC change monitoring procedures. See the Climate Monitoring Plan (GeoEcoMap Task 14, Annex U) for more details..

8.1.5 REPORTING

Monitoring and Implementation Reports will be prepared prior to verification in order to demonstrate net-positive climate, community, and biodiversity impacts over the monitoring/implementation period.

8.1.5.1 Dissemination

Monitoring and Implementation Reports will be posted in the public domain on the CCBA and VCS websites in accordance with each program's procedures. Summaries of monitoring results will be disseminated to stakeholders and community members within the project zone prior to verification.

8.2 DATA AND PARAMETERS AVAILABLE AT VALIDATION (CL3)

The parameters listed here are required for validation. Some of these values have not been filled in due to missing information.

Data/parameter [EA1]:	CF
Data unit:	[Mg C (Mg DM)$^{-1}$]
Description:	Carbon fraction of dry matter in wood
Sources of data:	Default value of 0.5 (IPCC GPG-LULUCF 2003) Conservative value of 0.485 (Annex AA GeoEcoMap Task 8 & 9)
Value applied:	0.485
Justification of choice of data or description of measurement methods and procedures applied:	According to the IPCC, the default value of 0.5 Mg C (Mg DM)^-1 is applicable for all three tiers when remaining forest land, forest land or biomass carbon is a key or non-key category. However, for this project a more conservative value of 0.485 was used as per (Annex AA GeoEcoMap Task 8 & 9).
Any comment:	

Data/parameter [EA2]:	E
Data unit:	[-]
Description:	Average combustion efficiency of the aboveground tree biomass
Sources of data (*):	Project-specific measurements Regionally valid estimates Estimates from Table 3.A.14 of IPCC GPG LULUCF If no appropriate combustion efficiency can be used, use the IPCC default of 0.5
Value applied:	0.3
Justification of choice of data or description of measurement methods and procedures applied:	IPCC 2006 gives this value for tropical moist primary forest types.
Any comment:	The value of 0.40 is provided as an average combustion efficient for aboveground tree biomass in tropical moist secondary forests.

Data/parameter [EA3]:	P
Data unit:	[-]
Description:	Average proportion of mass burned from the aboveground tree biomass.

Sources of data:	GPG-LULUCF Table 3A.1.13
Value applied:	83.9
Justification of choice of data or description of measurement methods and procedures applied:	83.9 is the mean provided by the IPCC for the average proportion of mass burned from the aboveground tree biomass in primary tropical forests which is the forest type the project for the most part, aligns with.
Any comment:	For secondary tropical forests, 8.1 is provided as an average value for young secondary tropical forests, 41.1 for intermediate secondary tropical forests, and 46.4 for advanced secondary tropical forests. These are provided here because some of growth within the project area is secondary but as a majority, it is still primary forest.

Data/parameter [EA4]:	GWP_{CH4}
Data unit:	[-]
Description:	Global Warming Potential for CH_4
Sources of data:	IPCC default value of 25
Value applied:	25
Justification of choice of data or description of measurement methods and procedures applied:	IPCC 2007 Fourth Assessment Report: Climate Change 2007 states that over a 100 year time horizon, the GWP for CH4 is 25.
Any comment:	

Data/parameter [EA5]:	ER_{CH4}
Data unit:	Proportion
Description:	Emission ratios for CH_4
Sources of data:	Table 3A.1.15 in IPCC GPG-LULUCF 2003
Value applied:	0.012
Justification of choice of data or description of measurement methods and procedures applied:	IPCC default value of 0.012 provided.
Any comment:	(0.009-0.015) Delmas, 1993 asterisked in IPCC table

Data/parameter [EA6]:	sc_1
Data unit:	[-]
Description:	First shape factor for the forest scarcity equation; steepness of the decrease in deforestation rate (greater is steeper).

Sources of data:	Statistical fitting procedure. Using remotely sensed forest cover data in heavily deforested areas close to the project area such as neighboring provinces, states or countries
Value applied:	
Justification of choice of data or description of measurement methods and procedures applied:	Use procedure from VM0006 v2.1
Any comment:	

Data/parameter [EA7]:	sc_2
Data unit:	[-]
Description:	Second shape factor for the forest scarcity equation; relative deforested area at which the deforestation rate will be 50% of the initial deforestation rate.
Sources of data:	Statistical fitting procedure. Using remotely sensed forest cover data in heavily deforested areas close to the project area such as neighboring provinces, states or countries
Value applied:	
Justification of choice of data or description of measurement methods and procedures applied:	Use procedure from VM0006 v2.1
Any comment:	

Data/parameter [EA8]:	$wwf(ty)$
Data unit:	[-]
Description:	Fraction of carbon in harvested wood products that are emitted immediately because of mill inefficiency for wood class ty. This can be estimated by multiplying the applicable fraction to the total amount of carbon in different harvested wood product category.
Sources of data:	The default applicable fraction is 24% and 19% respectively for developing and developed countries (Winjum et al. 1998).
Value applied:	24%
Justification of choice of data or description of measurement methods and procedures applied:	Winjum et al. 1998 states that the default fraction is 24% for developing countries.
Any comment:	Any new updates from locally generated results can be used instead of the default values.

Data/parameter [EA9]:	$slp(ty)$
Data unit:	[-]
Description:	Proportion of short lived products
Sources of data:	Default values are 0.2, 0.1, 0.4 and 0.3 respectively for wood class ty, i.e., sawnwood, wood-based panel, paper and paper boards and other industrial round woods as described in Winjum et al. (1998).
Value applied:	0.2
Justification of choice of data or description of measurement methods and procedures applied:	Winjum et al. provides the above values for sawnwood, wood-based panel, paper/paper boards and industrial roundwood
Any comment:	Any new updates from locally generated results can be used instead of the default values. The methodology assumes that all other classes of wood products are emitted within 5 years.

Data/parameter [EA10]:	$fo(ty)$
Data unit:	[-]
Description:	Fraction of carbon that will be emitted to the atmosphere between 5 and 100 years of harvest for wood class ty.
Sources of data:	See (Winjum et al. 1998).
Value applied:	0.84
Justification of choice of data or description of measurement methods and procedures applied:	Winjum et al. provides these values for the fraction of carbon that will be emitted into the atmosphere between 5 and 100 years after harvest for tropical wood classes.
Any comment:	Any new updates from locally generated results can be used instead of the default values.

Data/parameter [EA11]:	$\rho_{wood,j}$
Data unit:	[Mg DM m^{-3}]
Description:	Average basic wood density of species or species group j
Sources of data:	GPG-LULUCF Table 3A.1.9. or published data/literature.
Value applied:	See Section 5.3.4, emissions factors, for the vector of densities used
Justification of choice of data or description of measurement methods and procedures applied:	IPCC table 3A. 1.9-2 provides average basic wood densities for multiple species in tropical America.

