

January 26, 2012

# The Chocó-Darién Conservation Corridor









A Project Design Note for Validation to Climate, Community, and Biodiversity (CCB) Standards (2<sup>nd</sup> Edition).





# **Executive Summary**

Colombia is home to over 10% of the world's plant and animal species despite covering just 0.7% of the planet's surface, and has more registered species of birds and amphibians than any other country in the world. Along Colombia's northwest border with Panama lies the Darién region, one of the most diverse ecosystems of the American tropics, a recognized biodiversity hotspot, and home to two UNESCO Natural World Heritage sites. The spectacular rainforests of the Darien shelter populations of endangered species such as the jaguar, spider monkey, wild dog, and peregrine falcon, as well as numerous rare species that exist nowhere else on the planet.

The Darién is also home to a diverse group of Afro-Colombian, indigenous, and mestizo communities who depend on these natural resources. On August 1, 2005, the Council of Afro-Colombian Communities of the Tolo River Basin (Cocomasur) was awarded collective land title to over 13,465 hectares of rainforest in the Serranía del Darién in the municipality of Acandí, Chocó in recognition of their traditional lifestyles and longstanding presence in the region. If they are to preserve the forests and their traditional way of life, these communities must overcome considerable challenges. During 2001-2010 alone, over 10% of the natural forest cover of the surrounding region was converted to pasture for cattle ranching or cleared to support unsustainable agricultural practices.

This project helps to prevent global climate change and safeguard the ecosystems and wildlife of the Darién by strengthening the territorial identity and governance capacity of Cocomasur. It is among the first in the world to use to new methodologies under the Verified Carbon Standard (VCS) and Climate, Community, and Biodiversity (CCB) Standards. Under the guidance of Anthrotect and the Fund for Environmental Action, Cocomasur is carrying out activities designed to address the main drivers of deforestation and ecosystem degradation in the region, and communities receive 50% of net profits from the project. State of the art monitoring via remote sensing and community surveillance will be carried out in collaboration with the Carnegie Institution for Science, and will provide timely and accurate assessments of project impacts. Project monitoring will be managed in an open source mapping platform to inform and engage policymakers, the scientific community, and the general public.

Project activities include 1) building governance capacity, by raising awareness of collective identity and rights, demarcating title boundaries, resolving land disputes, instilling best practices for administration and accountability, and constructing collective visions and strategic plans for land use; 2) reducing carbon emissions, through community surveillance to conserve existing forest, restoring degraded lands, and improving forest management by extending harvest rotations and minimizing logging impacts; and, 3) investing in green commodity production, by improving technologies and agricultural practices, applying proven new models for sustainable ranching (e.g., Aliança da Terra) and artisanal gold mining (e.g., Oro Verde), and securing enduring markets for other community products. Over its 30-year lifespan, the project will prevent the emission of over 2.3 million tons of CO<sub>2</sub> into the atmosphere, demonstrating how forest-dependent communities can generate income from markets for ecosystem services while preserving their traditional ways of life.



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### **Table of Abbreviations**

ANAB ANSI-ASQ National Accreditation Board

ASTER Advanced Spaceborne Thermal Emission and Reflection Radiometer

CCBA Climate, Community, and Biodiversity Alliance

COCOMASUR Consejo Comunitario de Comunidades Negras del Río Tolo y Zona Costera Sur

CODECHOCO Corporación Autónoma Regional para el Desarrollo Sostenible de Chocó

CODHES Consultoría para los Derechos Humanos y el Desplazamiento

COP Colombian Peso

CORPOURABA Corporación para el Desarrollo Sostenible del Urabá

CR Critically Endangered Species

DANE Departamento Administrativo Nacional de Estadística

DD Deficient Data for Species Risk

DEM Digital Elevation Model
EBA Endemic Bird Area
EN Endangered Species
ENVISAT Environment Satellite

ERPA Emissions Reduction Purchase Agreement

ETF Environmental Trust Fund
FSC Forest Stewardship Council
GDI Gender Development Index
GDP Gross Domestic Product

GHG Greenhouse Gas

GMO Genetically Modified Organism
GPS Global Positioning System
GSN Global Seismographic Network

HCV High Conservation Value
HDI Human Development Index

IBA Important Bird Area

ICA Institute of Cultural Affairs

IDEAM Instituto de Hidrología, Meteorología y Estudios Ambientales

IDP Internally Displaced Person
ILO International Labor Organization

INCODER Instituto Colombiano para el Desarrollo Rural INGEOMINAS Instituto Colombiano de Geología y Minería

INVIAS Instituto Nacional de Vías

IPCC Intergovernmental Panel on Climate Change
ISO International Organization for Standardization
IUCN International Union for the Conservation of Nature

LANDSAT Land Remote-Sensing Satellite System

LIDAR Light Detection And Ranging LT Least Threatened Species



MAPs Medicinal and Aromatic Plants
MDG Millenium Development Goal
MPI Multidimensional Poverty Index

MRV Monitoring, Reporting, and Verification

NER Net Emission Reduction

NGO Non-Governmental Organization

NT Near Threatened Species
NTFPs Non-Timber Forest Products

OREWA Asociación de Cabidos Indígenas del Chocó

PES Payment for Ecosystem Services
RADAR Radio Detection and Ranging

REDD Reducing Emissions from Deforestation and Forest Degradation

REDD+ Reducing Emissions through Conservation and Sustainable Forest Management

RedLAC Red de Fondos Ambientales de Latinoamérica y el Caribe

SMA Special Management Area

STRI Smithsonian Tropical Research Institute

TCI Topical Convergence Index

tCO<sub>2</sub>e Tons of Carbon Dioxide Equivalent

TFR Total Fertility Rate

ToP® Technology of Participation

TWINSPAN Two-Way Indicator Species Analysis
UNDP United Nations Development Porgram

UNESCO United Nations Educational, Scientific and Cultural Organization

USAID United States Agency for International Development

USD United States Dollar

USGS United States Geological Survey
UTM Universal Transverse Mercator
VCS Verified Carbon Standard

VVIR Visual Near Infrared VU Vulnerable Species

WeD Wellbeing in Development

WWF World Wildlife Fund



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# **G.1** Original Conditions in the Project Area

### **G.1.1 Location and Basic Physical Parameters**

The Choco-Darien Conservation Corridor is located in the Darién region of northwest Colombia within the administrative jurisdictions of the Department of Chocó and the Municipality of Acandí. The Colombian Darién is part of the Chocó biogeographic region, recognized as one of the most biodiverse regions in the world for its strategic geographic location and high levels of species endemism. Much of this biological richness owes to the relatively recent formation of the Isthmus of Panama some 5 million years ago, an extraordinary geological event that separated the Atlantic and Pacific Oceans and formed a land bridge between North and South America.

### **Geology and Soils**

The most pronounced geomorphological regions of the Colombian Darien are the Baudó and Darién mountain ranges, which originated in a volcanic island arc that emerged in the Middle Eocene epoch, and the Atrato River basin, which emerged in the late Pliocene through tectonic activity. The Serranía del Baudó and the Caribbean slopes of the Serranía del Darién are largely of volcanic origin, while the inland slope of the Serranía del Darién is of Cenozoic sediments. The mountains and hills of the Pacific platform are formed largely by igneous rocks with basalts, diabases, andesites, and sedimentary clays, as well as siltstones, chert and limestone (Martínez, 1993). A second, less extensive lithostratigraphic formation contains diorite, quartz diorite, and different types of granite, while a third formation consists of gravel, sand, limestone, and river, lake, and marine deposits (Coates, Collins, Aubry, & Berggren, 2004; Cossio, 1994; Govea & Aguilera, 1985).

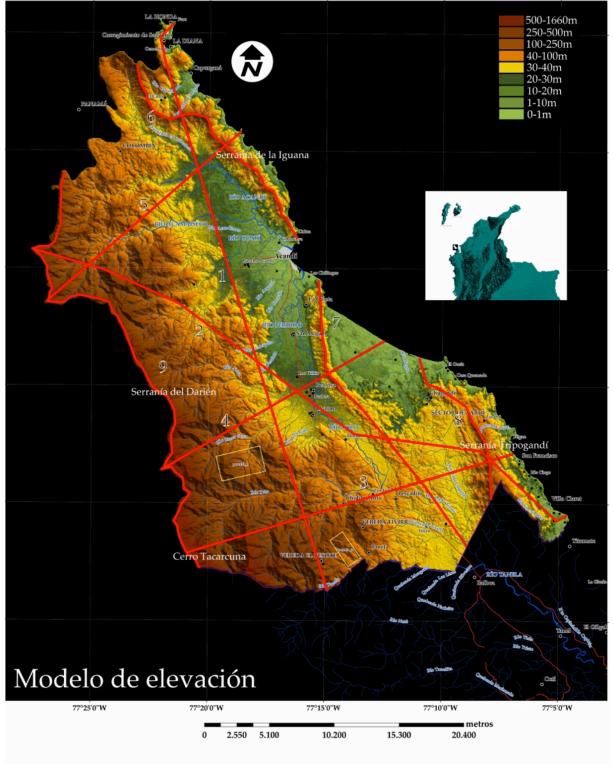
The soils of the Darién exhibit both marine and alluvial characteristics, and evidence suggests that sea level has fluctuated from 100 m below to 50 m above present levels, most recently during the early Pleistocene. The recent alluvial plains are formed by deposits from rivers such as the Atrato, which courses northward through a flat, marshy floodplain flanked by the Andes to the east and the Darién and Baudó ranges to the west, before emptying into the Gulf of Urabá (Lobo-Guerrero, 1993). While the lowland plains are dominated by alluvial deposits, the more hilly areas resulted from the dissection of Tertiary sediments (González & Marín, 1989). Where not alluvial, the lowland clay soils are lateritic, generally derived from late Miocene shale with layers of dolomite and calcareous sandstone. Where sloping, soils tend to be leached of nutrients by high rainfall (F. Golley, McGinnis, Clements, Child, & Duever, 1975).

### Topography

The municipality of Acandí is located in northwest Colombia in the department of Chocó and has a territorial extension of 1,551 km². It is bordered to the north and west by the Republic of Panama, to the east by the Caribbean Sea, and to the south by the municipality of Unguía. Figure 1 summarizes the most important morphological and topographic characteristics of Acandí. The red lines depict nine distinct topographical profiles based on cartographic information generated using Universal Transverse Mercator (UTM) coordinates WGS 84 zone 18 N (78-72W). Table 1 provides an overview of each of the nine topographical profiles.



Figure 1: Important Morphological and Topographic Characteristics of the Project Zone.





### Table 1: Summary of Nine Topographical Profiles in the Project Zone.

**Transect #1** Length: 48.0km Begin: 229037.825; 941908.547 End: 271216.792; 920867.103

Spans the easternmost and westernmost points of Acandí, with elevations ranging from around 1000m in the west to sea level in the east. Elevations are generally in the range of 1-100 m.

Transect #2 Length: 47.0km Begin: 239222.268; 959923.482 End: 250415.547; 915006.245

Spans the northernmost and southernmost points of Acandí, with elevations ranging from sea level to approx. 500 m. The maximum elevation is close to 900m, and the majority of the area crossed has elevations above 125m.

**Transect #3** Length: 26.8km Begin: 241047.781; 918224.913 End: 266941.247; 925334.807

Spans the southern portion of Acandí from the Serranía del Darién in the west, crossing high, medium, and low hills, piedmont terraces, alluvial plains, the Serranía de Tripogadí, and a small alluvial plain before reaching the Caribbean Sea. Maximum elevation is in the west (approx. 1660m at Cerro Tacarcuna), descending to around 550m before rising again to 1000m over a span of nearly 5km. Elevations are generally above 250m.

**Transect #4** Length: 20.4km Begin: 239366.387; 924470.090 End: 257237.203; 934366.294

Spans the southern-central region of Acandí from the Serranía del Darién in the west, crossing medium hills, piedmont, floodplains, low hills, and plains before reaching the Caribbean Sea. Elevations range from approx. 1300 m to sea level. The maximum altitude is approx. 1400 m and elevations generally do not exceed 50 m. The eastern region contains a chain of low hills (elevation < 250m) that separate two floodplains with small terraces less than 10 m elevation.

**Transect #5** Length: 20.1km Begin: 230334.9; 937729.082 End: 245659.605; 950795.915

Spans the region between the border with Panama to the Caribbean coast, beginning around 1250 m in the Cerro de Armila (Serranía del Darién), crossing low slopes, medium and low hills, piedmont, and the Serranía La Iguana before ending in a small floodplain at an elevation of approx. 10 m. This is the region with the greatest extension of piedmont, and elevations generally do not exceed 250m.

**Transect #6** Length: 21.6km Begin: 237108.516; 956560.694 End: 249935.149; 942436.985

Begins to the north on the border with Panama in the Serranía La Iguana at an elevation of around 550 m and ends approximately 100 m from the coast. Elevations are generally above 250 m and the highest point, excluding the starting point, occurs at approx. 400 m elevation about 7 km from the Panama border.

**Transect #7** Length: 24.6km Begin: 251904.782; 939122.237 End: 263626.499; 918801.391

Spans a small mountian range that dissects the floodplains of Acandí, beginning on the Caribbean coast (approx. 80 m elevation), crossing medium hills, low hills, and alluvial terraces (approx. 75m) before ending near the border with Unguía (70 m). Maximum elevation occurs at 250 m and the majority of the profile is above 100 m.

**Transect #8** Length: 13.2km Begin: 265211.814; 922164.179 End: 259639.194; 933177.259

Spans the Serranía de Tripogadí, beginning in the south near the border with Unguía (approx. 350 m elevation) and descending to sea level. Maximum elevation is at Tripogandí Hill (approx. 410 m). The formation is characterized by medium hills, low hills, piedmont, and coastal floodplains, with elevations generally above 200 m.

**Transect #9** Length: 41.9km Begin: 242200.737; 916975.877 End: 231824. 35; 947769.406

Spans the highest regions of the Colombian Serranía del Darién from south to north from an elevation of approx. 1560 m to an elevation of approx. 300 m. Elevations are generally above 750m. The highest elevations are found in the southern sector, at 1660 m (Cerro Tacarcuna), and around 1485 m some 12 km to the north of the starting point.



### Climate

The climatic characteristics of the Darién generally correspond to a super-humid climate (A) according to the Thornthwaite classification (Eslava-Ramírez, 1994; Thornthwaite, 1948). Located in the Intertropical Convergence Zone close to the terrestrial equator, northeast trade winds blow strongest from December to April, reaching speeds of up to 30 km/hr. The municipality of Acandí shows greater climatic variability than other regions of the Darién, with conditions approaching those of a semi-humid climate ( $B_1$ ) in the north of the municipality. Temperature in the Darién can vary from  $18^{\circ}$  C at higher elevations to  $28^{\circ}$  C in the valleys and lowlands, usually accompanied by high humidity. Average temperature in the town of Acandí is  $26.4^{\circ}$  C, reaching an annual maximum in April ( $26.9^{\circ}$  C) and a minimum in October ( $26.1^{\circ}$  C) with little variation throughout the year. The lowest and highest monthly averages occur in February ( $24.3^{\circ}$  C) and December ( $28.1^{\circ}$  C), respectively.

Average rates of evaporation in the Darién have been estimated at 1,020 mm/year, showing a monthly variation from 108.4 mm in March to 72.8 mm in November. The maximum value occurs during the month of May (155.4 mm/month) and the minimum value during the month of November (62.7 mm/month). Rainfall in the Darién ranges from less than 2,000 to nearly 6,000 mm annually in a monomodal pattern caracterized by a dry period between December and March and rainy between May and November. Average precipitation was recorded at 1,837 mm/year at the Unguía station and 5,523 mm/year at Playa Murri, with a maximum multi-year monthly rainfall of 684 mm recorded in October and a minimum of 14.7 mm/month recorded in January. Rainfall in the municipality of Acandí generally ranges from 2,000 mm to 4,000 mm, with substantial variation depending on local orography.

### Hydrographic Features

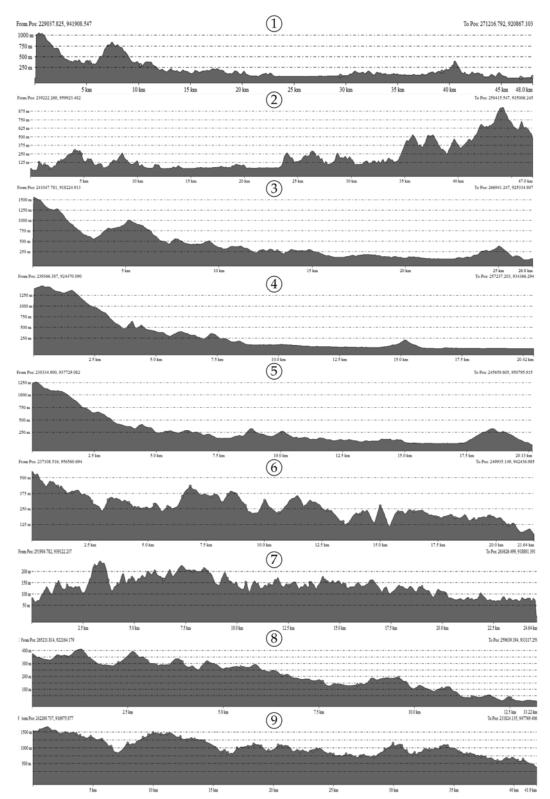
Acandí enjoys ample freshwater throughout the year, although water abundance and quality are increasingly threatened by cattle ranching, agriculture, and mechanized mining. The primary watersheds correspond to the Acandí, Tolo, Tanela, Arquití, Capurganá, Triganá, and La Carolina rivers, which are characterized by a constant process of erosion and accumulation of alluvial deposits at their mouths. Table 2 describes the three principal rivers in the project zone. Important secondary rivers include the Arquití, Neca, Corazón, Brazo Seco, and Jerónimo.

Table 2: Principal Rivers in the Project Zone

River	Source	Mouth	Direction	Tributaries	Depth
Acandí	Gandí Hills (1,060 m)	Caribbean Sea	Southeastward	Guatí, Acandí Seco, El Muerto, and Astí Rivers	1-4 meters
Tolo	Tanela Hills (1,215 m)	Caribbean Sea	Northward	Arquití, Neca, Corazón, Brazo Seco, and Jerónimo Rivers	1-4 meters
Tanela	Tanela Hills (1,315 m)	Caribbean Sea	Westward	Tanelita, Natí, Tibirre, Tisló, and Cutí Rivers	1-4 meters



Figure 2: Profiles of the Nine Topographical Transects in the Project Zone.





### G.1.2 Types and Condition of Vegetation within the Project Area

The vegetation of the Chocó biogeographic region has received considerable research attention, including taxonomic studies (Acosta-S., 1970; Cuatrecasas, 1958; E. Forero & Gentry, 1989) as well as research on composition (Cuatrecasas, 1946; Rangel & Lowy, 1993; Zuluaga-R., 1987). In particular, the Serranía del Darién exhibits a number of botanically interesting ecosystems, especially above 200 m where large pockets of primary forest are still intact (Prieto-C., Rangel, Rudas-L., Gonima-G., & Serrano, 2004). Dense low premontane rainforest occurs to 500 m, where *Brosimum* and *Dipteryx* species abound in the canopy, with lianas, ferns, and palms in the subcanopy and *Cephaelis elata* a dominant shrub. At 500-600 m there is seasonal yet evergreen tropical wet forest. *Anacardium excelsum* is dominant in the canopy with an abundance of *Bombacopsis quinata* (VU), *B. sessilis, Brosimum guianense, Ceiba pentandra, Cochlospermum williamsii, Dipteryx panamensis* and *Myroxylon balsamum*. In this range, the main subcanopy tree is *Oenocarpus panamanus*. The dominant understorey shrub is *Mabea occidentalis* and frequent shrubs include *Clidemia spp., Conostegia spp.* and *Miconia spp.* 

Cloud forest represented by species such as *Oenocarpus panamanus, Anacardium excelsum, Brosimum utile* and *Pseudolmedia laevigata* commences at around 750 m elevation, and elfin forest with *Clusia spp.* is found on the highest peaks and ridges (A. Gentry, 1977; F. Golley et al., 1975; Porter, 1973). A

distinctive montane oak forest of Quercus humboldtii (VU) is present at the highest elevations of the project area (above 1500 m) on the border with Panama, in the direction of Mt. Tacarcuna. Mt. Tacarcuna is a sacred site in Kuna cosmology and the highest point in the Serranía el Darién, where many endemics occur (A. Gentry, 1985; Lewis, 1971). The limited collections (90% identified) from high on Mt. Tacarcuna show 23% endemism and some 25% new species, including the new genus Tacarcuna (Euphorbiaceae) and three specimens only of the tree Freziera forerorum (CR) recently dscovered on the summit. Other similar areas are presumed to have high angiosperm endemism, especially in the isolated cloud forests (Herrera-MacBryde, 1997).



Dipteryx oleifera in the project area, Acandí, Chocó. Photo by Henry Arellano Peña.

In order to assess vegetation and prepare a more precise tree species inventory, field data was collected at two plots within the project area. This work was carried out by forest engineers Fernando Quejada Olivo, Robert Roa Mosquera, Wiston Antonio Rentería Escobar, and Jean Javier Urrutia under contract with Cocomasur at the following locations:

Lot 1: Located at the village of Peñaloza toward Balboa, reference point Jerónimo Creek, UTM coordinates (WGS 84 - Area 18N) defining Polygon 1 (247543.546875; 924394.1875), 2 (244,132; 923606.8125), 3 (243683.109375; 925,557) and 4 (247092.828125; 926374.3125), which corresponds to 706 hectares along an altitudinal gradient of 659.58 meters. The minimum elevation is approx. 179m and the maximum is 839m, with an average of 445m and a median of 401m.



Lot 2: Located at the confluence of the Chugandí River and Pescao Creek with coordinates 5 (254040.578125; 916893.125), 6 (252611.8125; 918945.375), 7 (253596.78125, 919631.4375) and 8 (255025.53125, 917579.25) corresponding to an area of 300 hectares over an altitudinal gradient of 377m. The minimum and maximum elevations recorded were 169m and 545m, respectively, with a mean elevation of 320m and a median of 307m.

In Lot 1, a total of fourteen (14) linear transects were laid with an area of one hectare each, within which ten (10) subtransects were defined, each with an area of 1000 m². In Lot 2, six (6) linear transects were laid, each with an area of one hectare, within which ten (10) subtransects were defined, each with an area of 1000 m². Of the total number of sampling subunits, information was collected from 194 subunits. This information on floristic composition was used to prepare a floristic inventory with scientific species names based on information from the Colombia Biodiversity Project Colombia (Rangel, 2004a). Table 3 presents an abbreviated list of the tree species identified at the two sites sampled.



Undergrowth palms in the project zone, Acandí, Chocó. Photo by Brodie Ferguson.

The structural characterictics of tree species identified in the two forest plots were used to define 21 classes of land cover or land use (Table 4) for the project zone using the TWINSPAN software program (McCune & Mefford, 1999) and comparing with other important work on vegetation in Colombia (Arellano-P. & Rangel-Ch., 2008, 2009)(Arellano-P. and Rangel-Ch. 2008; Arellano-P. and Rangel-Ch. 2009). Figure 3 shows land cover in the municipality of Acandí in the year 2010, where the color red represents Classes 5 and 6 from Table 4, and where the color green represents Classes 11 and 12 (forests). Table 5 shows the area of each class of land cover in the project area in the year 2010.



Table 3: Tree Species in the Project Area.

Species	Vernacular Name
Widely distributed species:	
Brosimum utile	Sande + Arbol Vaca
Elaegia sp.	Brasilete
Carapa quianensis	Guino + Cedro Guino
Hymenaea oblongifolia	Algarrobo
Phitecellobium dinizzi	Costillo
Tapirira quianensis	Fresmo + Cedro Macho
Pterocarpues rohric	Sangre de Gallo
Oneocarpus bataua	Milpesos
Maclura tinctoria	Mora
Cecropia hispidisima	Guarumo
Chrysophyllum sp.	Níspero
Forests characterized by Terminalia amazonia, Apeiba	Mispero
membranacea and Aspidosperma dugandii:	
	Facebo L Davasiamara
Terminalia ef. amazonia	Escobo + Parasiempre
Apeiba membranacea	Corcho
Aspidosperma dugandii	Carreto
Astronium graveolens	Santacruz
Micropholis guianensis	Caimito
Jacaranda copaia	Canalete + Chingale
Aniba pichurim	Caidita
Licaria canella	Canelon
Vitex columbienses	Truntago
Anacardium excelsum	Caracolí
Dialum guianense	Tamarindo + Culo de Hierro
Oxandra xylopioides	Yaya
Couratari guianensis	Cabuyo
Tabebuia rosea	Roble
Caryocar amygdalifera	Cavi (Cawi)
Pseudolmedia laevigata	Leche perra
Clarisia biflora	Caucho + Cauchillo
Unidentified "Humo sp."	Humo
Lecythis tuyrana	Oyeto
Arecaceae sp1	Canillona (palma)
Poulsenia armata	Damagua + Majagua
Peltogyne pubescens	Nazareno
Toxicodendron striatum	Manzanillo
Spondias mombin	Hobo
Schizolobium parahiba	Tambolero
Gustavia superba	Membrillo
Callophylum brasiliense	Aceite maria
Cassipourea elliptica	Pantano
Conostegia cuatrecasasii	Aji Mora
cedrela odorata	Cedro
Hirtella latifolia	Carbonero
Roupala obovata	Azufre



Macrolobium colombianum	Guamillo
Ficus cf. tonduzzi	Higueron
Cordia aff. panamensis	Laurel
Macrolobium stenosiphon	Dormilon
Nectandra acutifolia	Amarillo
Protium veneralense	Anime
Vitex masoniana	Aceituno
Other species present:	Aceitano
Inga sp.	Guamo
Cyrtostachys renda	Pintalabios
Copaifera canime Harms	Canime
Vismia baccifera	Carate
Eschweilera sclerophylla	Guasca
Trichilia martiana	Vara de Piedra
Aniba guianensis	Comino
Ceiba pentandra	Bonga
Unidentified "Copa seca"	Indeterminado "Copa seca"
Couroupita dananensis	Cocuelo
Dystovomita clusifolia	Zanca de Araña
Eschweilera coriacea	Cazuelo
Huberodendron patiñoi	Carra
Ochroma lagopus	Balso
Sterculia apetala	Camajon
Myroxylon balsamum	Balsamo
Osteophleum platyspermun	Palo de Agua
Vitex sp.	Polvo de Arroz
Mauria sp.	Palo Amargo
Ammandra decesperima	Tagua
Arecaceae sp3	Tres Patas
Ficus aff. palida	Lechudo
Catostemma digitata	Arenillo
Eschweilera pittieri	Coco Cristal
Zanthoxylum sp.	Tachuelo
Myristicaceae	Sangre de Pescao
Arecaceae sp2	Patona (palma)
Inga edulis	Churimo
Unidentified 1	Caobillo
Unidentified 2	Llovisna
Phyllanthus sp.	Balsilla
Platymiscium darienensis	Ebano
i iacymisciani aanenensis	LUGITO



Table 4: Classes of Land Cover in the Project Zone.

Class	Symbol	Туре	Description	Dominant Species
1	Bhal/Par-Vco	Humid tropical forest	Humid alluvial plain formation	Poulsenia armata and Vitex columbienses
2	Hb/Pac	Grasslands	Flat alluvial marshes (wetland, swamp) formation	Polygonum acuminatum
3	Hb/Mar	Grasslands	Alluvial plains or floodplains	Montrichardia arborescens
4	Pm/Rta	Palms	Mainland in dikes and basines	Raphia taedigera
5	A-Pd/PnsUre (a)	Grazinglands	Areas subject to anthropic action	Pennisetum purpureum and Urera laciniata
6	Α	Intervened	Completely intervened areas	
7	Mm-Ma/Efu-Cic	Shrublands	Alluvial plains and piedmont	Erythrina fusca and Chrysobalanus icaco
8	Bhal/Toc-Mba-Cpa	Humid tropical forest	Vegetation in floodplains or flat regions near rivers	Tabebuia ochracea, Myroxylon balsamum and Cordia aff. panamensis
9	Bhri/Efu-Isp	Humid tropical forest	Formations associated with watercourses and alluvial plains	Erythrina fusca and Inga sp.
10	Bhal-tf/Sgl-Hob-Tma	Humid tropical forest	Alluvial plains and terraces formation	Symphonia globulifera, Hyeronima oblonga and Terminalia amazonia
11	A-Ma/Trm	Shrublands	Areas subject to anthropic action	Trema micrantha
12	A-Ps/Hru-Abi	Pastures	Areas with anthropic disturbance	Hyparrhenia rufa and Andropogon bicornis
13	Bhtf/Tam-Ame-Adu	Humid tropical forest	Vegetation in non-alluvial plains	Terminalia amazonia, Apeiba membranacea and Aspidosperma dugandii
14	Bhtf/Toc-Mba-Tam	Humid tropical forest	Terrace vegetation	Tabebuia ochracea, Myroxylon balsamum and Terminalia amazonia
15	Bshtf/Dol-Par	Very humid tropical forest	Mainland and slope formations	Dipteryx oleifera and Poulsenia armata
16	Bshtf/Dol-Jco-Toc	Very humid tropical forest	Mainland and slope formations	Dipteryx oleifera, Jacaranda copaia, and Tabebuia ochracea
17	Bshtf/Dol-Esc-Tam	Very humid tropical forest	Mainland and slope formations	Dipteryx oleifera, Eschweilera sclerophylla, and Terminalia cf. amazonia
18	Bhtf/Cod-Agr-Cbr	Humid tropical forest	Formations over humid terraces	Cedrela odorata, Astronium graveolens, and Callophylum brasiliense
19	Bhtf/Cpl	Humid tropical forest	Monostratified canopy on high hills	Cavanillesia platanifolia
20	Bhtf/Aex	Humid tropical forest	Northward high hill formations	Anacardium excelsum
21	Bhtf/Qhu	Humid tropical forest	Northward high hill formations	Quercus humboldtii (oak)



Figure 3: Vegetative Cover in the Project Zone in 2010.

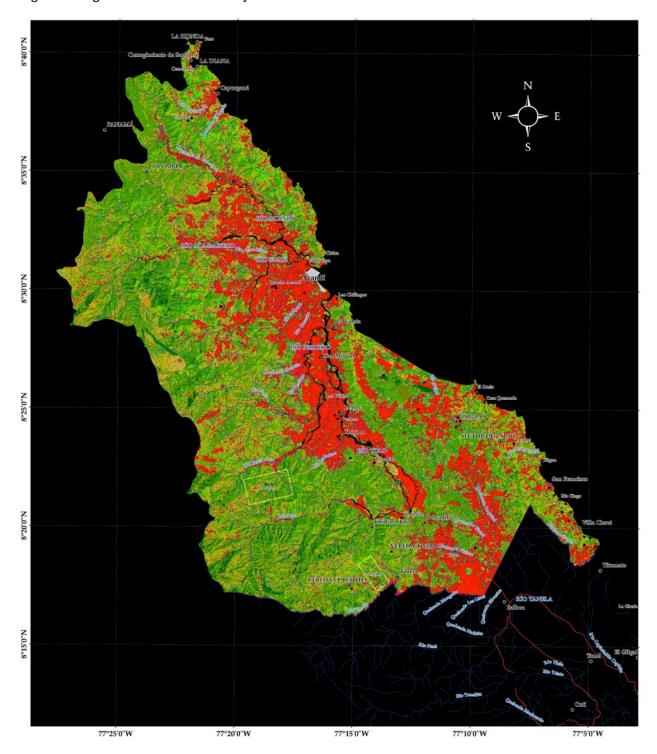




Table 5: Composition of the Project Area by Class, Type, and Condition of Land Cover (2010).

Class	Code	Condition	Туре	Area (ha)
3	Hb/Mar	Natural	Grasslands	1.7
4	Pm/Rta	Natural	Palms	0.3
5	A-Pd/Pns-Ure	Intervened	Grazinglands	2.0
6	Α	Intervened	Completely transformed areas	1.1
7	Mm-Ma/Efu-Cic	Natural	Shrublands	146.3
8	Bhal/Toc-Mba-Cpa	Natural	Humid tropical forest	214.7
9	Bhri/Efu-Isp	Natural	Humid tropical forest	266.1
10	Bhal-tf/Sgl-Hob-Tma	Natural	Humid tropical forest	148.6
11	A-Ma/Trm	Intervened	Shrublands	1,273.9
12	A-Ps/Hru-Abi	Intervened	Pastures	313.5
13	Bhtf/Tam-Ame-Adu	Natural	Humid tropical forest	325.1
14	Bhtf/Toc-Mba-Tam	Natural	Humid tropical forest	407.6
15	Bshtf/Dol-Par	Natural	Very humid tropical forest	916.7
16	Bshtf/Dol-Jco-Toc	Natural	Very humid tropical forest	5,451.9
17	Bshtf/Dol-Esc-Tam	Natural	Very humid tropical forest	957.4
18	Bhtf/Cod-Agr-Cbr	Natural	Humid tropical forest	144.7
19	Bhtf/Cpl	Natural	Humid tropical forest	648.6
20	Bhtf/Aex	Natural	Humid tropical forest	2,175.4
21	Bhtf/Qhu	Natural	Humid tropical forest	69.3
Total				13,465

Largely undisturbed humid and very humid tropical forests make up approximately 11,807 hectares, or 88% of the total project area. The most abundant class of forest in the project area is Class 16: Very humid tropical forest — mainland and slope formations (Bshtf/Dol-Jco-Toc) characterized by *Dipteryx oleifera, Jacaranda copaia*, and *Tabebuia ochracea* and comprising an estimated 5,452 ha, or nearly 40% of the project area. The second most abundant class of forest is Class 20: Very humid tropical forest northward high hill formations (Bhtf/Aex) dominated by *Anacardium excelsum* and comprising approximately 2,175 hectares, or 16% of the project area. Grazingland, pasture, and intervened shrubland combined comprise 1,590 ha, or almost 12% of the total project area.