Any comment:	

Data/parameter [EA12]:	BEF_2
Data unit:	[-]
Description:	Biomass expansion factor for converting volumes of extracted round wood to total aboveground biomass (including bark).
Sources of data:	IPCC GPG LULUCF Table 3A.1.10 or published data from scientific peer reviewed literature
Value applied:	Broadleaf = 3.4 (2.0 – 9.0)
Justification of choice of data or description of measurement methods and procedures applied:	BEF2 value for tropical broadleaf trees values according to IPPCC LULICF table 3A.1.10.
Any comment:	

Data/parameter [EA13]:	$EF_{rice,max}$
Data unit:	[kg CH_4 ha^{-1} day^{-1}]
Description:	Maximal emission factor for methane
Sources of data:	By default, an emission rate of 36 kg CH4 ha^{-1} day^{-1} must be used, which is 25% greater than the maximal value found in a review study comparing 23 studies of CH4 fluxes in rice fields (Le Mer and Roger, 2001). Project proponents may use a smaller emission rate if it can be demonstrated from empirical data or other supporting information such as published data that the rate remains conservative for the project conditions.
Value applied:	36
Justification of choice of data or description of measurement methods and procedures applied:	Default provided by Le Mer and Roger, 2001.
Any comment:	Only to be included if rice production is increased as a leakage prevention measure. Currently this project activity is not planned and thus this parameter is not applied.

Data/parameter [EA14]:	$NCV_{biomass}$

Data unit:	[TJ (Mg DM) $^{-1}$]
Description:	Net calorific value of non-renewable biomass that is substituted.
Sources of data:	0.015 TJ (Mg DM) $^{-1}$ IPCC default value.
Value applied:	0.015
Justification of choice of data or description of measurement methods and procedures applied:	IPCC default provided
Any comment:	Currently livestock grazing is not planned and thus this parameter is not applied.

8.3 DATA AND PARAMETERS MONITORED

The following data and parameters will be monitored by the biodiversity, community and climate monitoring teams prior each verification event. These parameters have been selected to correspond to the requirements of VM0006 and the outputs and outcomes of the theory of change model.

8.3.1 CLIMATE

*: Lower-ranked options may only be used if higher-ranked options are not available.

8.3.1.1 Sizes, areas, and transitions

Data/parameter [MN1]:	$size_{projectArea}$, $size_{leakageArea}$. $size_{referenceregion}$, $size_{referenceForest}$
Data unit:	[ha]
Description:	Size of project area, leakage area, reference region, and forest area in the reference region
Sources of data:	Project design
Description of measurement methods and procedures to be applied:	Coverage and demarcations will be monitored and created through the use of satellite imagery.
Frequency of monitoring/recording:	$size_{projectArea}$ and $size_{leakageArea}$ may be adjusted during crediting period per the rules for grouped projects and updated at verification, but only for the additional instances that were added after the project start date.
Value applied:	
Monitoring equipment:	GIS software, Landsat imagery
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	

Data/parameter [MN2]:	$\Delta area_{projectAreaEAH,ProjectScenario}(t,i)$
Data unit:	[ha yr^{-1}]
Description:	Hectares undergoing transition i within the project area, excluding ANR and harvest areas, under the project scenario during year t. [ha yr^{-1}].
Sources of data:	Remote sensing analysis
Description of measurement methods and procedures to be applied:	Procedures should be described in the Monitoring Report
Frequency of monitoring/recording:	At least once before verification
Value applied:	
Monitoring equipment:	GIS software, Landsat imagery
QA/QC procedures to be applied:	Data is to be entered into internal archive. Archive is accessed by qualified, authorized technical experts. All documents for monitoring, validation, verification and certification are reviewed and signed off by several team members. Data will be reported to project proponents and stakeholders. Discrepancies or disagreements will be justified by

	explanation or by visitation of the activities in question. All available satellite data for monitoring, validation, verification and certification will be archived and made available to auditors.
Calculation method:	
Any comment:	

Data/parameter [MN3]:	$\Delta area_{projectAreaEAH,baselineScenario}(t,i)$
Data unit:	[ha yr^{-1}]
Description:	Hectares undergoing transition i within the project area, excluding the ANR area, and harvest areas, under the baseline scenario for year t.
Sources of data:	Land-use change modeling
Description of measurement methods and procedures to be applied:	Procedures should be described in the Monitoring Report
Frequency of monitoring/recording:	At least once before every baseline. For added instances, may be recalculated at verification.
Value applied:	
Monitoring equipment:	GIS software, Landsat imagery
QA/QC procedures to be applied:	Data is to be entered into internal archive. Archive is accessed by qualified, authorized technical experts. All documents for monitoring, validation, verification and certification are reviewed and signed off by several team members. Data will be reported to project proponents and stakeholders. Discrepancies or disagreements will be justified by explanation or by visitation of the activities in question. All available satellite data for monitoring, validation, verification and certification will be archived and made available to auditors.
Calculation method:	
Any comment:	

Data/parameter [MN4]:	$\Delta area_{projectAreaWithANR,baselineScenario}(t,i)$
Data unit:	[ha yr^{-1}]
Description:	Hectares undergoing transition i within the leakage area under the project scenario for year t.
Sources of data:	
Description of measurement methods and procedures to be applied:	
Frequency of	

monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	Only applicable if project proponent decides to include ANR activities.

Data/parameter [MN5]:	$\Delta area_{leakageArea,projectScenario}(t,i)$
Data unit:	[ha yr^{-1}]
Description:	Hectares undergoing transition i within the leakage area under the project scenario for year t
Sources of data:	Remote sensing analysis
Description of measurement methods and procedures to be applied:	Procedures should be described in the Monitoring Report
Frequency of monitoring/recording:	At least once before verification
Value applied:	
Monitoring equipment:	GIS software, Landsat imagery
QA/QC procedures to be applied:	Data is to be entered into internal archive. Archive is accessed by qualified, authorized technical experts. All documents for monitoring, validation, verification and certification are reviewed and signed off by several team members. Data will be reported to project proponents and stakeholders. Discrepancies or disagreements will be justified by explanation or by visitation of the activities in question. All available satellite data for monitoring, validation, verification and certification will be archived and made available to auditors.
Calculation method:	
Any comment:	

Data/parameter [MN6]:	$\Delta area_{leakageArea,baselineScenario}(t,i)$
Data unit:	[ha yr^{-1}]
Description:	Hectares undergoing transition i within the leakage area under the baseline scenario during year t
Sources of data:	Land-use change modeling
Description of measurement methods and procedures to be applied:	Procedures should be described in the Monitoring Report

Frequency of monitoring/recording:	Once every baseline update. May also be updated at the time of instance inclusion that requires new leakage area.
Value applied:	
Monitoring equipment:	GIS software, Landsat imagery
QA/QC procedures to be applied:	Data is to be entered into internal archive. Archive is accessed by qualified, authorized technical experts. All documents for monitoring, validation, verification and certification are reviewed and signed off by several team members. Data will be reported to project proponents and stakeholders. Discrepancies or disagreements will be justified by explanation or by visitation of the activities in question. All available satellite data for monitoring, validation, verification and certification will be archived and made available to auditors.
Calculation method:	
Any comment:	

Data/parameter [MN7]:	$\Delta area_{historical}(CS_1 \rightarrow CS_2, t_1 \rightarrow t_2)$
Data unit:	[ha yr^{-1}]
Description:	Area of transition from LULC class or forest stratum 1 to 2 from time 1 to 2 during the historical reference period
Sources of data:	Remote sensing analysis
Description of measurement methods and procedures to be applied:	Procedures should be described in the Monitoring Report
Frequency of monitoring/recording:	At least once before every baseline update
Value applied:	
Monitoring equipment:	GIS software, Landsat imagery
QA/QC procedures to be applied:	Data is to be entered into internal archive. Archive is accessed by qualified, authorized technical experts. All documents for monitoring, validation, verification and certification are reviewed and signed off by several team members. Data will be reported to project proponents and stakeholders. Discrepancies or disagreements will be justified by explanation or by visitation of the activities in question. All available satellite data for monitoring, validation, verification and certification will be archived and made available to auditors.
Calculation method:	
Any comment:	

Data/parameter [MN8]:	$RFRGrate(CS_1 \rightarrow CS_2)$

Data unit:	[yr^{-1}]
Description:	Relative annual forest cover increase and regeneration factor for the transition from class or stratum 1 to 2.
Sources of data:	Remote sensing analysis
Description of measurement methods and procedures to be applied:	Procedures should be described in the Monitoring Report
Frequency of monitoring/recording:	At least once before every baseline update
Value applied:	
Monitoring equipment:	GIS software, Landsat imagery
QA/QC procedures to be applied:	Data is to be entered into internal archive. Archive is accessed by qualified, authorized technical experts. All documents for monitoring, validation, verification and certification are reviewed and signed off by several team members. Data will be reported to project proponents and stakeholders. Discrepancies or disagreements will be justified by explanation or by visitation of the activities in question. All available satellite data for monitoring, validation, verification and certification will be archived and made available to auditors.
Calculation method:	
Any comment:	It can be used for producing baseline transition matrix for new instances to be added into the project area.