## **G.1.3** Boundaries of the Project Area and the Project Zone

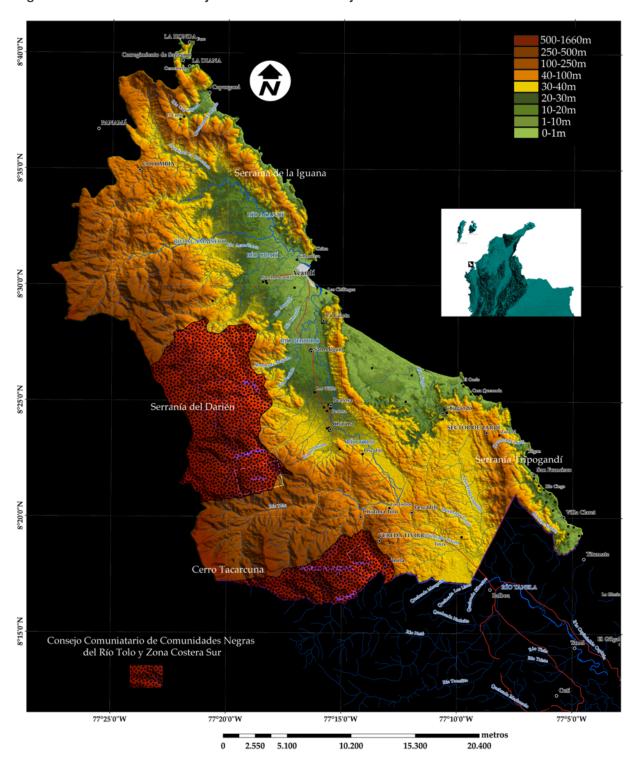
The project zone is located in northwest Colombia in the municipality of Acandí (Department of Chocó), while the project area is the territory constituting the collective land title of the Tolo River Basin Community Council (Cocomasur). Table 6 shows the UTM points corresponding to the project area--the property boundaries of the Cocomasur title, and Figure 4 indicates the area and location of the territory in red. The territory encompasses a total of 13,465 hectares distributed in two non-contiguous blocks, both of which are adjacent to Darién National Park in Panama.

Table 6: Boundaries of the Project Area Collectively Managed by Cocomasur.

Boundarie	s (Block 1): 10,366 ha	- 3,239 m <sup>2</sup>
Point 1	X = 1.424.414 m.N Y = 965.970 m.E	Borders the Republic of Panama and a neighboring collective land title (COCOMASECO). From Point 1, proceed northeast, downstream, along the right bank of Batatilla River for 6,529 m until arriving at Point 2.
Point 2	X = 1.428.518 m.N Y = 969.947 m.E	Borders COCOMASECO (separated by the Batatilla River). From Point 2, proceed eastward, then southward for 13,686 m until arriving at Point 3.
Point 3	X = 1.421.862 m.N Y = 976.622 m.E	Borders private property. From Point 3, proceed, southward for 3,684 m until arriving at Point 4.
Point 4	X = 1.418.594.53 m.N, Y = 975.743.76 m.E	Located on the Brazo Seco River and bordering private property. Proceed southward for 2,334 m until arriving at Point 5.
Point 5	X = 1.417.290 m.N Y = 977.631 m.E	Located on the Jerónimo River and bordering private property. Proceed from Point 5 southward for 781 m until arriving at Point 6.
Point 6	X = 1.416.649 m.N. Y = 978.038 m.E	Borders private property. From Point 6 proceed westward for 9,006 m until arriving at Point 7.
Point 7	X = 1.414.105 mN Y = 969.969	Borders the Chidima indigenous reserve. From Point 7 proceed northward along the border with Panama for 12,583.87 m until arriving back at Point 1.
Boundarie	s (Block 2): 3,517 ha + 3	3,846 m <sup>2</sup>
Point 8	X = 1.407.565 m.N Y = 971.492 m.E	Located on the border with Panama. From Point 8, proceed eastward for 13,811 m along the border with the Chidima indigenous reserve before arriving at Point 9.
Point 9	X = 1.412.406 m.N Y = 983.484 m.E	Borders the Chidima indigenous reserve. From Point 9 proceed eastward for 4,883 m before arriving at Point 10.
Point 10	X = 1.408.646 m.N Y = 985.654	Located on the Tanela River and bordering private property. From Point 10 proceed westward, upstream following left bank of the Tanela River for 17,601 m until arriving at Point 11.
Point 11	X = 1.406.510 m.N Y = 971.420 m.E	Located on the border with Panama. From Point 11 proceed northward for 1,078 m along the border with Panama until arriving back at Point 8.



Figure 4: Boundaries of the Project Area within the Project Zone.



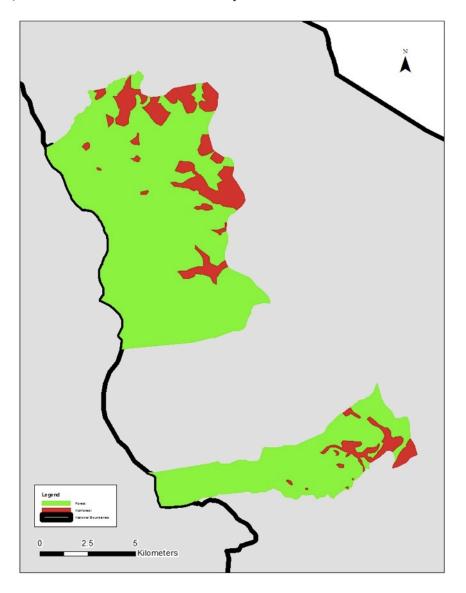


## **G.1.4 Current Carbon Stocks in the Project Area**

### Basic stratification

A forest/non-forest stratification was digitized from LANDSAT imagery to calculate carbon stocks over the project area (see Figure 5). The forested area (11,936 ha) and an aboveground biomass estimate of 269.0 Mg/ha were used to calculate the carbon stocks (value from F. B. Golley, Mcginnis, Clements, Child, & Duever, 2011, in units of kg/ha, for overstory leaves and stems in premontane forests). This methodology is more robust than IPCC guidelines as it specifically references biomass calculations in the same ecosystem type rather than broad, national averages. Field data being collected during monitoring per the monitoring plan will ultimately be used to estimate carbon stocks for project verification.

Figure 5: Forest/Non-Forest Stratification of the Project Area





### Detailed stratification

A detailed land use stratification was performed for the project zone in addition to the forest/non-forest stratification of the project area. The project area portion of this detailed stratification and forest measurement data from monitoring within the project area will be used to estimate carbon stocks for verification purposes. It was completed by reconstructing satellite imagery scenes (1:25,000) from different groups of remote sensors from distinct points in time over the period 1990-2010 (Arellano-P., 2011). Extensive cloud cover throughout the year makes it nearly impossible to carry out satellite imagery analysis using a single multispectral scene. For this reason, in addition to the costs associated with acquiring medium to high-resolution imagery for the project area and the drawbacks of using radar imagery, land cover was classified by comparing similar scenes in the region. This land cover analysis of aimed to include the following:

- 1. a series of satellite images or aerial photos (raster series) spaced at different points in time that allow evaluation pixel by pixel;
- 2. a series of vectoral, multi-temporal thematic maps that are sufficiently spaced in time;
- 3. evidence of types of land cover and vegetation in the project zone based on primary and secondary information;
- 4. a large comparison area at the same spatial resolution.

Table 7 shows the three groups of LANDSAT images pertaining to three decades that were selected for the project zone: LANDSAT Group 5 for the 1980's, LANDSAT Group 7 for the 1990's, and LANDSAT Group 7 for the 2000's (GloVis, 2011). It was necessary to address two issues in the image series. First, in the 1980's, the sensor lacked the panchromatic band which makes it impossible to compare with remote multispectral data from the 1990's and later. This issue was solved by combining with imagery from 1999, the oldest panchromatic image available. Second, although LANDSAT 7 provides uninterrupted information since July of 1999, a fault in the image capture instrument since May 31, 2003 makes it impossible to obtain images without bands. Conventional methods for addressing this issue include the use of Fourier transformations; however, given that the sensor damage results in large amounts of information loss, this technique does not recover sufficient information. Some research groups, such as the United States Geological Survey (USGS), have designed algorithms like the SLC-Gap-Fill Algorithm (Scaramuzza, Micijevic, & Chander, 2004) which attempt to correct the signal defects using similar information (Howard & Lacasse, 2004). However, applying these algorithms requires specific information on the scene as well as a complete series of the scene, which was not available for the project zone.

A group of techniques were used to process the images from the LANDSAT 7 group for the project zone (representing anthropogenic disturbance during 2000-2010). The process sacrifices the information distributed in bands, although the spectral result is similar to the combination of the bands separately (in this case bands 4, 5, and 3). The process, known as "histogram matching", is used to combine the color intensities as well as the distribution of the color palate associated with the best image selected among all dates over the three decade period. In general, the process consists of homogenizing the color information in the raw data and homologizing them in the rest of the images. This process was carried out using the MATLAB, Grass, and R statistical software packages (GRASS Development Team, 2010; Mathworks, 2007; R Development Core Team, 2011).



Next, images with banding and information loss were decomposed using Fourier analysis to eliminate small periodic interferences. Even though these processes substantially improve the visual information of the images, image processing software (especially histogram curve adjustment) is useful for the intuitive correction of subtle changes in brightness and color. Regions lacking information (i.e. areas affected by banding, dense clouds, atmospheric interference, or bodies of water) were modified by incorporating values of zero (0) in their histograms in order to reduce classification error and homogenize the number of resulting classes. This process yielded information on patterns of land cover in the project zone without interference. The information was incorporated into an image mosaic that, in the case of LANDSAT Group 7 (2000-2009), recuperated over 80% of the information lost as a result of the defective sensor. The remaining 20% was reconstructed by comparing land cover with the LANDSAT Group 7 (1990-1999) through the process illustrated in Figure 6.

Table 7: LANDSAT Scenes Used in the Image Reconstruction Process.

LANDSAT Scene	Year	Decade Equivalent	Bands Used	Panchromatic band
L5010054_05419830512	1983			
L5010054_05419860219				
L5010054_05419860510	1986	Land Cover 1980's	4,5,3	Unavailable, Band 8 from 1999 was used.
L5010054_05419860713	1900			
L5010054_05419861102				
L5010054_05419891228	1989			
L71010054_05420010527				
L71010054_05420011103	2001	Land Cover 1990's	4,5,5	
L71010055_05420011103				
L71010054_05420070613				8
L71010054_05420071019	2007			8
L71010054_05420071104		Land Cover 2000's		
L71010054_05420081106	2008			
L7G010054_05420100621	2010			

#### Land cover classification

In order to classify land cover, supervised (visual) classification was combined with classification using fuzzy logic (Arellano-P., 2011; Arellano-P. & Rangel-Ch., 2010). For the supervised classification of images, training surfaces were generated in order to reclassify those pixels that shared similar characteristics. LANDSAT-SPOT images can include specific types of land cover within each signal, for example, anthropogenic disturbance in lowlands can generate a signal that may be misinterpreted as areas of highly illuminated forest. This requires the revision of classification with visual methods in the vectorized product. For raster inputs, this type of pixel correction can be time-consuming when all of the signals are assessed, hence fuzzy logic can be a useful tool in the classification and separation of data. For the project zone, fifteen (15) spectral signatures were generated in order to separate the principal land cover classes. Table 7 shows the signal classes used in the classification of land cover in the project zone and the signal(s) they include. Figure 7 shows the results of the classification, where land cover classes dominated by anthropogenic intervention have been grouped into at least three classes (shown in red).



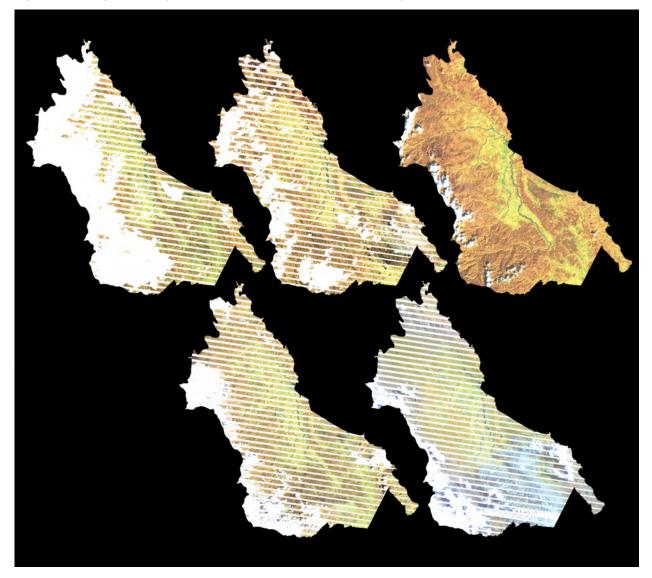


Figure 6: Histogram Analysis of Satellite Information for the Project Zone.

Figure 6 shows the condition of the LANDSAT satellite information, the histogram sectors that lack information, and the clouded regions that were substituted with zeros. The best image for the project zone was L71010054\_05420011103 (at upper right). The table of colors was copied from this image for color approval. The rest of the images correspond to the group made up of the intervention and existing land cover for the first decade of the 21<sup>st</sup> century. The image with the most deficient information was L71010054\_05420070613 (at lower right), which was only used for small corrections.



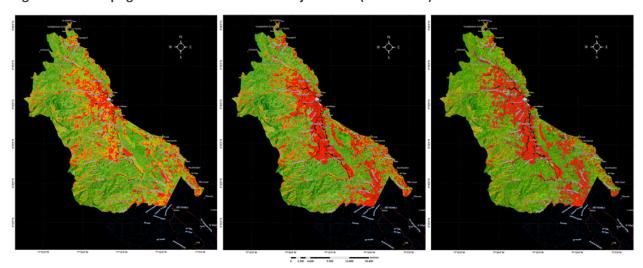


Figure 7: Anthropogenic Intervention in the Project Zone (1990-2010).

Figure 7 shows anthropogenic disturbance in the project zone over three decades, where green represents forest cover, orange depicts brush/scrubland at middle and higher elevations with some grassland, and red indicates anthropogenic disturbance. The presence of orange and red signals at higher elevations, such as in the Serranía del Darién, the Serranía de Tripogadí, and the Serranía La Iguana, are an artifact of mixed signals attributable primarily to illumination in the images. In order to address this issue, the distribution of vegetation patterns in the project zone was modeled using fuzzy logic. A digital elevation model (DEM), models of direction and slope, and the topographic convergence index (TCI) (Lookingbill & Urban, 2005) were generated at 1:25,000 scale using the GRASS 6.4 statistical software package (GRASS Development Team, 2010). The DEM was generated using the raw data from the 3N and 3B bands from the Visual Near Infrared (VNIR) sensor from the ASTER satellite (GloVis, 2011). These were superimposed in order to generate control points and a DEM scene at 15m of vertical resolution. Since the coverage of this model is never 100% due to certain atmospheric phenomenon, the classic elevation model of 30 meters resolution from ENVISAT is also used to obtain ordinary control points for addressing inconsistencies in the ASTER images. The sum of the two control points from the two sources are exported to a text file using Kriging interpolation at 15m and are converted again to a .dem file containing the digital elevation model. Next, the r.terraflow and r.slope algorithms (GRASS Development Team, 2010) were applied in order to calculate the flow, accumulation, fill, TCI, and watersheds through the model's XYZ grid (Arellano-P., 2011).



Table 8: Signal Classes Used in the Classification of Land Cover.

Class	1980-1989	1990-1999	2000-2010
Class 1	Forest Type 1	Forest Type 1	Forest Type 1
Class 2	Forest Type 2	Forest Type 2	Forest Type 2
Class 3	Forest Type 3	Forest Type 3	Forest Type 3
Class 4	Forest Type 4	Forest Type 4	Forest Type 4
Class 5	Forest Type 5	Forest Type 5	Forest Type 5
Class 6	Alteration/parceling	Secondary brush/scrub adjacent to intervened areas	High brush/scrub and intervened lowland areas
Class 7	Forest Type 2	Alteration/parceling	Forest Type 2
Class 8	Forest Type 6	Forest Type 6	Alteration/parceling
Class 9	Forest Type 6	Forest Type 6	Forest Type 6
Class 10	Forest along watersheds with less structure and lowland brush	Forest along watersheds with less structure	Forest along watersheds with less structure
Class 11	Forest Type 1 at higher elevations and brush/scrub in lowlands	Forest Type 1 at higher elevations and brush/scrub in lowlands	Forest Type 1 at higher elevations and brush/scrub in lowlands
Class 12	Forest Type 1 at higher elevations and brush/scrub in lowlands	Alteration/parceling 2	Forest Type 1 and brush/scrub in mountainous areas, alteration in lowland areas
Class 13	Forest Type 1 at higher elevations and brush/scrub in lowlands	Altered brush/scrub	Forest Type 1 at higher elevations, altered brush/scrub at middle elevations, and heavily intervened brush/scrub in lowlands
Class 14	Forest Type 1 at higher elevations and brush/scrub in lowlands	Alteration/parceling in lowlands, Forest Type 1 at higher elevations and forests associated with watersheds	Alteration/parceling in lowlands, Forest Type 1 at higher elevations and in forests along watersheds
Class 15	Alteration in ravines	Alteration in ravines	Alteration in ravines



### Image reclassification

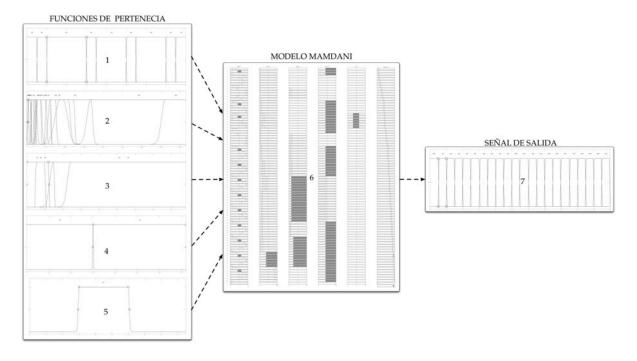
Fuzzy logic can be used to discriminate mixed or vague signals from any classification source. The approach is particularly valuable in understanding transition zones, since forests often lack clear boundaries. The use of fuzzy logic for image classification in the present analysis had multiple aims, including the possibility to objectively distinguish between patterns of vegetation and land cover in areas which may appear to be homogenous or with similar radiometric characteristics (Arellano-P., 2011; Arellano-P. & Rangel-Ch., 2010). The application of fuzzy logic is equally useful in solving resolution problems when a very detailed sample is available (e.g., Quickbird, WORLDVIEW 2, or IKONOS images). In generating fuzzy sets from the information resulting from the supervised classification from each time period, the membership functions for the DEM, slope, direction, and TCI were used as additional inputs in the membership functions (see Figure 9). This process was carried out using the MATLAB statistical software package (Mathworks, 2007).

Table 8 shows the 15 signal classes used in the classification of land cover over the three-decade period. Component (1) of Figure 8 shows the membership functions that describe the behavior of the 15 classes resulting from the supervised classification. Due to signal mixing and the classification of shade and illuminations, various classes are synthesized into the same membership function. For example, the forest signal is grouped into a single function in order to separate the different types of forest based on the additional model inputs. Component (2) of Figure 8 shows the membership functions for the elevation signal used to describe the distribution of vegetation types along the altitudinal gradient. A Gaussian model (gauss2mf) was selected as it permits a broader response signal and adequately represents the superimposition of vegetation limits. Component (3) shows the functions (gauss2mf) that describe the behavior of vegetation in areas with some degree of inclination. Component (4) of Figure 8 shows the two membership functions for direction: the regions between 150° and 360° represent areas located within the rain shadow, which can mean less humid conditions than on the windward side. For the TCI, the membership function describes the proximity of the vegetation to watersheds. Component (6) of the same Figure shows the rules for creating the response signal, which is represented in Component (7). The solution of the model was carried out using the Mamdani and centroid methods.

A total of 83 rules were generated for the thematic map synthesizing anthropogenic disturbance (1980-1989) in order to create 22 responses, of which 21 are types of land cover and the remaining one is a null signal. For the map synthesizing summarizes human intervention during 1990-1999, a total of 110 rules were created generating the same number of responses, and for 2000-2010, a total of 132 rules were created. The difference in the number of rules owes to the distinct mixes of signal resulting from the first classification. Annex CA 31 presents the types of land cover identified and the parameters of classification used in the process.



Figure 8: Structure of the Fuzzy Logic Model for Image Classification (Arellano 2011).





Modelo de elevación Pendientes 4 2.00 sam Dirección Índice de convergencia topográfica

Figure 9: Inputs Used in the Membership Functions for Land Classification via Fuzzy Logic.



### Current carbon stocks

Total carbon stocks in all included pools are 9.87 million  $tCO_2e$ . Table 9 shows the pools of carbon included in the estimation of carbon stocks. Total carbon stocks are estimated as follows where the variables and sources for values are defined as Table 10.

$$C_{TOTAL} = A_{FOREST} \times B_{ABG} \times R_{C:B} \times F_{CO2e} \times (1 + R_{R:S}) + A_{FOREST} \times C_{SOIL} \times F_{CO2e}$$
$$= 11936 \times 269 \times 0.47 \times 3.6667 \times (1 + 0.27) + 11936 \times 65 \times 0.47 \times 3.6667$$

It is important to note that this estimate is to show original conditions in the project area before the project commences and to demonstrate the net climate benefit of the project for validation. Data collected though the implementation of a detailed and robust monitoring plan will be used for subsequent verification.

Table 9: Pools of Carbon Included in the Estimation of Carbon Stocks.

Туре	Inclusion	Observations
Above-ground tree biomass	Included	Expected to be a major source of GHG emissions from deforestation.
Above-ground non- tree biomass	Excluded	Conservatively excluded.
Below-ground tree biomass	Included	Expected to be a major source of GHG emissions from deforestation.
Below-ground non- tree biomass	Excluded	Conservatively excluded.
Deadwood	Excluded	Likely to remain constant under the project scenario.
Leaf litter	Excluded	Expected to represent only a small proportion of total biomass (<1%).
Soil	Included	Expected to be a major source of GHG emissions from deforestation.

Table 10: Variables Used in the Calculation of Carbon Stocks.

Variable	Description	Reference
$A_{FOREST}$	Area of forest in project area (ha).	Forest/non-forest stratification of project area.
$B_{ABG}$	Aboveground biomass (MgC/ha).	Overstory leaves and stems from Golley et al. (1969).
$R_{C:B}$	Ratio of carbon to biomass.	From IPCC 2006 default of 0.47 (Chapter 4, Table 4.3).
$F_{CO2e}$	Conversion to carbon-dioxide equivalent.	Ratio of molecular weights 44/12.
$R_{R:S}$	Root-to-shoot ratio.	From IPCC 2006 default of 0.27 for tropical mountain systems (Chapter 4, Table 4.4).
$C_{SOIL}$	Soil carbon (MgC/ha).	Estimated based on IPCC 2006 default for HAC soils and tropical moist climate (Chapter 2, Table 2.3)



### **G.1.5** Communities Located in the Project Zone

### Precolonial history

A variety of indigenous groups have inhabited the Daríen for several millennia including the Tule (Kuna), Cueva and Embera. Lithic artifacts in the area date back to around 10,000 B.C.. Paleobotanical evidence of tools used for grinding and processing vegetables suggest that there was cultivation of maize and squash by around 7,000 B.C., while ceramics, weaving, goldsmithing, and the cultivation of yuca appeared shortly thereafter around 6,000 – 2,000 B.C. During the 16<sup>th</sup> and 17<sup>th</sup> centuries, Kuna and Embera groups that inhabited the region managed to exercise a high degree of independence from the Spanish, who were unable to establish a permanent presence in the Darién until a peace was signed with the Kuna in 1677 (Santos Vecino, 1989; Torres de Araúz, 1975). Pirates frequently attacked Spanish settlements and mining operations throughout the 17<sup>th</sup> century with the tacit support of the Kuna, who maintained good relations with the English and French as well as the Embera during the early colonial period (Torres de Araúz, 1975).

### Black settlements in the Chocó

In the 17th century, slave companies began to bring Africans to the Chocó as the search for gold in the region intensified. Between 1724 and 1728, approximately 53% of slaves arriving to Cartagena were destined for the more important mining regions of the Chocó (Tovar Pinzón, 1980). Africans and indigenous were spatially segregated and subject to strict controls, which included a division of labor in which Africans worked mines in and around rivers while indigenous groups were displaced to other regions for the cultivation of crops. Often, escaped African slaves (*libres*) would flee into the sparsely populated forests, such as those of the Darién, to join maroon communities (*palenques*) along the lower banks of rivers, usually in peaceful coexistence with indigenous groups (Pardo, 1996). Meanwhile, mining in the Pacific was the impetus for the establishment of large estates (*haciendas*), such that slaves increasingly worked not just in mining but also in the fields. By the end of the 17<sup>th</sup> century, the distribution of the slave population had experienced a fundamental shift: nearly 60% were working in agricultural zones, while only 40% were dedicated to mining (Tovar Pinzón, 1980).

With the official abolition of slavery in 1851 and the decline of the gold mining economy in the Chocó, black settlement patterns spread significantly along the river banks (Aprile, 1993; Romero, 1995). Settlements in the Darién arose longitudinally along the region's key rivers: the Atrato, Salaquí, Baudó, Cacarica, Tanela, Perancho, Truandó, Brazo Viejo, León, Tumaradó, Jimarandó, and Riosucio, which together comprised the regional transportation network, connecting the communities with each other and with regional commercial centers such as Quibdó, Turbo, and Cartagena. By the early 20<sup>th</sup> century, the Chocó remained physically and economically marginalized with respect to the rest of the country. Since the mid-19<sup>th</sup> century, the region experienced what was essentially a series of boom-and-bust cycles in which natural products were exploited intensively in response to external demands before declining demand led to a rapid decrease and economic collapse (Oslender, 2004). Ivory nut (*tagua*) and rubber exploitation on the Pacific coast in the first half of the 20<sup>th</sup> century were typical of these cycles, while local people continued to practice a subsistence economy of fishing, agriculture and gathering for their everyday needs (Whitten, 1986).



#### Acandí

The project area is located within the municipality of Acandí, which was formed by settlers arriving from the Atlantic coast and Sinú region (e.g., the departments of Bolívar and Córdoba) looking for products such as rubber, tagua, raicilla, and tortoiseshell. While the name "Acandí" comes from the Kuna (or Tule) language, meaning "river of stone", there are currently no Kuna settlements in the municipality. Acandí was officially created in 1880 within the jurisdiction of the District of Turbo (Cauca). In 1908, it was incorporated into the newly created District of San Nicolás de Titumate (Department of Quibdó). Shortly thereafter, in 1909, the National Congress created the Department of Chocó from what was previously the Department of Quibdó. In 1971, Acandí was divided into two regions in order to create the municipality of Unguía, which was separated from Acandí along its present southern border. The 2005 Census registered a population of 10,455 for the municipality, of which over 85% identify themselves as Afro-descendants (DANE, 2005). Approximately 80% of the population older than 5 years of age is able to read and write. Table 11 shows the townships, settlements, and sectors that currently comprise the municipality of Acandí. Figure 12 shows the age structure of the population.

## Indigenous settlements in the project zone

Indigenous groups present in the project zone include the Embera-Katío as well as the Kuna (Tule). There are two indigenous reserves in the immediate vicinity of the project area. The Chidima-Tolo reserve was established in 2001 and is located between Globes 1 and 2 of the Cocomasur territory in the upper watershed of the Tolo River. Pescadito, a second, smaller Embera-Katío reserve, was also created in 2001, and is located only a few kilometers from the village of Peñaloza. Despite the creation of the reserves, members of the Chidima communities have suffered constant encroachment to the detriment of the natural resources on which they depend for food, shelter, and traditional activities. The community of Chidima Tolo consists of approximately 66 individuals belonging to 13 families, with a relatively balanced sex ratio and an estimated population growth rate of 35% growth over the last ten years. The community of Pescadito is comprised of approximately 8 families totaling 49 individuals, with an estimated growth rate of 20% over the last 10 years.



Table 11: Administrative Subunits of Acandí (Townships, Settlements, and Sectors).

Township	Sectors and Settlements
Sapzurro	Township Seat: Sapzurro
Supzuito	Sectors: Cabo Tiburón, La Diana
	Township Seat: Capurganá
Capurganá	Sectors: El Cielo, El Aguacate
	Settlements: La Mora
Rufino	Township Seat: Rufino
	Settlements: Borbúa, Pinorroa
	Township Seat: Capitán
Canitán	<b>Settlements</b> : Cogollo, El Brillante, Astí, Capitancito, Los Girasoles, El Cedro, Juancho, Acandí Seco (Medio), Acandí Seco (Bajo), El Brazo, Dos Bocas, La
Capitán	Diabla, La Hoya
	Sectors: Río Muerto, Quebrada Arena
	Township Seat: Caleta
Caleta	Settlements: Playona, Goleta, Playeta, Furutungo
	Township Seat: San Miguel
San Miguel	Settlements: El Perdido
	Township Seat: Peñalosa
	Settlements: Barrancón, Brazo Seco, Campo Difícil, Ñeca, Nequita, Ñeca Arriba,
Peñalosa	Reinaldo
	Indigenous reserve (Embera Katío): Pescadito
	Indigenous reserve (Embera): Chidima
	Township Seat: Chugandí
Santa Cruz de Chugandí	Settlements: Chugandicito, La Joaquina, Tibirrí (Alto), Tibirrí (Medio), Tibirrí
	(Bajo), Aguas Blancas
Titiza	Township Seat: Titiza
	Settlements: Titiza (Alto), Titiza (Bajo), Los Morales, El Besote, Quebrada Loma
Villa Claust	Township Seat: San Francisco
Villa Claret	Settlements: Triganá, Coquital, San Nicolás, Napú, Loma del Cielo, Río Ciego,
	Sasardí

#### Livelihoods

River systems are the organizing force of Chocó life, connecting communities to each other and to the main commercial centers along the coast. Concepts of "up" and "down" are understood in terms of the flow of rivers, and not as north or south. The rivers have traditionally shaped the formation of villages such that they are completely integrated into the daily life and activities of the inhabitants. Houses in riparian communities are typically constructed of locally harvested materials, with a family garden located behind the dwelling or on higher ground in close proximity to the village. Dwellings and community buildings such as schools, kiosks, and social spaces are often connected by elevated wooden planks that run parallel to the river.



Line fishing in Sapzurro Bay, Acandí, Chocó. Photo by Nicolas Arms.



The majority of *chocoanos* depend on subsistence resources including agricultural products as well as hunting and fishing. In 2005, more than 57% of the population of the Chocó lived in rural settings working in small-scale units of production (DANE, 2005). Agriculture and gathering are important elements in household subsistence strategies, though lacking in advanced techniques. Residents of the region cultivate rice, cassava, plantain, yam, coconut, peach palm (*chontaduro*) and *borojó* at subsistence volumes. Riverine communities trade small volumes of fish, such as *bocachico*, to passing boats heading to larger cities on the coast. While surplus yields were once exported to neighboring regions, production has declined in recent years and most no longer reach sufficient volumes for export, and some staples, such as coconut and corn, are now imported (Marín Marín, Álvarez de Uribe, & Rosique Gracia, 2004). While families traditionally cultivate their own gardens, many families were forced to abandon their parcels, particularly during the peak in violence in the region during 1997-1998.

Subsistence fishing is as important as agriculture and involves a substantial portion of the male population. Artisanal techniques are practiced at great disadvantage to industrial fishermen who negatively impact the integrity of coastal and marine ecosystems. Fishing is done in a variety of large and small boats, mainly dugout canoes of different widths and lengths, such as the long, narrow *piragua* and the wider canoe (*canoa*), often used with outboard motors. Quality woods, such as cedar, *ceiba*, *chibuga*, *caracolí*, and *cativo*, are prized for their durability in the construction of these boats. Fishermen prefer the dry season (*verano*), when fish are more concentrated in diminished water than in the rainy season (*invierno*).

## Agriculture

Traditional subsistence cultivation by black communities coexists alongside the more socially and environmentally damaging phenomena of larger-scale land use by large businesses, often backed by armed actors, who have displaced black communities to pursue their own agricultural interests (INCODER, 2005). The Darién region has made an attractive site for cattle ranching and large-scale agriculture. In 2008, Colombia had 24 million heads of cattle, representing the fourth largest herd in Latin America. Contract farming models for plantain cultivation are now widespread across thousands of hectares in the surrounding neighboring region of Urabá, whereby landowners who grow plantain are paid per box at a price set across the entire region. The predominant pattern of growth and development in the region has resulted in major imbalances in income distribution, serious deficiencies in basic public services provision, and the progressive degradation of the region's soil, water and other natural resources that underpin the livelihoods of the majority of the region's inhabitants.



Yam (Dioscorea spp.) in Acandí, Chocó. Photo by Emily Roynestad.



## Forestry

The Chocó is particularly apt for forestry, and logging is an important source of income and local employment. The most important timber companies that have operated in the Chocó include Maderas del Atrato, Maderas del Darién, Maderas de Urabá, Madurex, Maderas de Riosucio, and Madisa. Logging peaked in the 1970's and 1980's reaching a volumes in excess of 150,000 m³ during 1986-1987 when logging concessions were granted to large companies prior to the collective titling of lands to black communities (INVIAS, 1999). In Acandí, some of the more important commercial species are *cativo*, *caracolí*, cedar, *sagal*, *cativo*, *hobo*, *sande*, and *virola* (see Table 3). Trees with diameters greater than or equal to 50 cm DBH are felled using high-powered chainsaws, typically with a 36" blade and weighing approximately 13 kg (see video of selective logging in the project zone). Locals estimate cubic yields per hectare to be in the range of 250 m³ ha⁻¹, of which 160 m³ ha⁻¹ correspond to commercial species.