Data/parameter [MN9]:	$area_{historical}(CS_1, t_1)$
Data unit:	[ha]
Description:	Total area of LULC class or forest stratum 1 at time 1
Sources of data:	Remote sensing analysis
Description of measurement methods and procedures to be applied:	Procedures should be described in the Monitoring Report
Frequency of monitoring/recording:	At least once before every baseline update
Value applied:	
Monitoring equipment:	GIS software, Landsat imagery
QA/QC procedures to be applied:	Data is to be entered into internal archive. Archive is accessed by qualified, authorized technical experts. All documents for monitoring, validation, verification and certification are reviewed and signed off by several team members. Data will be reported to project proponents and stakeholders. Discrepancies or disagreements will be justified by

	explanation or by visitation of the activities in question. All available satellite data for monitoring, validation, verification and certification will be archived and made available to auditors.
Calculation method:	
Any comment:	

Data/parameter [MN10]:	$area_{biomssLos}(i)$
Data unit:	[ha yr^{-1}]
Description:	Total annual area of LULC class that was cleared for creating firebreaks
Sources of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	NA
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	Analysis of fire breaks needs to be completed.

Data/parameter [MN11]:	$area_{fireBiomassLoss}(i)$
Data unit:	[ha yr^{-1}]
Description:	Annual area of forest stratum that was cleared by using prescribed burning
Sources of data:	
Description of measurement methods and procedures to be applied::	
Frequency of monitoring/recording:	
Value applied:	NA
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	Analysis of prescribed burns needs to be completed.

Data/parameter [MN12]:	$area_{fireBiomassLoss,ANR}(t,i)$
Data unit:	[ha]
Description:	Area of biomass removed by prescribed burning within ANR stratum i during year t
Sources of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	NA
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	Analysis of prescribed burns needs to be completed.

Data/parameter [MN13]:	$area_{projectAreaWithANR,projectScenario}(t,i)$
Data unit:	[ha]
Description:	Amount of land on which ANR activities are planned under the project scenario for year t and in stratum i
Sources of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	NA
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Only applicable if ANR activities are included in the project.
Any comment:	

Data/parameter [MN14]:	$area_{harvest}(t,i)$
Data unit:	[ha]
Description:	Area of forest in harvest stratum i that is harvested at time t.
Sources of data:	

Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	NA
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	No harvesting activity in project area.

Data/parameter [MN15]:	$area_{projectAreaWithHarvest,projectScenario}(t,i)$
Data unit:	[ha yr^{-1}]
Description:	Size of strata i within the project area with harvest activities during year t under the project scenario.
Sources of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	NA
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	No harvesting activity in project area.

Data/parameter [MN16]:	$\Delta area_{projectAreaWithHarvest,baselineScenario}(t,i)$
Data unit:	[ha yr^{-1}]
Description:	Hectares undergoing transition i within the harvest areas under the baseline scenario during year t.
Sources of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	

Value applied:	NA
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	No harvesting activity within project area.

Data/parameter [MN17]:	$BetaReg_{DF}(t)$ and $BetaReg_{DG}(t)$
Data unit:	[ha yr^{-1}]
Description:	Beta regression model describing the relationship between time and deforestation/degradation rate in the reference region during the historical reference period.
Sources of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	NA
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	Model used to predict deforestation must be clarified, and analysis must be completed.

8.3.1.2 Locations, Descriptions, Qualitative and Social Data

Data/parameter [MN18]:	Area under agricultural intensification
Data unit:	[ha]
Description:	Size of the area of agricultural intensification separated for each agricultural intensification measure
Sources of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN19]:	Yields under agricultural intensification
Data unit:	[Mg ha^{-1}]
Description:	Harvested yield for agricultural intensification practices
Sources of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN20]:	NTFP harvest rate
Data unit:	[m^3 yr^{-1}] or [kg yr^{-1}]
Description:	Annual volumes of non-timber forest products extracted

Sources of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN21]:	Local NTFP price
Data unit:	Local currency
Description:	Price of non-timber forest products on local markets
Sources of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	Analysis must be completed in order to fill this section in.

8.3.1.3 Dates on Drivers and Actions

Data/parameter [MN22]:	$CFW_{baseline}$
Data unit:	[m^3 yr^{-1}]
Description:	Annual volume of fuel wood gathering for commercial sale and charcoal production in the baseline scenario
Sources of data (*):	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN23]:	$DFW_{baseline}$
Data unit:	[m^3 yr^{-1}]
Description:	Annual volume of fuel wood gathered for domestic and local energy in the baseline scenario
Sources of data (*):	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN24]:	$DFW_{project}$
Data unit:	[m^3 yr^{-1}]
Description:	Biomass (dry matter) of fuel wood collected by project participants

	under the project scenario.
Sources of data (*):	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN25]:	$DFW_{allowed}$
Data unit:	[m^3 yr^{-1}]
Description:	Biomass (dry matter) of allowed fuel wood collection in the project area under the project scenario. This amount is typically fixed in a management plan. [m3 yr-1]
Sources of data (*):	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN26]:	$VG_{baseline}$
Data unit:	[m^3 yr^{-1}]
Description:	Biomass (dry matter) of understory vegetation extraction by project participants under the baseline scenario. [Mg DM yr-1]
Sources of data (*):	
Description of measurement methods and procedures to be	

applied:	
Frequency of monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN27]:	$VG_{project}$
Data unit:	[Mg DM yr-1]
Description:	Biomass (dry matter) of understory vegetation extraction by project participants under the project scenario.
Sources of data (*):	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	At least once before verification
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN28]:	$VG_{allowed}$
Data unit:	[Mg DM yr-1]
Description:	Biomass (dry matter) of allowed as understory vegetation extraction under the project scenario. This amount is typically fixed in a management plan
Sources of data (*):	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	

Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN29]:	$CT_{baseline}(h, j, ty, t)$
Data unit:	[m^3 yr^{-1}]
Description:	Annually extracted volume of harvested timber round-wood for commercial on-sale under the baseline scenario during harvest by species j and wood product class ty during year t
Sources of data (*):	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	At least once before every baseline update
Value applied:	
Monitoring equipment:	None
QA/QC procedures to be applied:	Data is to be entered into internal archive. Archive is accessed by qualified, authorized technical experts. All documents for monitoring, validation, verification and certification are reviewed and signed off by several team members. Data will be reported to project proponents and stakeholders. Discrepancies or disagreements will be justified by explanation or by visitation of the activities in question. All available satellite data for monitoring, validation, verification and certification will be archived and made available to auditors.
Calculation method:	Calculated using EQ4 of VM0006 v2.1
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN30]:	$CT_{allowed}$
Data unit:	[m^3 yr^{-1}]
Description:	Annually allowed volume of harvested timber round-wood for commercial on-sale under the project scenario
Sources of data (*):	
Description of measurement methods and procedures to be applied:	
Frequency of	

monitoring/recording:	
Value applied:	NA
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	No harvesting activity in project area.