In Colombia, yields of teak (*Tectona grandis*) are in the range of 7-10 m³/hectare/year, and there are an estimated 100-200 hectares of teak plantations in the project zone. Teak plantations in the project zone consist largely of small plantations of 5-10 hectares each, largely owing to the lack of infrastructure in the region. There is currently no teak under cultivation in the project area.



## Artisanal mining

Alluvial gold mining using traditional techniques has been practiced in the Chocó for centuries. Although on a very small scale, gold mining occurs in the municipalities of Acandí and Unguía; along the Acandí Seco River, the Upper Titirita, the Titila, the Arreynaldo, and the Cuque. Alluvial gold has also been traditionally mined from the Tolo River using rudimentary techniques. Although traditional panning techniques are still used in some communities (e.g., Tibirre), dredges, motorized water pumps, and other methods harmful for the natural environment are being increasingly employed in order to maximize diminishing yields.

Many families in the project zone practice sustainable artisanal mining techniques (such as those employed in this video). The project will explore implementation of the Oro Verde model, which assists traditional gold and platinum mining communities in meeting social and environmental criteria to access international markets for fairly mined and traded metals. Oro Verde addresses irresponsible mining practices in the region by rescuing local communities' ancestral knowledge, integrating it with technical and scientific know how, and enabling families to generate sustainable incomes.



Artisanal mining is an important livelihood in Tibirre, Acandí, Chocó. Photo by Nicolas Arms.

Artisanal techniques do not use chemicals such as cyanide and mercury. Examples include:

**Panning** (mazamorreo) - involving getting gravel from riverbeds and riverbanks in the dry season;

**Summer immersion** (*zambullidero*) - a summer season technique where the mine is located at the end of a river. After successive immersions the minerals are extracted from the gravel.

**Hole technique** (hoyadero) - manually excavated holes of varying sizes until bedrock is reached.

**Flow water method** - a technique used in the rainy season that uses the force of pressurized water to extract sediments, circulating it through narrow artificial channels and man made dams where the sediments containing gold are washed.



## Marginalization

With improving security in the Chocó and the Darién, Afro-descendant and indigenous familes displaced by the conflict have begun to return home. Nonetheless, the department of Chocó still lags far behind the rest of the country in all measures of human and economic development. The Chocó scored 0.73 on the Human Development Index (HDI) in 2010—well below the national average of 0.84 and in last place among all departments (UNDP, 2011). The department also scored the lowest of all departments (0.68) on the conflict-adjusted HDI, which factors violence, land concentration, and displacement, below the national average of 0.77 (UNDP, 2011). The



A fisherman dries his catch in the sun along a river in the Darién. Photo by Emily Roynestad.

muncipality of Acandí placed in the lowest category on municipal vulnerability index, a composite measure of human and institutional capacity, conflict and displacement, female headship, young children per household, environmental vulnerability and economic capacity (UNDP, 2011). Despite Colombia's impressive economic growth in recent decades, the Chocó may still be characterized as a pre-modern society compared with the rest of the country (Gosling & Taylor, 2005; Palacio & Bengtsson, 2009). The Chocó has one of the lowest shares of industrial production in the country, contributing only 0.38% of GDP in 2005 and with a declining annual growth rate since 1990. Figure 10 shows the lack of progress towards achieving the Millenium Development Goals (MDGs) in the Chocó as a factor of its isolation.

Despite democratic elections, political accountability is poor in the region and institutions fail to provide the minimum basic public goods such as health, education and utilities (Bonet, 2007). Indicators of health and wellbeing in the Chocó are among the worst in the country. In 2005, some 79% of the inhabitants of the Chocó had "basic unmet needs", the highest percentage of any department in Colombia and roughly four times the national average (DANE, 2009). Figure 11 depicts the elevated levels of unmet basic needs in rural and urban areas of regions with Afro-Colombian collective territories. Despite the lack of data, it is possible to see the trend of underdevelopment in the Chocó: male infant mortality rates are roughly double the national average at 86 per 1000 births, and illiteracy among Afro-Colombians is 32% compared to 15% among other ethnic groups (DANE, 2007). Only 38% of Afro-Colombian teenagers attend high school, compared to 66% of non-black Colombian teenagers. Only 2% of all Afro-Colombian youth attend university. In the year 2000, the Chocó experienced an internal displacement rate of 3,440 per 100,000 habitants, the highest of any department in Colombia in that year (CODHES, 2008; Ferguson, 2010).



GRAFICO 2.5.1 Índice de ruralidad vs. índice de avance de los ODM departamental Atlántico Risaralda Caldas 75,29 Bogotá Santander 70,29 Bolívar 65,29 Cundinamarca Cesar 60,29 Caquetá Casanare 55,29 Arauca Córdoba Guaviare 50,29 San Andrés La Guajira Amazonas 0 45,29 Chocó Vichada 40,29 Vaupes 35,29 -16,13 26,13 36,13 76,13 6,13 46,13 56,13 66,13 Índice de ruralidad departamental Fuente: cálculos PNUD, proyecto OOML con base en cifras oficiales y en el índice de ruralidad del IDH.

Figure 10: Progress Towards the MDGs Relative to Rural Isolation.

Source: UNDP 2011

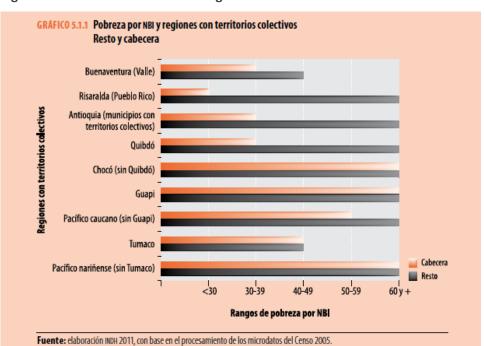


Figure 11: Unmet Basic Needs in Regions with Collective Territories

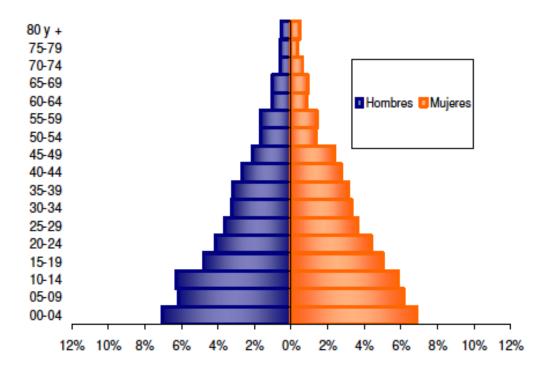
Source: UNDP 2011



# Gender and Age

The Chocó ranks second to last on the Gender and Development Index (GDI), a measure of income, life expectancy, literacy and basic education, at 0.759 compared to a national average of 0.788 (UNDP, 2011).

Figure 12: Population Structure of Acandí by Sex and Age Group.



Source: Dane 2005



### **G.1.6 Current Land Use and Property Rights**

Despite their marginalization, black communities have played a central role in democratic reforms in Colombia beginning with the election of a constituent assembly and the adoption of a new constitution in 1991 that redefined the country as multiethnic and pluricultural. The new constitution's Transitory Article 55 (AT-55) required Congress to pass a law granting Pacific black communities (*comunidades negras*) collective property titles to the rural and riparian areas that they occupy "in conformity with their traditional systems of production" (Cepeda Espinosa, 2009; Offen, 2003). Later, Congress passed Law 70 guaranteeing the "territorial rights" of black communities, and Decree 1745 required the collaboration of governmental institutions in the demarcation and titling of black territories to locally-elected community councils (*consejos comunitarios*). These councils were newly created ethnoterritorial and political entities that served to solicit and administer the new territories. To date, the Colombian government has demarcated and titled 150 black territories totalling over 5 million hectares and representing over 300,000 people in one of the most ambitious and radical territorial reforms ever undertaken in Latin America. Despite the titling of black ancestral lands, property ownership remains highly concentrated in the project zone, with a gini coefficient of property ownership over 0.8 in Acandí municipality—representing the most inequitable range on the scale (see Figure 13).

On August 1<sup>st</sup>, 2005, the *Instituto Colombiano para el Desarrollo Rural* (INCODER) awarded Collective Title No. 1502 to the Council of Black Afro-Colombian Communities of the Tolo River Basin and Southern Coastal Zone (Cocomasur) in recognition of their longstanding presence in Acandí. This 13,465 ha area is managed by the nine Local Councils of Cocomasur, who in turn represent a mix of Afro-descendant and *mestizo* families spread amongst 31 villages (Figure 29) The most recent census accounts for 826

families and 5,782 individuals. Notwithstanding their territorial recognition, many communities are uncertain as to their territorial boundaries and rights and some conflicts do exist (see Annex CA 32). Inadequate resources have been allocated to guarantee implementation of the new property laws and enable territorial governance building. There is widespread ignorance of Law 70, and many communities lack the internal governance structures and regulations necessary for effective resource management.

to erty ing. any ence tive

The rights to subsoil non-renewable resources *Chi* including minerals, oil, and gas in Colombia belong *Pho* 

Children bathing in the Tolo River, Acandí, Chocó. Photo by Emily Roynestad.

to the state, while the soil belongs to the landowner (see Annex CA 10). In the case of Cocomasur, there is no conflict between soil and subsoil ownership rights and the use of renewable natural resources, including forests and their ecosystem services. In order for the Colombian state to explore or exploit subsoil non-renewable resources, a free prior informed consent process regulated by Decree 1320 would be required to guarantee the rights of the community landowner and to establish compensation mechanisms for any social, economic, cultural or ecologic damages that might be incurred. This would include those from lost revenue from the commercialization of environmental services in the case of Cocomasur. At present, there are no permits granted for mining exploitation in the project area (see Annex CA 11).



WA CARIBE PANAMA VENEZUELA OCEANO PACIFICO BRASIL ECUADOR Informe Nacional de Desarrollo Humano PNUD INDH 2011 Índice de GINI de propietarios < 0,7 6,0-0,8 PERU 8,0 <

Figure 13: Gini Coefficient of Property Ownership by Municipality.

Source: UNDP 2011



Forest

Plantation forestry

Land Use	Economic Activity	Community or Individual	Ownership type
Pasture	Cattle ranching	Neighboring ranchers	Private individual title
Agriculture	Subsistence food production	Cocomasur members, other individuals in the project zone	Private individual title or possession
Forest	Environmental services	Cocomasur	Private collective title

Chidima

Individuals in the project zone

Table 12. Land Use and Property Rights in the Project Zone.

## **G.1.7 Current Biodiversity and Threats to Biodiversity**

Teak production

Subsistence forest product

collection and agriculture

Colombia is home to over 10% of the world's plant and animal species despite covering just 0.7% of the planet's surface, and has more registered species of birds and amphibians than any other country in the

world. Around one third of its plant species and 12% of its terrestrial vertebrates exist nowhere else on earth. Even by Colombian standards, the lowland rainforests of Colombia's Pacific coast are outstanding. This region, known as the Chocó, is characterized by moist tropical forest, seasonally flooded forests, and mangroves with average annual rainfall ranging from 1,500-5,000 mm in the Darién region to as much as 12,700 mm further south. The Darién in particular has been prioritized by global conservation organizations for its high degree of biodiversity and endemism. The region boasts over 500 species of birds, over 25% of the total reported for Colombia, in an area less than 1% of the country's size.



Indigenous reserve (a

private collective title)
Private individual title

The near-threatened jaguar (Panthera onca) is the largest feline in the Western Hemisphere. Photo by Emily Roynestad.

Although biological inventories are still incomplete, Colombia is considered to rank 4<sup>th</sup> globally in total species diversity, 2<sup>nd</sup> in both plant and amphibian diversity, 1<sup>st</sup> in bird diversity, and 3<sup>rd</sup> and 5<sup>th</sup> in mammals and reptiles respectively (Rangel, 2004b). Much of this extraordinary biological diversity owes to the Great American Interchange, an important paleozoogeographic event in which land and freshwater fauna migrated from North America via Central America to South America and vice versa, as the volcanic Isthmus of Panama rose up from the sea floor bridging the formerly separated continents (Wallace, 1876). The migration peaked around three million years ago (during the Piacenzian and upper Pliocene), and resulted in the joining of the Neotropic (roughly South America) and Neartic (roughly North America) ecozones to form the Americas. While the most dramatic effect of the interchange was on the zoogeography of mammals, it also provided migration opportunities for weakflying (or flightless) birds, reptiles, amphibians, arthropods, and even freshwater fish.



For this reason, the Chocó biogeographic region is one of the most important reservoirs of biodiversity on the planet (Rangel, 2004a). The northern region of the Chocó (the Darién) is particularly important because of a confluence of environmental factors such as the Caribbean Sea and the presence of large areas of forest both on the Colombian side as well as in Darién National Park in Panama. This is one of the most species-rich expanses of lowland and highland rainforest in the world, possessing endemism over a broad range of taxa. The biotic composition of the Darién has been estimated at 5% of the total worldwide. The northern region of Chocó is considered one of the least studied in Colombia (Lynch & Suárez- Mayorga, 2004). Analysis of biodiversity in the project zone, and specifically around the towns of Acandí and Unguía, indicates the presence of 167 species of terrestrial mammals, 35 species of aquatic mammals, 598 species of birds, 58 species of amphibians, and 45 species of reptiles. Unfortunately, an estimated 44 species of mammals are considered under threat, as well as 153 birds, 25 reptiles, 217 amphibians, 63 fish and 28 invertebrates, 523 species of higher plants and 96 species of lower plants (Roguiguez-Mahecha, Rueda-Almonacid, & Gutierrez, 2008). Table 13 presents an overview of the biogeographical districts of the Darién (INVIAS, 1999), while the following sections explore the project zone in further detail.



Table 13: Flora and Fauna of the Darién by Biogeographic Districts (from INVIAS 1999).

District	На	Percent	Location	Characteristics
San Blas- Acandí- Tanela	128,866	8.9%	Coastal corridor from the Panamanian province of San Blas to the valleys of the rivers Tolo, Acandí, Tanela y Arquía	Sub rainforest vegetation, area of Cana turtle nesting on the beaches of Acandí and Playona (wildlife sanctuaries) with 82 identified species of reptiles, 845 plants, 110 fish, 177 mammals, 328 birds and 14 amphibians; a bird migration corridor.
Tacarcuna	34,842	2.4%	Foothills of the Serrania del Darien above 400 meters, from the province of San Blas, towards the south to the river Pipirre	Rainforest vegetatation, center of endemism, a wildlife sanctuary, the existence of 50 endemic woody species 507 plants, 130 mammals, 247 birds, 74 reptiles and 19 amphibians.
Serranía del Limón Pirre- Serranía de los Saltos	274,554	18.9%	Mountain range that includes the highlands of Cerro Pirre Limón in Panama, and the hills of Aspavé of the Serrania de los Saltos in Colombia	Rainforest vegetation, 131 identified species of mammals including endemic species including rodents, 31 species of reptiles, 237 birds and 19 amphibians.  Hardly any study in detail as to plants and amphibians.
Juradó- Cupica	99,182	6.8%	Coastal plain of the Pacific littoral, from the Gulf of San Miguel, flanking the west, the former district until Cupica Bay	806 plant species, 172 mammals, 301 birds, 25 reptiles and 26 amphibians.
Curvaradó- Río León	264,800	18.2%	Floodplain on the right bank of the Atrato River from its delta and offshore in the Gulf of Uraba to Curvaradó River basin south	Rainforest vegetation, 512 species of plants, 181 species of mammals, 312 birds, 105 reptiles and 98 species of fish. Presence of white-headed marmoset, an endemic species.
Katíos	275,813	19.0%	Hilly portion of the foothills of the Serranía del Darién closer to the banks of the Atrato River	National Park; 933 species of plants, 182 mammals, 428 birds, 96 reptiles and 113 fish have been identified.
Murri	151,161	10.4%	Right side of the Atrato river	Rainforest vegetation, 158 species of plants, 170 mammals, 293 birds, 77 reptiles, 27 amphibians and 74 fish, a littlestudied region.
Domingodó- Upurdú- Bojayá	223,944	15.4%	Truandó river valleys, Nercua, Upurdú, Opogadó and Napipí to the left bank of the River Bojayá	224 plant species, 63 reptiles, 100 fish, 167 mammals, 369 birds and 11 amphibians have been identified.



#### Mammals

A total 13 orders, 39 families, 106 genera and 167 species (Table 14) have been observed in the project zone. In addition, there are aquatic mammals, which include some species of very wide distribution or migration patterns. The most representative mammals are the order *Chiroptera* (bats) with a total of 89 species (53.2%), followed by the order *Rodentia* with 31 species (18.5%), the order *Carnivora* with fifteen species, the order *Didelphimorphia* with eight species; and the order *Primates* with seven species.

Mammals in the project zone include the threestriped night monkey *Aotus trivirgatus*, howler monkey *Alouatta villosa*, brown-headed spider



The endangered cotton-top tamarin (Saguinus oedipus) is found only in northwestern Colombia. Photo by Miroslav Petrasko.

monkey Ateles fuscipens, three-toed sloth Bradypus variegatus, giant anteater Myrmecophaga tridactyla (VU), capybara Hydrochaerus hydrochaeris, agouti Dasyprocta punctata, and paca Aguti paca. The giant pocket gopher Orthogeomys dariensis, Mt. Pirre climbing mouse Rhipidomys scandens (VU), and Panama slender opossum Marmosops invictus are endemic. There are also bush dog Speothos venaticus (VU), spectacled bear Tremarctos ornatus, jaguar Panthera onca, ocelot Felis pardalis, margay F. wiedii, jaguarondi F. yagouaroundi, oncilla F. tigrinis, whitelipped peccary Tayassu pecari, long-tailed weasel Mustela frenata, and Baird's tapir Tapirus bairdii (EN) (Mello & Zuercher, 2005; Reid & Helgen, 2008; Zuercher, Swarner, Silveira, & Carrillo, 2008).

There are 23 species of mammal categorized as experiencing some degree of threat according to the Red Book of Colombian Mammals (Rodríguez-Mahecha, Alberico, Trujillo, & Jorgenson, 2006). Table 14 presents those species classified as IUCN conservation priorities (IUCN, 2010). In the case of bats, researchers have noted that some 65% of species in the Chocó region lie further than 30 km from conservation areas such as national parks, and are therefore vulnerable to a host of conservation threats. This group includes endemic species and those that have only recently been described for which there is no further information available (Mantilla-Meluk & Jiménez-Ortega, 2006; Pineda & Rodriguez, 2008).

Mammals in the project zone are at particular risk of being killed by commercial or subsistence hunters, or simply because they are considered dangerous to humans or their livelihoods. For example, the giant anteater (*Myrmecophaga tridactyla*) is often killed when encountered since it is perceived to threaten domesticated animals. Table 14 indicates the level of risk for mammal species in the project zone by category of risk, where EN = "Endangered", VU = "Vulnerable", CR = "Critically Endangered", NT = "Near Threatened", and DD = "Insufficient data".



Baird's tapir (Tapirus bairdii) is the largest land mammal found in the wild in South America.



Table 14: Mammal Species in the Project Zone by Category of Risk.

Species	Common Name	Rodríguez- Mahecha et al., 2006	IUCN	CITES
Alouatta palliata aequatorialis	Black howler monkey	VU	LC	Appendix I
Aotus zonalis	Panamanian night monkey	VU	DD	Appendix II
Ateles fusciceps rufiventris	Colombian Spider Monkey	EN	CR	Appendix II
Choloepus hoffmannii	Two-toed sloth	VU	DD	Appendix III
Leopardus pardalis aequatorialis	Ocelot/Dwarf Leopard	NT	LC	Appendix I
Leopardus wiedii	Tree Ocelot	NT	LC	Appendix I
Lontra longicaudis	Neotropical River Otter	VU	DD	Appendix I
Mazama temama	Red Brocket Deer	DD	LC	Appendix III
Myrmecophaga tridactyla	Giant Anteater	VU	NT	Appendix II
Odocoileus virginianus tropicalis	Rainforest White-tailed deer	CR	LC	Appendix III
Panthera onca centralis	Jaguar	VU	NT	Appendix I
Pecari tajacu	Collared peccary	*	LC	Appendix II
Phylloderma stenops	Pale-faced bat	DD	LC	
Platyrrhinus chocoensis	Choco broad-nosed bat	DD	VU	
Puma concolor	Puma	NT	LC	Appendix I
Rhinophylla alethina	Hairy little fruit bat	LC	NT	
Saguinus oedipus	Cotton-top tamarin	CR	EN	Appendix I
Speothos venaticus panamensis	Bush dog	LC	NT	Appendix I
Tamandua mexicana	Northern tamandua	LC	LC	Appendix III
Tapirus bairdii	Central American tapir	CR	EN	Appendix I
Tayassy pecari	White-lipped peccary	*	NT	Appendix II
Tremarctos ornatus	Spectacled bear	VU	VU	Appendix I

#### **Birds**

A total of 589 bird species (see Appendix 3) have been recorded in the project zone (Chapman, 1917; Haffer, 1959, 1967; Rangel, 2004b). These birds represent 69 families, with the largest groups being the Tyrannidae (tyrant flycatchers), Thraupidae (tanagers), Trochilidae (hummingbirds), Thamnophilidae (antbirds), Accipitridae (hawks and eagles), Parulidae (New World warblers) and Icteridae. Knowledge of avian fauna in the Serranía del Darién is still quite incomplete, as most bird sightings are registered along the coastline and at altitudes below 500 m in Acandí.

Of the bird species in the project zone, at least 30 are restricted-range species, some confined to a single mountain like Mt. Tacarcuna or Mt. Pirre. Notable species include the world's largest population of the harpy eagle *Harpia harpyjia*, white-crowned eagle *Spizastur melanoleucus*, red-throated caracara *Daptrius americanus*, great curassow *Crax rubra*, crested guan *Penelope purpurascens*, marbled woodquail *Odontophorus gujanensis*, russet-crowned quail *Geotrygon goldmani*, four macaw species including the great green macaw *Ara ambigua* (VU), rufus-vented ground cuckoo *Neomorphus geoffroyi*,



crested owl *Lophostrix cristata*, brown violet-ear *Colibri delpinae*, green-crowned brilliant *Heliodoxa jacula* and black-cheeked woodpecker *Centurus pucherani*.

Six of the bird species registered in the project zone are endemic to Colombia, and 39 are near-endemic (Stiles, 1998). Some 29 species belong to an IUCN threat category: Critically Endangered (0),Endangered (2), Vulnerable (11), and Near Threatened (16) (L. M. Renjifo, 1998; L. M. Renjifo, Franco-Maya, Amaya-Espinel, Kattan, & López-Lanús, 2002). Threatened lowland species include the Baudó oropendula Psaracolius cassini (EN), the Chocó tinamou Crypturellis kerriae (VU), and the speckled ant-shrike Xenornis setifrons (VU). Most mountain species are not threatened at present, but their very small range sizes leave them vulnerable to disturbance (Stattersfield, Crosby, Long, & Wege, 1998). Nearly one-quarter of species found on the



The three-toed sloth (Bradypus variegatus) sleeps 15-18 hours per day. Photo by Brodie Ferguson.

Serranía del Tacarcuna are endemic, such as the Tacarcuna woodquail *Odontophorus dialeucos* (VU), Tacarcuna bush-tanager *Chlorospingus tacarcunae*, Tacarcuna tapaculo *Scytalopus panamensi* and violet-capped hummingbird *Goldmania violiceps*. The Serranía de Pirre has the Pirre bush-tanager *Chlorospingus inornatus*, green-naped tanager *Tangara fucosa*, Pirre hummingbird *Goldmania violiceps*, beautiful tree-runner *Margarornis bellulus* and Pirre warbler *Basileuterus ignotus* (VU).

A total of 13 endemic bird species have been identified in the project zone (2% of the total recorded), among which the Chocó tinamou *Crypturellis kerriae* and the Tacarcuna Wood-quail *Odontophorus dialeucos* are most notable. The distribution of endemic birds occurs along two corridors in particular: the first is located towards the Serranía de los Saltos along the coast between Juradó and Cupica, while the second includes the Serranía del Darién, Cerro Tacarcuna, Los Katíos National Park, and the foothills of the Serranía del Darién. At least 47 species belong to the genus of songbirds, which have a significant presence in the Gulf of Urabá since they adapt easily to intervened habitats. There are seven species of endangered birds (two species of eagles, three parrots, and two herons) that have virtually disappeared from the project zone. There are a total of 88 migratory species, of which almost all (86) nest in North America and winter in South America, while two species nest in southern South America and spend their winter further north. Most records are based on insufficient samples, hence further fieldwork is needed in order to more accurately estimate species richness (Rangel, 2004b).

#### **Amphibians and Reptiles**

Colombia currently ranks 2<sup>nd</sup> in global diversity of amphibians, with 735 species in 13 families (Rueda-Almonacid, Lynch, & Amézquita, 2004). The country also ranks 4<sup>th</sup> globally in reptiles, with about 500 species reported to date (Castaño-M., Cárdenas-A., Hernández-R., & Castro-H., 2004).



## **Amphibians**

A total of 58 amphibian species have been recorded in the project zone. These are distributed among two orders, 11 families and 21 genera (see Table 15). Among the species identified by the IUCN as of Least Concern (LC) are Savage's Thin-toed Frog *Leptodactylus savagei*, the Tungara Frog *Engystomops pustulosu*, and the Cane Toad *Rhinella marina*, the latter of which is considered to be a growing

population, since it can occupy a variety of habitats and adapts well to anthropogenic changes. The aforementioned species comprise the group of frogs found in lowlands and transformed areas of the project zone (Lynch, 2006). The presence of these species is supported by landscape heterogeneity, particularly transition zones between open areas, secondary forests, and areas dominated by human intervention that offer plenty of open habitat, such as grasslands and crops.

Heterogeneity in habitat structure due to increased human intervention may result in favorable characteristics for the establishment of certain amphibian species (Yahner, 1988). Water bodies,



The Glass Frog (Hypsiboas boans) requires slowflowing bodies of water to reproduce. Photo by Brian Gratwicke.

shrubs and grasses have been found to be suitable for anuran species with certain reproductive characteristics. Species such as the Gladiator Tree Frog *Hypsiboas boans* (LC) require slow-flowing bodies of water whereupon to lay their eggs for tadpoles to develop, as do the Glass Frog *Hyalinobatrachium sp.* and *Phyllomedusa venusta* (LC), which are found in areas with tree cover and also associated with bodies of water (Duellman & Trueb, 1994). The presence of *R. marina and E. pustulosus* in open areas may be due to the fact that they have several reproductive events throughout the year. Of the species found in the project zone, *Phyllomedusa venusta* is most vulnerable to deforestation and pollution by agrochemicals and herbicides (J. M. Renjifo, Solís, Ibáñez, Jaramillo, & Fuenmayor, 2004). Further studies are required to better understand the behavior of *Hyalinobatrachium* as well as the potential negative impacts caused by human intervention.

## Reptiles

There are approximately 8000 registered species of reptiles in the world (Uetz, 2002), and Colombia counts among the richest in reptile species with more than 500 described species and numerous more yet to be described, especially in the group of snakes and lizards. Colombia has the most turtle species in South America (the same number as Brazil) as well as the most crocodiles (the same number as Venezuela) (Castaño-Mora, 2002). The 42 species of reptiles present in the project zone span three orders and 13 families (see Table 16). Of all the species identified for the region, eight are considered endangered, particularly from pressures exerted by hunting (for the pet trade) and habitat destruction. An additional seven species are considered threatened, largely due to their low tolerance to changes in habitat. Among the reptiles present in the project zone are the Central American bushmaster *Lachesis stenophys*, Central American coral snake *Micrurus nigrocinctus*, the deadly fer-de-lance *Bothrops asper*, cayman *Caiman crocodilus*, and American crocodile *Crocodylus acutus* (VU).



Table 15: Amphibian Species in the Project Zone by Category of Risk.

				Threat	Category
Order	Family	Scientific Name	Common Name	Global IUCN	Population
				2010*	Trend
		Allobates talamancae		LC	Stable
		Colostethus panamansis		LC	Declining
		Colostethus pratti	Rana flecha	LC	Stable
	December 1911	Dendrobates auratus	Dardo, flecha verde, cocoi, cocoy	LC	Unknown
	Dendrobatidae	Phyllobates bicolor	Rana Bicolor	NT	Declining
		Silverstoneia flotator		LC	Stable
		Silverstoneia nubicola		NT	Declining
		Ranitomeya fulgurita		LC	Unknown
		Ranitomeya minuta		LC	Unknown
		Atelopus varius	Sapito arlequín	CR A2ace	Declining
		Incilius coniferus		LC	Stable
	Bufonidae	Rhaebo haematiticus		LC	Declining
	Битопіцае	Rhinella acrolopha		DD	Unknown
		Rhinella marina	Sapo común	LC	Increasing
		Rhinella margaritifera		LC	Stable
		Cochranella euknemos		LC	Declining
ANURA		Espadarana prosoblepon		LC	Stable
ANUKA		Hyalinobatrachium	Danita da suistal	1.0	Chabla
		chirripoi	Ranita de cristal	LC	Stable
		Hyalinobatrachium		LC	Ctabla
	Controlonidos	colymbiphyllum		LC	Stable
	Centrolenidae	Hyalinobatrachium		LC	Unknown
		fleischmanni		LC	Ulikilowii
		Sachatamia albomaculata		LC	Stable
		Sachatamia ilex		LC	Declining
		Teratohyla pulverata		LC	Unknown
		Teratohyla spinosa		LC	Stable
		Dendropsophus ebraccatus		LC	Stable
		Dendropsophus phlebodes		LC	Stable
		Dendropsophus subocularis		LC	Stable
		Hyloscirtus colymba		CR	Declining
		Hyloscirtus palmeri		LC	Unknown
		Hypsiboas boans		LC	Stable
		Hypsiboas crepitans		LC	Stable
		Hypsiboas pugnax	Rana platanera	LC	Stable
	Hylidae	Hypsiboas rosenbergi		LC	Declining
		Scinax boulengeri		LC	Stable
		Scinax rostratus		LC	Stable
		Scinax ruber		LC	Stable
		Smilisca phaeota		LC	Stable
		Smilisca sila		LC	Declining
		Agalychnis callidryas		LC	Declining
		Agalychnis lemur		CR	Declining
		Cruziohyla calcarifer		LC	Declining
		Phyllomedusa venusta	Rana arborícola de ojos rojos	LC	Declining
		Strabomantis bufoniformis		LC	Stable
	Ctrohomontido -	Pristimantis achatinus		LC	Stable
	Strabomantidae	Pristimantis cruentus		LC	Stable
		Pristimantis gaigeae		LC	Stable
		Pristimantis ridens		LC	Stable
		Pristimantis taeniatus		LC	Stable
		Diasporus gularis		LC	Stable
	Leptodactylidae	Diasporus tinker		LC	Stable



		Leptodactylus bolivianus		LC	Stable
	Leptodactylidae	Leptodactylus fuscus		LC	Stable
	Leptodactylidae	Leptodactylus savagei		LC	Stable
		Leptodactylus insularum		LC	Stable
ANURA		Craugastor crassidigitus		LC	Stable
ANONA	Craugastoridae	Craugastor fitzingeri		LC	Stable
		Craugastor longirostris		LC	Declining
		Craugastor opimus		LC	Declining
		Craugastor raniformis		LC	Stable
	Leiuperidae	Engystomops pustulosus		LC	Stable
	Leiuperiuae	Pleurodema brachyops		LC	Stable
	Pipidae	Pipa myersi		EN B1ab(iii)	Unknown
CAUDATA	TA Plethodontidae Bolitoglossa biseriata			LC	Stable

With the exception of turtles, reptiles have traditionally received much stigma and little respect from humans, despite the important role they play in ecosystems. Snake populations have particularly suffered as a result of the fear people have of them (Castaño-Mora, 2002), and environmental education is needed to address human attitudes and behavior with respect to snakes. Many lizard and gecko species have adapted to living in environments populated by humans, which has changed their original distribution as their habitat has been destroyed. Thanks to ectothermy, or the ability to use solar energy for most of vital processes, a typical reptile uses only a tiny percentage of the daily energy that a mammal of the same size would consume. Hence, their demand for food is considerably less and they are more efficient in transforming food energy into body tissue or investing in reproduction. For these reasons, reptiles and amphibians are considered to be ecologically inexpensive energy reservoirs (Castaño-Mora, 2002).

Marine turtles are subject to intense pressure from hunting on breeding grounds and marine habitats, either as a result of deliberate actions to catch them, or from accidental capture and drowning during commercial shrimp fishing. Accidental capture in the Colombian Pacific alone results in the death of more than 8,000 individuals each year (Duque-Goodman, 1988). Although hunting has diminished in recent years, the hawksbill sea turtle *Eretmochelys imbricata* (CR) and the leatherback sea turtle *Dermochelys coriacea* (CR) continue to be prized for their meat and eggs. Other factors that adversely affect the survival of sea turtle populations in the project zone are related to the destruction of nests by domestic animals such as dogs and pigs, and infant mortality resulting from disorientation caused by light and fires. Although representatives of the order *Crocodylia* were never as abundant in the Chocó as elsewhere in the country, the populations in the lower Atrato swamp and its tributaries, where they were most numerous, were almost exterminated in the 1940s as a result of commercial hunting for skins (Medem, 1962). Subsistence hunting and trade of iguanas, boas, *lobos polleras* (*Tupinambis teguixin*) and the unnecessary killing of venomous snakes considered to be pests have eradicated or reduced to critical levels these taxa throughout much of the Chocó (Cuesta-Ríos, Valencia-Mazo, & Jiménez-Ortega, 2007).