Data/parameter [MN31]:	$CT_{project}(h, j, ty, t)$
Data unit:	[m^3 yr^{-1}]
Description:	Annually extracted volume of harvested timber round-wood for commercial on-sale inside the project area under the project scenario during harvest h by species j and wood product class ty during year t.
Sources of data (*):	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	NA
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	No harvesting activity in project area.

Data/parameter [MN32]:	$DT_{baseline}(h, j, ty, t)$
Data unit:	[m^3 yr^{-1}]
Description:	Annually extracted volume of timber for domestic and local use, round wood under the baseline scenario during harvest h by species j and wood product class ty during year t.
Sources of data (*):	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	At least once before every baseline update
Value applied:	
Monitoring equipment:	None

QA/QC procedures to be applied:	Data is to be entered into internal archive. Archive is accessed by qualified, authorized technical experts. All documents for monitoring, validation, verification and certification are reviewed and signed off by several team members. Data will be reported to project proponents and stakeholders. Discrepancies or disagreements will be justified by explanation or by visitation of the activities in question. All available satellite data for monitoring, validation, verification and certification will be archived and made available to auditors.
Calculation method:	Calculated using EQ5 of VM0006 v2.1
Any comment:	

Data/parameter [MN33]:	$DT_{allowed}$
Data unit:	$[m^3\ yr^{-1}]$
Description:	Annually allowed volume of harvested timber round-wood for domestic and local use under the project scenario
Sources of data (*):	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	NA
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	No harvesting activity in project area.

Data/parameter [MN34]:	$DT_{project}(h, j, ty, t)$
Data unit:	$[m^3\ yr^{-1}]$
Description:	Annually extracted volume of timber for domestic and local use, round wood inside the project area under the project scenario during harvest h by species j and wood product class ty during year t.
Sources of data (*):	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	

Value applied:	NA
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	No harvesting activity in project area.

Data/parameter [MN35]:	$contribution_{DF}(d)$ and $contribution_{DG}(d)$
Data unit:	[-]
Description:	Relative contribution of driver i respectively to total deforestation and forest degradation.
Sources of data:	Use procedure from VM0006 v2.1
Description of measurement methods and procedures to be applied:	Remote sensing LULC analysis and emissions factors
Frequency of monitoring/recording:	At least once before baseline update.
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Data is to be entered into internal archive. Archive is accessed by qualified, authorized technical experts. All documents for monitoring, validation, verification and certification are reviewed and signed off by several team members. Data will be reported to project proponents and stakeholders. Discrepancies or disagreements will be justified by explanation or by visitation of the activities in question. All available satellite data for monitoring, validation, verification and certification will be archived and made available to auditors.
Calculation method:	VM0006 v2.1 8.1.3.2
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN36]:	$RelativeDriverImpact_{DF}(t,d)$ and $RelativeDriverImpact_{DG}(t,d)$
Data unit:	[-]
Description:	Relative impact of the geographically unconstrained driver d at time t of the crediting period respectively on deforestation and forest degradation.
Sources of data:	Use procedure from VM0006 v2.1
Description of measurement methods and procedures to be applied:	Remote sensing LULC analysis and emissions factors

Frequency of monitoring/recording:	At least once before baseline update.
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Data is to be entered into internal archive. Archive is accessed by qualified, authorized technical experts. All documents for monitoring, validation, verification and certification are reviewed and signed off by several team members. Data will be reported to project proponents and stakeholders. Discrepancies or disagreements will be justified by explanation or by visitation of the activities in question. All available satellite data for monitoring, validation, verification and certification will be archived and made available to auditors.
Calculation method:	VM0006 v2.1 8.1.3.2
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN37]:	$leakage_{unconstrained}(d)$
Data unit:	[-]
Description:	Leakage cancellation rate for avoiding deforestation/degradation from geographically unconstrained drivers.
Sources of data:	
Description of measurement methods and procedures to be applied:	NA
Frequency of monitoring/recording:	At least once before baseline update.
Value applied:	NA
Monitoring equipment:	
QA/QC procedures to be applied:	Data is to be entered into internal archive. Archive is accessed by qualified, authorized technical experts. All documents for monitoring, validation, verification and certification are reviewed and signed off by several team members. Data will be reported to project proponents and stakeholders. Discrepancies or disagreements will be justified by explanation or by visitation of the activities in question. All available satellite data for monitoring, validation, verification and certification will be archived and made available to auditors.
Calculation method:	NA
Any comment:	Unless a lower rate can be justified, a default rate of 100% must be used.

Data/parameter [MN38]:	$effectiveness(a,d)$
Data unit:	[-]
Description:	Effectiveness of every project activity a in decreasing any deforestation driver$d$ relative to that driver's contribution to deforestation and forest degradation,
Sources of data:	
Description of measurement methods and procedures to be applied:	NA
Frequency of monitoring/recording:	At least once before baseline update.
Value applied:	NA
Monitoring equipment:	
QA/QC procedures to be applied:	Data is to be entered into internal archive. Archive is accessed by qualified, authorized technical experts. All documents for monitoring, validation, verification and certification are reviewed and signed off by several team members. Data will be reported to project proponents and stakeholders. Discrepancies or disagreements will be justified by explanation or by visitation of the activities in question. All available satellite data for monitoring, validation, verification and certification will be archived and made available to auditors.
Calculation method:	NA
Any comment:	The $effectiveness(a,d)$ factor represents the maximal effectiveness during the crediting period.

Data/parameter [MN39]:	$\Delta A_{rice}(t)$
Data unit:	[ha]
Description:	Annual increase in harvested area of rice due to leakage prevention measures.
Sources of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	

Calculation method:	
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN40]:	$t_{flooded,max}$
Data unit:	[days yr^{-1}]
Description:	Maximal period of time a field is flooded
Sources of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN41]:	$GR_{baseline}$
Data unit:	[-]
Description:	Number of grazing animals of type g within the project boundary baseline
Sources of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN42]:	$GR_{allowed}$
Data unit:	[-]

Description:	Number of grazing animals of type g allowed for grazing within the project boundary in the project scenario
Sources of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN43]:	$Fuelwood\,(t)$, $Fuel\,(t)$
Data unit:	[$m^3\ yr^{-1}\ HH^{-1}$]
Description:	Average annual volume of biomass fuel consumed by households in the absence of the project activity in year t for cooking purpose.
Sources of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	NA
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	No fuel wood activity in project area. Cook stoves not included as activities in project area.

Data/parameter [MN44]:	$HH_{non-CFE}(t)$
Data unit:	[-]
Description:	Total number of households in the project area that collect biomass fuel from the project area and do not use CFE in year t.
Sources of data:	

Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	NA
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	No fuel wood activity in project area. Cook stoves not included as activities in project area.

Data/parameter [MN45]:	η_{old}
Data unit:	[-]
Description:	Efficiency of the project cook stoves or appliances.
Sources of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	NA
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	No cook stove activity in project area.

Data/parameter [MN46]:	η_{new}
Data unit:	[-]
Description:	Efficiency of the baseline cook stoves or appliances.
Sources of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	NA

Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	No cook stove activity in project area.

Data/parameter [MN47]:	$U_{CFE}(t)$
Data unit:	[-]
Description:	Fraction of cumulative usage rate for technologies in project scenario in year t. [-]
Sources of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN48]:	$DF_{LeakageCFE}(t)$
Data unit:	[-]
Description:	Leakage discount factor applicable to GHG emissions reduction benefits from CFE activities [-]
Sources of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	NA
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	

Any comment:	No leakage discount factor included in project area.

Data/parameter [MN49]:	$EF_{non-CO2,fuel}$, $EF_{CO2,fuel}$
Data unit:	[t CO_2 TJ^{-1}]
Description:	Respectively, non-CO2 emission factor of the fuel that is reduced and CO2 emission factor for the substitution of non-renewable woody biomass by similar consumers.
Sources of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN50]:	EF_{forest}
Data unit:	[t CO_2e]
Description:	Emission factor related to leakage.
Sources of data:	If comprehensive national-level statistics on biomass densities are available, EF_{forest} must be calculated based on the average biomass of the country, if local data is not available. Sources of the data allowed are (1) academic research papers and (2) studies and reports published by the forestry administration or other organizations, including the FAO's Forest Resource Assessment reports, (3) the upper range of biomass in the GPG-LULUCF (2003) Table 3A.1.2.
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	At least once before verification
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Data is to be entered into internal archive. Archive is accessed by qualified, authorized technical experts. All documents for monitoring,

	validation, verification and certification are reviewed and signed off by several team members. Data will be reported to project proponents and stakeholders. Discrepancies or disagreements will be justified by explanation or by visitation of the activities in question. All available satellite data for monitoring, validation, verification and certification will be archived and made available to auditors.
Calculation method:	
Any comment:	

8.3.1.4 Data on Organic Matter and Carbon Densities

Data/parameter [MN51]:	$OM_o(i)$
Data unit:	[Mg DM ha-1]
Description:	Plant-derived organic matter of LULC class or forest stratum i in pool o. [Mg DM ha-1]
Sources of data:	Estimates using Lidar data
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	At least once before every baseline update
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Follow uncertainty deduction procedures described in methodology. Ensure calibrated Lidar data.
Calculation method:	
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN52]:	$proportion_{DF}(d)$ and $proportion_{DG}(\mathrm{d})$
Data unit:	[-]
Description:	Proportion of the gradual carbon loss that leads to deforestation or forest degradation, respectively, due to driver d
Sources of data:	
Description of measurement methods and procedures to be applied:	LULC and emissions factors
Frequency of monitoring/recording:	At least once before every baseline update
Value applied:	
Monitoring equipment:	NA
QA/QC procedures to be applied:	Data is to be entered into internal archive. Archive is accessed by qualified, authorized technical experts. All documents for monitoring, validation, verification and certification are reviewed and signed off by several team members. Data will be reported to project proponents and stakeholders. Discrepancies or disagreements will be justified by explanation or by visitation of the activities in question. All available satellite data for monitoring, validation, verification and certification will be archived and made available to auditors.

Calculation method:	
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN53]:	$C(t,i)$
Data unit:	[Mg C ha^{-1} yr^{-1}]
Description:	Carbon stock density at time t in stratum i.
Sources of data:	Estimate using calibrated Lidar data
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	AOnce before verification and before every baseline update
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Data is to be entered into internal archive. Archive is accessed by qualified, authorized technical experts. All documents for monitoring, validation, verification and certification are reviewed and signed off by several team members. Data will be reported to project proponents and stakeholders. Discrepancies or disagreements will be justified by explanation or by visitation of the activities in question. All available satellite data for monitoring, validation, verification and certification will be archived and made available to auditors.
Calculation method:	
Any comment:	Used in estimating change in carbon stock density such as in ANR areas.

Data/parameter [MN54]:	$f_{allometric}(y)$
Data unit:	Equation
Description:	Allometric relationship to convert a tree metric such as DBH or tree height into biomass
Sources of data (*):	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	May be updated at baseline update
Value applied:	

Monitoring equipment:	NA
QA/QC procedures to be applied:	Data is to be entered into internal archive. Archive is accessed by qualified, authorized technical experts. All documents for monitoring, validation, verification and certification are reviewed and signed off by several team members. Data will be reported to project proponents and stakeholders. Discrepancies or disagreements will be justified by explanation or by visitation of the activities in question. All available satellite data for monitoring, validation, verification and certification will be archived and made available to auditors.
Calculation method:	
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN55]:	$f_{belowground}(y)$
Data unit:	Equation
Description:	Relationship between aboveground and belowground biomass, such as a root-to-shoot ratio
Sources of data (*):	Standard root-to-shoot ratios as found in Table 4.A.4 of the IPCC GPG-LULUCF 2003
Description of measurement methods and procedures to be applied:	NA
Frequency of monitoring/recording:	May be updated at baseline update
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Data is to be entered into internal archive. Archive is accessed by qualified, authorized technical experts. All documents for monitoring, validation, verification and certification are reviewed and signed off by several team members. Data will be reported to project proponents and stakeholders. Discrepancies or disagreements will be justified by explanation or by visitation of the activities in question. All available satellite data for monitoring, validation, verification and certification will be archived and made available to auditors.
Calculation method:	NA
Any comment:	

Data/parameter [MN56]:	$C_{Harvest}(t,i)$
Data unit:	Mg C ha-1
Description:	Biomass carbon stock density at time *t* in stratum *i* in harvested areas.
Sources of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	NA
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	No harvesting activity in project area.

Data/parameter [MN57]:	$CE_{inventory,harvest(t,i)}$
Data unit:	[-]
Description:	Combined error in estimate of average biomass stock density in harvest areas in stratum i at time t.
Sources of data (*):	
Description of measurement methods and procedures to be applied:	NA
Frequency of monitoring/recording:	At least once before verification
Value applied:	NA
Monitoring equipment:	
QA/QC procedures to be applied:	Data is to be entered into internal archive. Archive is accessed by qualified, authorized technical experts. All documents for monitoring, validation, verification and certification are reviewed and signed off by several team members. Data will be reported to project proponents and stakeholders. Discrepancies or disagreements will be justified by explanation or by visitation of the activities in question. All available satellite data for monitoring, validation, verification and certification will be archived and made available to auditors.
Calculation method:	NA
Any comment:	Uncertainty estimate in carbon stocks in harvested strata must come

	from sampling of plots in harvested areas.

Data/parameter [MN58]:	$CE_{inventory,ANR\,(t,i)}$
Data unit:	[-]
Description:	Combined error in estimate of average biomass stock density in ANR areas in stratum i at time t.
Sources of data (*):	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN59]:	$u_{classification}$
Data unit:	[-]
Description:	Discounting factor for NERs from avoided deforestation, based on the accuracy of classification, i.e. dividing land into broad land use types.
Sources of data:	
Description of measurement methods and procedures to be applied:	VM006 v2.1, 8.1.2.7
Frequency of monitoring/recording:	At least once before verification
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Data is to be entered into internal archive. Archive is accessed by qualified, authorized technical experts. All documents for monitoring, validation, verification and certification are reviewed and signed off by several team members. Data will be reported to project proponents and stakeholders. Discrepancies or disagreements will be justified by explanation or by visitation of the activities in question. All available satellite data for monitoring, validation, verification and certification will be archived and made available to auditors.