Table 16: Reptile Species in the Project Zone by Category of Risk.

Order	Family	Scientific Name	Common Name	IUCN Threat Category 2010*
		Boa constrictor	Boa	LC
	Boidae	Corallus annulatus		LC
		Corallus ruschenbergerii		LC
		Clelia clelia	Cazadora negra	LC
		Chironius munticola	Verde juetiadora, guache	LC
		Dendrophidron bivitta	Guardacaminos	LC
	Colubridae	Imantoides cenchoa	Bejuquillo	LC
		Leptodeira annulata		LC
		Phimophis guianenis		LC
		Spilotes pullatus cf.	Soche	LC
	Viperidae	Bothrops atrox asper	Mapaná	LC
		Lepidoblepharis		LC
	Gekkonidae	peraccae		
		Sphaerodactylus		LC
SQUAMATA		lineolatus		
	Gymnophtalmidae	Echinosaura horrida		LC
		Anolis auratus		LC
		Anolis chocorum		LC
		Anolis frenatus		LC
	Iguanidae	Anolis granuliceps		LC
		Anolis maculiventris		LC
		Anolis tropidogaster		LC
		Basiliscus basiliscus		LC
		Basiliscus galeritus		LC
	Scincidae	Mabuya mabuya		LC
		Ameiva ameiva		LC
	Teiidae	Ameiva anomala		LC
		Cnemidophorus		LC
		lemniscatus		
		Eretmochelys imbricata	Tortuga Carey, Kurira, Hawksbill Sea Turtle	CR
		Lepidochelys kempii	Tortuga Golfina, Kemp's Ridley Sea Turtle	CR
	Cheloniidae	Caretta caretta	Tortuga Caguama, Loggerhead Sea Turtle	EN
TECTUDINATA		Chelonia mydas mydas	Tortuga Blanca, Green Sea Turtle	EN
TESTUDINATA		Chelonia mydas	Tortuga Verde, Pacific Green Sea	EN
		agassizii	Turtle	LIV
		Lepidochelys olivacea	Tortuga Lora, Olive Ridley Sea Turtle	VU
	Dermochelyidae	Dermochelys coriacea	Cardón, Cardona, Tortuga Caná, Leatherback Sea Turtle	CR
	Testudinidae	Geochelone carbonaria	Morrocoy, Morrocoyo, Motelo, Red- footed tortoise	EN
	Alligatoridae	Caiman crocodilus	Caimán común, caimán de anteojos, babilla, Spectacled caiman	LC
CROCODYLIA	Crocodylidae	Crocodylus acutus	Cocodrilo Americano, Caimán del Magdalena, American Crocodile	CR



## Fish

Fish diversity in the project zone is low relative to elsewhere in the country with 274 species making up some 9% of the national total. The taxon exhibits a pattern of steady decline of species diversity moving from south to north. Of the species recorded, most are primary (165) and secondary (26) freshwater species from the Atrato, San Juan and Baudó rivers; nonetheless, it is unknown what the tributaries of these rivers contribute in terms of species richness, such as the Juradó and other rivers that descend from Serranía de Los Saltos and Serranía del Baudó. A total of 83 species registered are marine species found in the Golf of Urabá.



Bocachico (Prochilodus reticulatus), once abundant in the project zone, Acandí, Chocó. Photo by Brodie Ferguson.

Despite their under-representation at the national level, fish populations in the Darién produce

significant amounts of fish that vary according to season, constituting an important source of income and employment for residents in the project zone. The highest fish diversity recorded is in the Acandí-Tanela area, partly due to the importance of the Acandí River basin and its higher likelihood of being included in biological surveys. Next in importance are the Arquía River and the Truandó and Salaquí Rivers, tributaries of the Atrato just south of the project zone. A total of 19 endemic species have been registered in the Darién (INVIAS, 1999).

## Plants

Colombia ranks 3<sup>rd</sup> worldwide in endemic plant species, with a total of 15,000 to 17,000 species (a high percentage of these species are found in the Darién) corresponding to roughly 6.0-6.8% of the global total of plants endemic to each country, a figure close to that held by the kings of plant endemism (Brazil and Indonesia), which are at the top to 6.6-7.4% and 5.9-7.4% respectively, with larger land areas. A total of 3,493 plant species from 1,380 families have been reported in the Darién, representing approximately 10% of the national total (Rangel, 2004a). Of these 1,380 families, Rubiaceae, Euphorbiaceae, Melastomataceae and Poaceae are the most represented (See Table 17). Levels of plant endemism in the Chocó region are among the highest in the world; almost a quarter of plants recorded at Mt. Tacarcuna are endemic. Limited information on plant distributions prevents a more accurate comparison of plant endemism at the local, regional, and national levels. Nonetheless, the phenomenon of exclusivity in vegetation is closely related to the trend that occurs in animal groups. Hence, levels are higher as altitude increases in the project zone and most of the endemic species occur in epiphytes, shrubs and grasses in these areas. In summary, a total of 86 species of endemic plants have been recorded in the project zone, in addition to unique populations of oak (*Quercus humboldtii*).



Table 17: Plant Families with the Most Number of Species in the Chocó and in the Darién.

Family	Chocó	Darién
Rubiaceae	350	62
Euphorbiaceae	103	38
Melastomataceae	229	29
Poaceae	112	29
Solanaceae	81	25
Orchidaceae	251	23
Asteraceae	127	20
Bromeliaceae	127	20
Arecaceae	93	20
Gesneriaceae	109	19
Piperaceae	185	16
Total	4525	1380

Source: (Prieto-C., et al. 2004)

#### Endemism

The Colombian Pacific shares many elements of its flora and fauna with other biogeographical units. The lowland forests of Central America are the most closely related to those of the Chocó, both in terms of fauna and history. Until the middle of last century, the forests of Central America, the equatorial Pacific and the Middle Magdalena River Valley converged in the Chocó. However, of the 5,823,469 ha of forest that once existed in the Middle Magdalena region of Colombia, only 2,170,000 ha remain, representing an annual rate of forest conversion of over 80,000 ha/year (Cardenas-Torres, 2006). At the north end of the Colombian Chocó, there are still remnants of a connection to the Magdalena Valley (Hernández-Camacho, Adriana Hurtado, Rosario Ortiz, & Walschburger, 1992). Nonetheless, the Chocó region is much richer in species than the Caribbean coasts of Colombia and Venezuela, and shows a greater number of endemic species registered for most taxa. Species in groups that are less capable of dispersal, such as amphibians, reptiles and rodents, tend to show higher endemism. In more mobile groups, such as birds and bats, the degree of endemism is lower and a higher percentage of species is shared with other areas (Alberico, 1993).

The most likely explanation for the restriction of the distribution of these species in Colombia is the geography of the Colombian Pacific, specifically its enclosure by the Western Andes to the east and the Pacific Ocean to the west, a weather barrier to the south, and the Serranía del Darién to the North. These geographical barriers have likely been responsible for preventing the dispersal of many species, particularly of small animals, such as the armored rat *Hoplomys* (Echimyidae), the isthmus rat *Isthmomys* (Cricetidae) and the pocket gopher *Orthogeomys* (Geomyidae), even though their distributions may continue into Central America. Confinement of these genera to the Colombian Pacific and the strong distribution of the Central American tapir *Tapirus bairdii* undoubtedly strengthen the notion of the Chocó as a bioregion, as do other phenomena of the biota, such as the fact that the Colombian Chocó has probably the greatest diversity of flora found in the Neotropics (Rangel, 2004a).



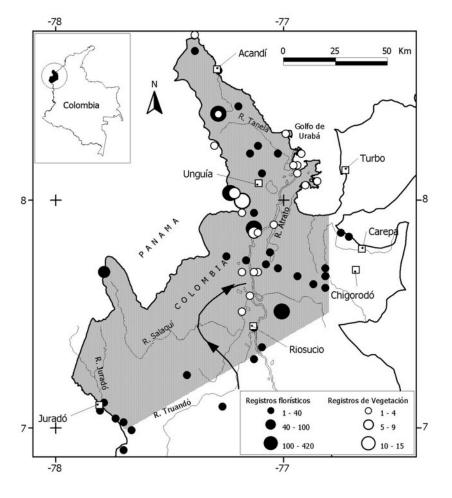


Figure 14: Records of Flora and Fauna in the Project Zone (from Rangel-Ch. 2004).

# **G.1.8** Areas and Species of High Conservation Value

The High Conservation Value (HCV) concept is a globally applicable framework for identifying and managing areas of particular importance in terms of biodiversity, social values, or ecosystem services (ProForest, 2008; Stewart, Lindhe, & Cura, 2010). Annex CA 22 summarizes the findings of the HCV assessment in the project zone.

The Darién is part of the Chocó bioregion which is one of the world's most rich and diverse plant and animal species, many of them still unidentified or analyzed by science. This project addresses multiple globally, regionally, and nationally significant concentrations of biodiversity values in the project zone.

In the context of the entire Chocó-Darién Ecoregional Complex (from the Canal Zone in Panama, along the Pacific and Western Mountains of the Andes in Colombia down to Guayaquil in Ecuador), the Darién region has been highlighted as a priority conservation area for all vertebrate, butterly, and plant families (Adriana Hurtado Guerra, Walschburger, Gómez Návia, Chávez, & Gómez N., 2008; Thomas Walschburger et al., 2008). Again, Mt. Pirre and Mt. Tacarcuna are highlighted because of species richness and presence of endemic species. Hurtado Guerra et al. recorded 476 bird species for the Serranía del Darién in Panama and Colombia (38% of the total avifauna of the Chocó-Darién Complex),



of which 38 are endemic (32% of the total endemic avifauna of the Chocó-Darién Complex). These values are even higher than those recorded for the sectors of Mt. Pirre, Mt. Sapo, the Serranía de los Saltos and the Serranía del Baudó. During a recent expedition by Conservation International and Fundación Ecotrópico to Mt. Tacarcuna, 12 new frog species were recorded and ranges were extended for 4 bird species that were previously not considered present in Colombia.

The Darién region, with its hills and mountain chains, is geologically part of the Isthmus of Panama, which emerged during the late Pliocene (Duque-Caro, 1990) and gave origin to the great faunal and flora exchange that strongly influenced species composition of the Pacific region in the Neotropics, with immigration of many northern and Central American elements (e.g., *Quercus humboldtii* present in the montane forest of Mt. Pirre and Mt. Tacarcuna.)

Protected areas in the project zone include Darién National Park in Panama, recognized as a UNESCO Natural World Heritage Site and Biosphere Reserve for its extraordinary biodiversity (see Figure 15). A second UNESCO Natural World Heritage Site, Los Katíos National Park, is located some 50 km south of the project area.

The Colombian Darién is also part of the Mesoamerican Migratory Corridor, a pass through for many migratory birds like *Wilsonia canadensis*, *Dendroica cerulea* and *Vermivora chrysoptera*, and where around 3.2 million individuals of *Buteo playpterus*, *Buteo swainsonii* and *Cathartes aura* have been registered (Colorado sf). Birdlife International (D. C. Wege & Long, 1995) include Mt. Tacarcuna and Mt. Pirre, each independently, as key areas for endangered birds in the Neotropics.

The Red Lists for plants of Colombia provide the records for several species with areas of distribution less than 20,000 km² and as restricted as 5,000 km² in the Serranía del Darién (see Table 18). A recent survey registered (14) endemic species of plants, (38) butterflies, (19) amphibians, (20) birds and (6) mammals (Ecotrópico 2007).

Table 18: Selected Plant Species with Restricted Distributions in the Project Zone.

Species	Distribution Area
Licania maritime	5,000 km <sup>2</sup>
Dichapetalum foreroi	Only northern Chocó
Astrocaryum malybo	Only northern Colombia
	5,000 km <sup>2</sup>
Zamia manicata	· ·
Zamia chigua	20,000 km <sup>2</sup>

Despite their unique flora and fauna, the forests on the Colombian side of the Serranía del Darién show fragmentation due to cattle ranching in nearby lowlands. Premontane and montane forests of the highlands have suffered the greatest fragmentation in the southern part of the Serranía del Darién, between the middle and upper Cuti river basins and the middle and upper Arquía and Unguía rivers, including the northern boundary of Los Katíos National Park (A. Hurtado Guerra & Sagardía, 2007). Furthermore, other local pressures, such as logging, illicit crops and illegal wildlife trading are increasing the vulnerability of these unique flora and fauna, mostly of montane forests above 1,200 m.

The project zone also includes a number of areas of particular importance to local communities. Among the areas providing critical ecosystem services are the riparian zones of the Arquití, Neca, Corazón,



Brazo Seco, and Jerónimo Rivers (tributaries of the Tolo River) and the Tanelita, Natí, Tibirre, Tisló, and Cutí Rivers (tributaries of the Tanela River), which support livestock and guarantee clean drinking water for communities in the watersheds.

Mapa 1. Área de Estudio PCA
scotto de Securio de Caribe

Provincia de Darier

Los Monos

Chirola L. Palma

Controla Consciente

Controla Contro

Figure 15: Darién National Park, Panama, Adjacent to the Project Area.

Source: Courtesy of The Nature Conservancy, 2010

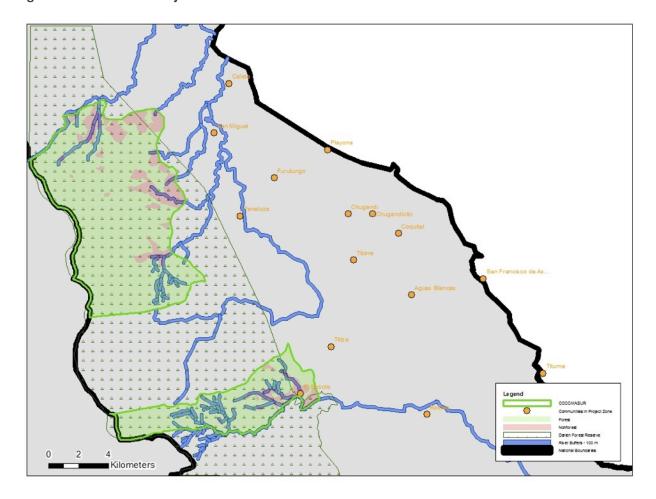


Table 18: Areas of High Conservation Value within the Project Zone.

HCV	Description	Identification in the Project Zone	
	Globally, regionally or nationally significant concentrations of biodiversity values:		
	1.1 Protected areas	National Darien Forest Protection Reserve designation equivalent to IUCN category III (natural monument) area (figure 1); two international Important Bird Area (IBA) designations rated "urgent" conservation priorities by Birdlife International.	
1	1.2 Threatened species	Biodiversity assessments confirm presence of IUCN listed plant (15), bird (10), and mammal (8) species in categories of most concern (CR, EN, VU) in the Serranía del Darién and Cerro Tacarcuna.	
	1.3 Endemic species	Designation of the "Darien Lowlands" as an Endemic Bird Area (EBA) by Birdlife International for having 5 endemic species of limited distribution. Prioritization of the Cerro de Takarkuna as a key site for biodiversity conservation in the country by the Alexander von Humboldt Research Institute (Figure 2).	
	1.4 Areas that support significant concentrations of a species during any time in their lifecycle (e.g. migrations, feeding grounds, breeding areas)	Presence of 86 Neartic migratory bird species including 3 species listed in the IUCN Red list in the project area make it a critical area for the survival of these species during the northern winter.	
2	Globally, regionally or nationally significant large landscape-level areas where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance	The humid forest of the Serranía del Darien has been identified as a unique ecosystem for its bio geographical characteristics and species content; Connectivity with Darien National Park (figure 3).	
3	Threatened or rare ecosystems	Forests dominated by <i>Dipteryx oleifera</i> , <i>Cedrela odorata</i> , <i>Aspidosperma dugandii</i> , <i>Anacardium excelsum</i> and <i>Quercus humboldtii</i> (classes 13 – 21) in the Serranía del Darien are now rare and threatened by rapid deforestation in the rest of the Colombian Chocó (Table 1).	
4	Areas that provide critical ecosystem services (e.g., hydrological services, erosion control, fire control)	The forested areas of the Tolo and Tanela river catchments of the Serranía del Darien provide critical hydrological services to human settlements and cattle ranches in the lowlands.	
5	Areas fundamental for meeting the basic needs of local communities (e.g., for essential food, fuel, fodder, medicines or building materials without readily available alternatives)	The Serranía del Darien provides water for all the human population of Acandí and Ungía municipalities (and their rural areas) and for all their productive activities. There are currently no other water sources available.	
6	Areas that are critical for the traditional cultural identity of communities (e.g., areas of cultural, ecological, economic or religious significance)	The Serranía del Darien and its forests, with all the goods and services it provides to local communities of rural Acandí.  Areas with secondary or mildly transformed habitats should also be considered part of this HCV. The forest sustains the way of life of these communities, who have depended upon it for generations	



Figure 16: HCVs in the Project Zone.