Calculation method:	NA
Any comment:	

Data/parameter [MN60]:	$u_{stratification}$
Data unit:	[-]
Description:	Discounting factor for NERs from avoided degradation, based on the accuracy of stratification, i.e. dividing forest into individual forest biomass classes.
Sources of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value applied:	NA
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	Analysis must be completed in order to fill this section in.

Data/parameter [MN61]:	$u_{transition}\ (i)$
Data unit:	[-]
Description:	Discounting factor for the emission factor for the transition from LULC class or forest stratum 1 to class 2 according to the uncertainty of the biomass inventory.
Sources of data:	LULC analysis, classification
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	At least once before verification
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Data is to be entered into internal archive. Archive is accessed by qualified, authorized technical experts. All documents for monitoring, validation, verification and certification are reviewed and signed off by several team members. Data will be reported to project proponents and stakeholders. Discrepancies or disagreements will be justified by

	explanation or by visitation of the activities in question. All available satellite data for monitoring, validation, verification and certification will be archived and made available to auditors.
Calculation method:	NA
Any comment:	All measurements within allowed threshold Analysis must be completed in order to fill this section in.

8.3.2 COMMUNITY

Data/parameter:	Involvement of the community in the surveillance and patrolling of forests
Data unit:	Number of people hired in the REDD+ units (number of rangers)
Description:	There will be a record of the people hired for the REDD+ Units.
Sources of data:	Registration form of people engaged in the REDD+ Units
Description of measurement methods and procedures to be applied:	There will be a form for each registered person in the REDD+ Units. There will be an update of the information of the people in the REDD+ Units, every month. Each person must fill in a data base with basic information, such as identification number, gender, age, location, and number of people in beneficiary household.
Frequency of monitoring/recording:	Monthly
Value applied:	Cost included in the tasks of the community leader and / or rangers
Monitoring equipment:	Engagement/register form. Spreadsheet or database project.
QA/QC procedures to be applied:	Predefined form for the collection of basic data will be used. Identification number is used to avoid double counting of a person. There will be analog and digital records. FONDO ACCION will be responsible for hiring and supervising the staff responsible for carrying out QA/QC.
Calculation method:	Every person involved will count.
Any comment:	

Data/parameter:	Involvement of Corteros, women and young people (and/or “piangueras” for projects with mangrove) in the regeneration and maintainance of the conservation areas
Data unit:	Number of corteros (and/or piangueras)
Description:	People recognized as 'corteros' (or 'piangueras') linked through the Community Council in regeneration tasks and / or maintenance of forest. A “cortero” is a person whose income depends mainly on logging. A piangüera is the person dedicated to the extraction of piangua in mangrove areas and whose income depends mainly on the activity.
Sources of data:	Registration form of people engaged in the regeneration and maintenance of forests, and households benefited
Description of measurement methods and procedures to be applied:	There will be a form for each related person and household, which includes basic information such as identification number, gender, age, location and number of people in beneficiary household (discriminated by gender and age). Data should be recorded on the form, once the person is engaged to regeneration activities and / or maintenance of the forest. The information recorded on the form will be typed into a spreadsheet or a database designed for the project.
Frequency of monitoring/recording:	Monthly
Value applied:	Cost included in the tasks of the community leader and / or rangers
Monitoring equipment:	Engagement form and recipient household. Spreadsheet or database project.
QA/QC procedures to be applied:	Predefined form for the collection of basic data will be used. Identification number is used to avoid double counting of a person. There will be analog and digital records. FONDO ACCION will be responsible for hiring and supervising the staff responsible for carrying out QA/QC.
Calculation method:	Every person involved will count.
Any comment:	

Data/parameter:	Trained and equipped people
Data unit:	Number of people
Description:	A qualified person is one who participates in training activities which can be formal, informal, or virtual. These activities are supported by the project,and may include training modules such as short courses, workshops, job training or exchanges of experiences, within others. A person who completes this training course is considered a qualified or trained person. A training course will allow a person to appropriate of a specific subject. It has a leader or instructor, and its' objectives, methodology and activities are designed to achieve and ensure learning.
Sources of data:	Records of training follow-ups
Description of measurement methods and procedures to be applied:	At the start of the training course there will be a registration of the participants. At the end the trainer will send the attendance list of the trainees to the Project Coordinator, in order record it in a spreadsheet or database.
Frequency of monitoring/recording:	Quarterly
Value applied:	Cost included in the tasks of the community leader and / or rangers
Monitoring equipment:	Registration form, digital and spreadsheet data base
QA/QC procedures to be applied:	Predefined form for the registration data. Identification number is used to avoid double counting of a person. There will be analog and digital records. FONDO ACCION will be responsible for hiring and supervising the staff responsible for carrying out QA/QC.
Calculation method:	N/A
Any comment:	

Data/parameter:	Households receiving technical assistance
Data unit:	Number of households
Description:	A household with technical assistance has access to advisory activities, technical training and education about establishing, maintening, harvesting and post-harvesting agricultural products.
Sources of data:	Track records of households training
Description of measurement methods and procedures to be applied:	The Technical Assistant will carry a record of counseling and training activities offered to the households visited.
Frequency of monitoring/recording:	Monthly
Value applied:	N/A
Monitoring equipment:	Register form, assistance list, digital database generated by th Technical Assistant.
QA/QC procedures to be applied:	FONDO ACCION will be in charge of contracting and supervising the staff needed to carry out the QA/QC.
Calculation method:	N/A
Any comment:	

Data/parameter:	Enhancement / Establishment of new productive agricultural activities
Data unit:	Number of new established hectares/enhanced
Description:	The new established hectares for each agricultural product will be counted, as an indicator of project implementation and new activities adoption. Hectares already established receiving resources, goods or services to enhance productivity.
Sources of data:	Track record of households properties
Description of measurement methods and procedures to be applied:	Technical register format (digital and physical) of the new established hectares per family engaged to REDD+ Project. This register will be recorded by the Technical Assistant of the REDD+ Project. Each Assistant must have a register form per each household visited.
Frequency of monitoring/recording:	Biannual
Value applied:	N/A
Monitoring equipment:	
QA/QC procedures to be applied:	FONDO ACCION will be responsible for hiring the personnel needed for QA/QC
Calculation method:	N/A
Any comment:	

Data/parameter:	Employed people in the value chains
Data unit:	Number of people
Description:	There will be a record of the people hired in the in the Special Purpose Vehicle (SPV) companies, as well as in the different steps in the value chain, such as crop setting, transport and logistics, stockpiling, transformation and packaging.
Sources of data:	Records of families involved in the REDD+ Project and contracts of people hired in the Special Purpose Vehicle (SPV) companies
Description of measurement methods and procedures to be applied:	Keep a digital record of the people who are working in the in the Special Purpose Vehicle (SPV) companies
Frequency of monitoring/recording:	Biannual
Value applied:	N/A
Monitoring equipment:	Register form and copy of contracts
QA/QC procedures to be applied:	FONDO ACCION will be responsible for hiring the personnel needed for QA/QC
Calculation method:	
Any comment:	

Data/parameter:	Sales volume of the Special Purpose Vehicle (SPV) companies
Data unit:	Tons of sold transformed products
Description:	There will be a daily record of sales of transformed products, in digital format, specifying national and international sales. This will contribute to the indicator of business growth.
Sources of data:	Sales formats; bills; sales tracking sheets
Description of measurement methods and procedures to be applied:	Daily records of sales, in digital format, identifying the market in which the product is sold. In addition, a bi-monthly sales report, including information of buyers, market trends, sales and customer feedback will be presented to the Community Council
Frequency of monitoring/recording:	Daily
Value applied:	N/A
Monitoring equipment:	Sales formats
QA/QC procedures to be applied:	The Manager of the Special Purpose Vehicle (SPV) companies Company will be responsible for creating a Quality Control department. FONDO ACCION will supervise.
Calculation method:	N/A
Any comment:	

Data/parameter:	Net income of the Special Purpose Vehicle (SPV) companies
Data unit:	Colombian pesos earned/ period
Description:	There will be a daily record of sales of transformed products, in digital format, specifying national and international sales. This information will be gathered and analyzed bi-monthly, in order to keep track of business growth and income to be able to control an equitably benefit distribution amongst the habitants of the communities of the REDD+ Projects.
Sources of data:	Sales formats; bills; sales tracking sheets
Description of measurement methods and procedures to be applied:	Daily records of sales, in digital format, identifying the market in which the product is sold. In addition, a bi-monthly sales report, including information of buyers, market trends, sales and customer feedback will be presented to the Community Council
Frequency of monitoring/recording:	Daily recording of sales. Bi-monthly reports
Value applied:	N/A
Monitoring equipment:	Sales formats
QA/QC procedures to be applied:	The Manager of the Special Purpose Vehicle (SPV) companies Company will be responsible for creating a Quality Control department. FONDO ACCION will supervise.
Calculation method:	N/A
Any comment:	

Data/parameter:	Sales volume of cash crops established by the REDD+ Project
Data unit:	Tons of sold raw agricultural products
Description:	There will be a daily record of sales of raw agricultural products, grown by the families engaged in the REDD+ Projects, to the SPV companies. This will contribute to monitor the project implementation, as well as the successful engagement of families in the alternative activities set by the REDD+ Projects.
Sources of data:	Sales formats; bills; sales tracking sheets
Description of measurement methods and procedures to be applied:	Families will keep a daily record of sales. In addition, a bi-monthly sales report, including information of buyers, market trends, sales and customer feedback will be presented to the Community Council. The REDD+ Project Coordinator must collect the physical formats that families fill in, and make a digital spreadsheet with the information.
Frequency of monitoring/recording:	Daily record of sales. Bi-monthly report.
Value applied:	N/A
Monitoring equipment:	Sales formats; spreadsheets.
QA/QC procedures to be applied:	FONDO ACCION will be responsible for hiring the personnel needed for QA/QC
Calculation method:	N/A
Any comment:	

Data/parameter:	Families benefited from the Social investments of the REDD+ Projects
Data unit:	Number of beneficiary households
Description:	This indicator keeps track of the number of families/households that benefit from the Social Investments of the REDD+ Projects.
Sources of data:	Annual household surveys executed; PRAs
Description of measurement methods and procedures to be applied:	Conducting annual household surveys to determine access to the benefits generated by the REDD+ Project social investments. The sample chosen for the survey will be statistically significant.
Frequency of monitoring/recording:	Annual
Value applied:	N/A
Monitoring equipment:	Survey format
QA/QC procedures to be applied:	FONDO ACCION will be responsible for contracting the personnel needed for QA/QC
Calculation method:	Statistical analysis of the results
Any comment:	All the areas that have been positively affected by the social investments will be considered for the implementation of surveys

Data/parameter:	Strengthened governance
Data unit:	Number of approved and/or implemented governance initiatives (e.g. number of updated Internal By-laws, updated Management Plans in the REDD+ Project area)
Description:	Each Community Council must keep a monthly register of activities carried out (such as assemblies, meetings, socialization, etc), that are required to approve governance tools such as Management Plans and Internal By-laws. There will also be a record of the plans and laws approved and implemented. If needed the case, each plan must develop implementation monitoring indicators. This will contribute to the monitoring of the strengthening of the board governance capacity in the territory, and thereby strengthens the development of REDD + Project.
Sources of data:	Meeting minutes, attendance lists and resolutions adopted by the Board regarding governance issues, such as Management Plans, Bylaws, among others.
Description of measurement methods and procedures to be applied:	Carry a physical and digital record of attendance lists, meeting minutes and resolutions implemented.
Frequency of monitoring/recording:	Monthly
Value applied:	N/A
Monitoring equipment:	Physical and digital formats record.
QA/QC procedures to be applied:	FONDO ACCION will be responsible for hiring/contracting the qualified staff needed to perform QA/QC
Calculation method:	N/A
Any comment:	

Data/parameter:	Operation of the Grievances Redress Mechanism
Data unit:	Number of requests, complaints or claims filed/registered
Description:	The Coordinator of each REDD+ project will be responsible for keeping a monthly record of complaints, requests and claims that are registered/filed in the Administrative REDD+ Project Office. This will allow to control if the Mechanism is operating and if the community is getting involved in the REDD+ Project.
Sources of data:	Requests, complaints or claims that are registered/filed
Description of measurement methods and procedures to be applied:	There will be a monthly record (physical and digital) of the number of requests, complaints and claims filled out.
Frequency of monitoring/recording:	Monthly
Value applied:	N/A
Monitoring equipment:	Grievances register format
QA/QC procedures to be applied:	FONDO ACCION will be responsible for hiring/contracting the qualified staff needed to perform QA/QC
Calculation method:	N/A
Any comment:	

Data/parameter:	Effectiveness of the Grievances Redress Mechanism
Data unit:	Number of solved requests, complaints or claims
Description:	The Coordinator of each REDD+ Project will be responsible for keeping a monthly record of complaints, requests and complaints that are resolved, in order to track the effectiveness of the management of conflict resolution in the REDD+ Project.
Sources of data:	Requests, complaints or claims that are registered/filed
Description of measurement methods and procedures to be applied:	There will be a monthly record (physical and digital) of the number of requests, complaints and claims that are solved
Frequency of monitoring/recording:	Monthly
Value applied:	N/A
Monitoring equipment:	Grievances register format
QA/QC procedures to be applied:	FONDO ACCION will be responsible for hiring/contracting the qualified staff needed to perform QA/QC
Calculation method:	N/A
Any comment:	

Data/parameter:	Women benefited from REDD+ Projects
Data unit:	Number of beneficiary women
Description:	Keep track of the number of women benefited by indicators related to people beneficiated by the activities of the Project.
Sources of data:	Annual surveys executed; PRAs
Description of measurement methods and procedures to be applied:	The sample chosen for the survey will be statistically significant, taking into account the gender of people in the selected group.
Frequency of monitoring/recording:	Annual
Value applied:	N/A
Monitoring equipment:	Survey format
QA/QC procedures to be applied:	FONDO ACCION will be responsible for hiring/contracting the qualified staff needed to perform QA/QC
Calculation method:	Statistical analysis of the results
Any comment:	All the areas that have been positively affected by the social investments will be considered for the implementation of surveys

8.3.3 BIODIVERSITY

Data/parameter:	Intact Forest Area
Data unit:	Hectares of intact forest area
Description:	The forest conservation will be monitored through the area of intact forest.
Sources of data:	Data will be obtained from the stratification map and land use map measured through ALOS PALSAR.
Description of measurement methods and procedures to be applied:	The vegetation mosaic of the area will be measured by ALOS PALSAR radar, at a resolution of 50 m. A more accurate measurement of plant cover will be obtained by the LIDAR at a spatial resolution of 1 m. From the information collected and the map of stratification, the information is processed to identify intact forest area.
Frequency of monitoring/recording:	Annual
Value applied:	N/A
Monitoring equipment:	LIDAR
QA/QC procedures to be applied:	FONDO ACCION will be responsible for hiring/contracting the qualified staff needed to perform QA/QC
Calculation method:	According to VM006 methodology
Any comment:	

Data/parameter:	*Above-ground tree biomass*
Data unit:	Ton/ha
Description:	Change in aboveground biomass will be calculated to monitor the state of the forest and the impact of REDD + Project in forest regeneration.
Sources of data:	Data will be obtained from the stratification map, land use map measured through ALOS PALSAR, and forest growth calculated from LIDAR information.
Description of measurement methods and procedures to be applied:	The vegetation covers mosaics of the area will be measured by ALOS PALSAR radar, at a resolution of 50 m. A more accurate measurement of plant cover will be obtained by the LIDAR at a spatial resolution of 1 m to allow calculation of topography and vegetation height. From the information collected and the map of stratification, the information is processed to estimate forest biomass in raster and vector formats to a spatial resolution of 1 and 4 ha. Likewise, the uncertainty is estimated.
Frequency of monitoring/recording:	Before the first verification and before every subsequent baseline update.
Value applied:	N/A
Monitoring equipment:	LIDAR
QA/QC procedures to be applied:	FONDO ACCION will be responsible for hiring/contracting the qualified staff needed to perform QA/QC
Calculation method:	According to VM006 methodology
Any comment:	

Data/parameter:	*Inventory of tree species*
Data unit:	Number of individuals of each identified specie
Description:	Identification and registration of tree species and their conservation status
Sources of data:	Field trips to the plots
Description of measurement methods and procedures to be applied:	The diameter of the trees located on the plots will be measured at a 1.3m POM. These will be plated and then each individual species will be identified. 80-100 samples randomly selected must be taken within the permanent plot, in order to be identified in and herbarium
Frequency of monitoring/recording:	Annual
Value applied:	N/A
Monitoring equipment:	Competent equipped team of 4 people (diametric tape, plastic ruler, tape, chalk, etc). It can be done by CONIF or other qualified entity to conduct such monitoring.
QA/QC procedures to be applied:	FONDO ACCION will be responsible for hiring/contracting the qualified staff needed to perform QA/QC
Calculation method:	N/A
Any comment:	

Data/parameter:	*Rare, endemic or endangered species*
Data unit:	Number of endemic individuals or endangered
Description:	Monitoring based on direct observations in certain representative areas to observe the change in the number of individuals and populations
Sources of data:	Direct counting
Description of measurement methods and procedures to be applied:	Straightforward methodology for counting animals during the same season of the year. There will be an assessment and identification of endemic and endangered species that should be monitored. Representative ecosystems must be chosen within the project area, where 1 km transects long will be randomly established.
Frequency of monitoring/recording:	Annual
Value applied:	N/A
Monitoring equipment:	Competent equipped team of 4 people (diametric tape, plastic ruler, tape, chalk, etc). This should be done by the REDD+ Units (rangers) with the support of qualified entities such as IIAP, IAvH or local universities.
QA/QC procedures to be applied:	FONDO ACCION will be responsible for hiring/contracting the qualified staff needed to perform QA/QC
Calculation method:	N/A
Any comment:	

Data/parameter:	*Bioindicators of mammals, birds and reptiles*
Data unit:	Number of individuals
Description:	Monitoring based on direct observations in certain representative areas, in order to observe the change in the number of individuals and populations. Bioindicators must be chosen such that their presence enables the monitoring of the state of the environment and the effectiveness of mitigation measures implemented in the REDD + Project.
Sources of data:	Direct counting
Description of measurement methods and procedures to be applied:	Direct methodology for counting animals during the same season of the year. Firstly, the species that serve as indicators of ecosystem state must be chosen (biodindicators). Secondly, the representative ecosystems within the project area must be chosen. In these areas, transects of 1 km long will be established randomly to monitor endemic or endangered species.
Frequency of monitoring/recording:	Annual
Value applied:	N/A
Monitoring equipment:	Competent equipped team of 4 people (diametric tape, plastic ruler, tape, chalk, etc). This should be done by the REDD+ Units (rangers) with the support of qualified entities such as IIAP, IAvH or local universities.
QA/QC procedures to be applied:	FONDO ACCION will be responsible for hiring/contracting the qualified staff needed to perform QA/QC
Calculation method:	N/A
Any comment:	

Data/parameter:	*Identified mangrove biomass*
Data unit:	Ton/ha
Description:	Change in mangrove biomass will be calculated to monitor the state of the HCV and the impact of REDD+ Project in forest regeneration.
Sources of data:	Data will be obtained from the stratification map, land use map measured through ALOS PALSAR, forest growth calculated from LIDAR information and carbon stocks calibrated with Lidar data.
Description of measurement methods and procedures to be applied:	The vegetation covers mosaics of the area will be measured by ALOS PALSAR radar, at a resolution of 50 m. A more accurate measurement of plant cover will be obtained by the LIDAR at a spatial resolution of 1 m to allow calculation of topography and vegetation height. From the information collected and the map of stratification, the information is processed to estimate mangrove biomass in raster and vector formats to a spatial resolution of 1 and 4 ha. Likewise, the uncertainty is estimated.
Frequency of monitoring/recording:	Before the first verification and before every subsequent baseline update.
Value applied:	N/A
Monitoring equipment:	LIDAR
QA/QC procedures to be applied:	FONDO ACCION will be responsible for hiring/contracting the qualified staff needed to perform QA/QC
Calculation method:	According to VM006 methodology
Any comment:	

Data/parameter:	*Logging in mangrove area*
Data unit:	Number of reports logging in mangrove areas
Description:	Mangroves will be monitored to ensure the maintenance or improvement of the HVC
Sources of data:	Data obtained from field trips of REDD+ Units (rangers)
Description of measurement methods and procedures to be applied:	The Rangers must record and report any logging event observed during their field trips. The REDD+ Units will receive training to species identification, data collection, use of protocols, methods of use of equipment report, etc (computers, GPS)
Frequency of monitoring/recording:	Monthly
Value applied:	N/A
Monitoring equipment:	Rangers, GPS, register format
QA/QC procedures to be applied:	FONDO ACCION will be responsible for hiring/contracting the qualified staff needed to perform QA/QC
Calculation method:	
Any comment:	

Data/parameter:	*Hunting of endemic or endangered species*
Data unit:	Number of endemic or endangered individuals hunted.
Description:	Followup to hunting the hunting of endangered or endemic species to ensure the maintenance or improvement of the HCV.
Sources of data:	Annual surveys and field trips.
Description of measurement methods and procedures to be applied:	Families should indicate interest species related to hunting activieties during the Participative Rural Evaluations. Rangers should register and report any hunting event (such as tamps or corpses) observed during their field trips. The REDD+ Units will receive training to species identification, data collection, use of protocols, methods of use of equipment report, etc (computers, GPS).
Frequency of monitoring/recording:	Annual surveys and monthly field reports.
Value applied:	N/A
Monitoring equipment:	Rangers, GPS, register format, surveys
QA/QC procedures to be applied:	FONDO ACCION will be responsible for hiring/contracting the qualified staff needed to perform QA/QC
Calculation method:	N/A
Any comment:	

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