## Management recommendations for maintenance and enhancement of HCVs

In order to maintain the area's biodiversity and rare ecosystems, it is key to maintain forest structure and composition and to guarantee habitat connectivity. The project should aim to:

- Reduce forest conversion to minimum levels in areas of rare ecosystems, such as forests dominated by Dipteryx oleifera (Classes 15, 16, 17) or Cedrela odorata (Class 18), Anacardium excelsum (20) and Quercus humboldtii (21);
- Protect continuous forest cover along the altitudinal gradients and key water catchments;
- Maintain and if possible increase connectivity with neighboring Panamanian national park;
- Reduce timber extraction to minimum levels, specially of endangered or keystone (i.e., those which provide food to a wide array of animals, for example *Dipteryx oleifera*) tree species;
- Eliminate hunting of large to medium size mammals; and,
- Plant fast growing trees to provide fuel for cooking in areas close to human settlements.

In order to guarantee the persistence of large, landscape level forest it is key to:

- Maintain and if possible increase connectivity with neighboring Panamanian national park; and,
- Protect continuous forest cover along the altitudinal gradients and key water catchments.



# **G.2** Baseline Projections

## G.2.1 Most Likely Land Use Scenario in Absence of Project

A range of potential land-use scenarios and associated drivers are presented in Table 19. The most likely land use scenario is conversion of forest to pasture and grazingland for cattle ranching. In the absence of the project, the same patterns of deforestation and degradation evident in the project zone in recent decades will continue unchecked. This means a continuation of forest degradation driven by cattle ranching, agricultural expansion, and, to a lesser extent, selective logging. The compound damage to the ecosystem from the conversion of forest to pasture would, in turn, affect habitat and land use patterns as farmland becomes more vulnerable to more frequent and intense flooding. Erosion and silt accumulation in rivers from forest destruction would put further pressure on livelihoods. Without investment in community-based resource management, it is unlikely that current community governance would be capable of preventing the encroachment and illegal logging in the territory.

Table 19: Potential Baseline Land Use Scenarios.

Baseline Land Use Scenario	Drivers
Cattle Ranching  Cattle ranching in Colombia is largely extensive and uses very small inputs of labor and capital relative to the land area utilized.	Colombia has over 24 million heads of cattle representing the 4 <sup>th</sup> largest herd in Latin America. There are an estimated 47,000 heads of cattle in the vicinity of the project area.
Selective logging  Selective logging occurs both illegaly as well as via CODECHOCO permits in the project zone.  Carbon storage in selectively logged forests can be reduced by as much as 25%.	Increasing scarcity of timber resources in Colombia is putting increasing pressure on the forests of the Chocó (UNDP, 2011).
Subsistence and small-scale agriculture  Cultivation, particularly of rice, cassava, and plantain, is an important element in the subsistence strategies of households in the project zone.	Small-scale agriculture is driven largely by subsistence needs of rural families, with limited commercialization in local markets and virtually no export.

Two methodologies were used to project the land use change in the project area in the absence of the project: a peer-reviewed spatial model called Dinamica and VM0009, a VCS-approved methodology. The two methodologies converge to the same cumulative levels of deforestion. Both analyses exclude important threats of deforestation, such as mining, since no quantitative data is available on their historical dynamics. It also excludes important social and demographic variables, such as the total



fertility rate (TFR) and recent figures on internally displaced persons (IDPs) returning to the project zone. In the event that existing threats increase in significance or new threats emerge, the baseline can be updated accordingly.

## Dinamica projection

Land use change was modeled using Dinamica-EGO and the MATLAB statistical software package for the eight types of natural cover defined in the vegetation analysis depicted previously in Table 5 (Arellano-P., 2011; Soares-Filho & Rodrigues W. L., 2009; Soares-Filho, Pennachin, & Cerqueira, 2002). This approach supposes a logistic curve for baseline deforestation. First, historical transition matrices are calculated, where the entries refer to two categorical thematic maps for images classified into two periods of time. The products are two matrices with rates of change or percentage change between the

types of initial and final pixels. The first transition matrix (multiple) refers to interim periods (a year in this case) between the start and end dates of the classified images. The second matrix only takes into account extreme states (a simple transition matrix). The multiple matrix is the result of dividing the simple matrix by the summation of the units of time between the two dates and is used to calculate the matrix of gross change for which the percentage transition of area reinterpreted by time and applied in the process of expansion and patch generation of the final model (Soares-Filho, et al. 2009).



Pasture for cattle ranching in the project zone, Acandí, Chocó. Photo by Brodie Ferguson.

#### VCS VM0009 projection

The VCS-approved REDD Methodology VM0009 was also used to estimate baseline deforestation in the project area. The model assumes a logistic relationship between the percent deforestation in the project area and time. VM0009 will be used to generate credits under VCS. Per VM0009, a reference area was defined as illustrated in Figure 17. The reference area is comprised of primary and intervened forest belonging to neighboring Afro-Colombian organizations (collective land titles), large individual landholders engaged in extensive ranching, and various smallholders who rely on subsistence agriculture. Conversion of native forest to cattle ranching and small-scale agriculture in the reference area share the same underlying drivers as in the project area insofar as both areas face the same socioeconomic conditions, tenure characteristics, and market dynamics.

Per the methodology, a sample of 2202 interpretation points were classified as forest or non-forest over a historic reference period during the years 1986, 1989, 1996, 1999, 2002, 2005, 2007 and 2010. The cumulative deforestation given these observations in the reference area is shown in Figure 18. The predicted total deforestation at the end of the project crediting period is 48%. See Section G.2.3 for estimated carbon stock changes associate with the selected baseline scenario per the deforestation projection of VM0009.



Figure 17: Reference Area used for VM0009.

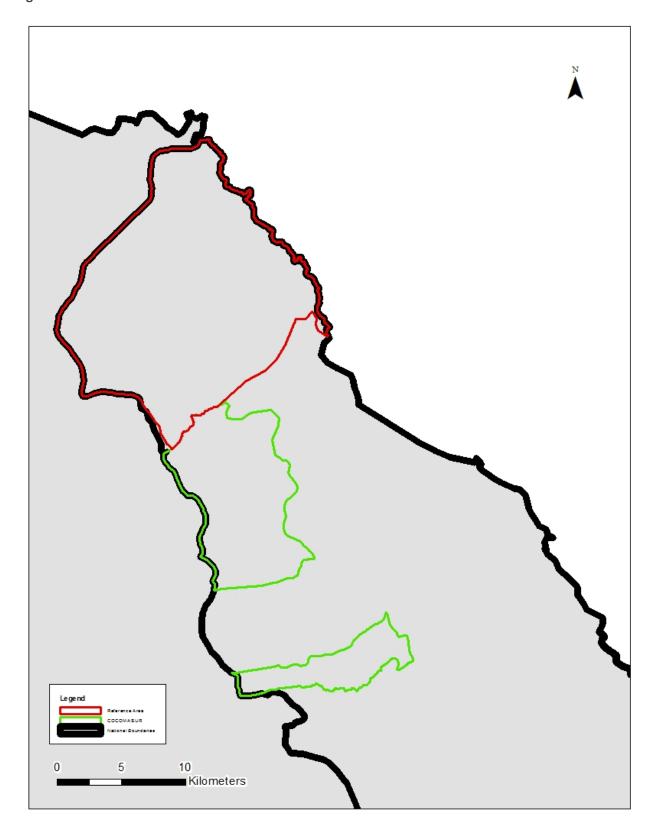
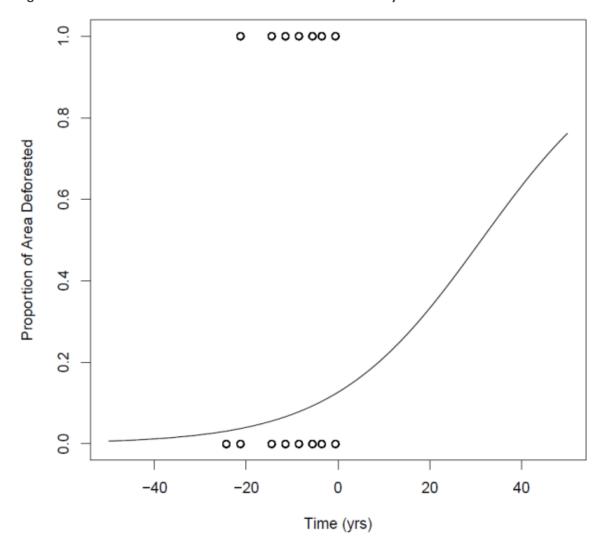




Figure 18: Cumulative Deforestation over Time as Predicted by VM0009.





## **G.2.2** Additionality of Project Benefits

The project conducted a preliminary assessment using the VCS Tool for the Demonstration and Assessment of Additionality (VM0001).

#### 1. Alternative land use scenarios

In the absence of project activities, the most likely land use scenarios include 1) ranching, 2) selective logging, 3) subsistence and small scale agriculture, and 4) abandonment or lack of use (see Table 19). No project actitivities would occur on the land within the project boundary in the absence of project. All of the above four land use alternatives are legal under current Colombian law when carried out by members of Cocomasur with the authorization of the Governing Council and General Assembly, with the exception of selective logging, which requires a license granted by CODECHOCO (see Annex CA 16). None of the above four land uses nor any activities similar to those of the project are required by Colombian law to be carried out in the project area or project zone (see Annex CA 16). In addition, all of the above activities are known to occur illegally in the project zone owing to a systematic lack of enforcement of property law (e.g., encroachment) in Acandí and in the Chocó more generally (Ferguson, 2010; INCODER, 2005; UNDP, 2011).

### 2. Investment analysis

This project generates no financial or economic benefits other than income from forest carbon offsets (See Annex CA 25).

### 3. Barrier analysis

Barriers that would prevent the implementation of the project in the absence of forest carbon revenue include:

- A. Investment barriers Inavailability of debt funding, lack of access to credit, and lack of commercial financing mean that forest conservation activities in Colombia are carried out by large non-profits or the public sector (World Bank, 2003).
- B. Institutional barriers Underdeveloped institutional mechanisms at the regional, national, and international levels for conservation finance (Ortega, García, Ruíz, Sabogal, & Vargas, 2010; WWF, 2009).
- C. Technological barriers Equipment required for the implementation of project activities, such as satellite and airborne remote sensing, GPS units, clinometers, and other measuring devices are not available in the Chocó (Butler, 2011).
- D. Barriers due to prevailing practice The Choco-Darien Conservation Corridor is the first project of its kind in Colombia. No project of this type is currently operational in the Chocó or elsewhere in the country (Cenamo, Pavan, Campos, Barros, & Carvalho, 2009).
- E. Barriers due to social conditions Demographic pressure on the land due to population growth among of Cocomasur, immigration, and return of forcibly displaced families to the project zone



(Ferguson, 2010; A. M. Ibáñez & Querubín, 2004). Social conflict among interest groups in the region where the project takes place (OREWA, 2010). Widespread illegal practices, such as property encroachment and timber extraction (Controlaloría General De La República, 2010; J. Forero, 2009). Shortage of qualified labor to undertake project activities (UNDP, 2011).

- F. Barriers relating to land tenure, ownership, and property rights Communal land ownership with a hierarchy of rights for different stakeholders limits the incentives to undertake project activities (Clarke, 2009; Hardin, 1968; Offen, 2003). Absence of clearly defined and regulated property rights in relation to natural resource products and services.
- G. Barriers relating to markets, transport and storage Unregulated and informal markets for products and services related to the project activity prevent the transmission of effective information (UNDP, 2011). Remoteness of project activities and undeveloped road and infrastructure incur large transportation expenditures (INVIAS, 1999).

These barriers influence the alternative land uses to a considerably lesser extent. Ranching and agriculture face barriers similar to environmental services in terms of social conditions, land tenure, markets, and storage. However, ranching and small-scale agriculture face much lower investment and institutional barriers owing to the maturity of the industry in Colombia, and the greater availability of commercial credit for these activities. These have led to strong local markets such that technology, labor and other inputs are widely available locally.

## 4. Common practice analysis

There are no projects or activities similar to those proposed by this project underway in the project zone or within the broader region.



## G.2.3 Estimated Carbon Stock Changes in Absence of Project

Analysis of alternative land use in Section G.2.1 indicates that conversion of forest to pasture and grazingland for cattle ranching is the most likely land use scenario without the project. Under this scenario, low intensity cattle ranching already prevalent in the project zone would continue to expand in the absence of carbon revenue. Conversion of natural ecosystems under the without project scenario would result in the loss of an estimated 2.3 million tCO<sub>2</sub>e over the thirty year crediting period per the projections of VM0009 (see G.2.1 and http://www.v-c-s.org/methodologies/VM0009). This approach is justified as the project meets all assumptions and applicability conditions of VM0009. Conversion of natural ecosystems to pasture and grazingland in the without project scenario is based on published values and IPCC defaults (see G.1.4). Figure 28 shows the estimated gross carbon stock changes over the crediting period. See Table 20 for estimated carbon stock changes by pool over time per VM0009. Estimated carbon stock changes are based on a linear model of deforestation to from 0% to 48% deforestation as predicted by VM0009. This method of accounting is permitted under VM0009 where the linear model predictions are always less than the predictions by the logistic model.

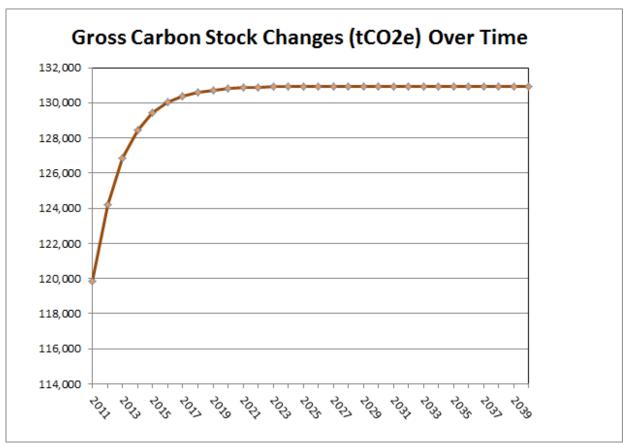


Figure 19: Gross Estimated Carbon Stock Changes (tCO₂e) over the Crediting Period.



Table 20: Estimated Carbon Stock Changes per VM0009.

Year	Aboveground (tCo₂e)	Belowground (tCO₂e)	Soil (tCO <sub>2</sub> e)	Gross (tCO₂e)
2011	88,726	23,956	7,179	119,861
2012	88,726	23,956	11,534	124,215
2013	88,726	23,956	14,175	126,857
2014	88,726	23,956	15,777	128,458
2015	88,726	23,956	16,748	129,430
2016	88,726	23,956	17,338	130,019
2017	88,726	23,956	17,695	130,377
2018	88,726	23,956	17,912	130,594
2019	88,726	23,956	18,044	130,725
2020	88,726	23,956	18,123	130,805
2021	88,726	23,956	18,172	130,853
2022	88,726	23,956	18,201	130,883
2023	88,726	23,956	18,219	130,900
2024	88,726	23,956	18,230	130,911
2025	88,726	23,956	18,236	130,918
2026	88,726	23,956	18,240	130,922
2027	88,726	23,956	18,242	130,924
2028	88,726	23,956	18,244	130,926
2029	88,726	23,956	18,245	130,926
2030	88,726	23,956	18,245	130,927
2031	88,726	23,956	18,246	130,927
2032	88,726	23,956	18,246	130,928
2033	88,726	23,956	18,246	130,928
2034	88,726	23,956	18,246	130,928
2035	88,726	23,956	18,246	130,928
2036	88,726	23,956	18,246	130,928
2037	88,726	23,956	18,246	130,928
2038	88,726	23,956	18,246	130,928
2039	88,726	23,956	18,246	130,928
2040	88,726	23,956	18,246	130,928

Per Section G.1.4, regional estimates of carbon stocks are used to calculate estimated changes in carbon stocks associated with the 'without project' reference scenario. However, locally-specific carbon stocks and a project-specific spatial analysis of deforestation will be completed per the monitoring plan (see CL.3.1) and VCS project validation.

### **Assumptions**

**End land use** - The methodology assumes the end land use in the "without-project" reference scenario is non-forest. This assumption has been met, as the ultimate end land uses in the "without-project" reference scenario are cattle ranching and subsistence, small-scale agriculture (see section G.2.1).

**Shifting cultivation** - The methodology assumes the end land use in the "without-project" reference scenario is not swidden or shifting agriculture. This assumption has been met as the ultimate end land uses in the "without-project" reference scenario are cattle ranching and subsistence, small-scale agriculture (see section G.2.1).



**Harvesting** - The methodology assumes that no biomass is harvested for use in long-lived wood products in the "with project" scenario. This assumption has been met as no harvesting for use in long-lived wood products in planned as a project activity.

**Soil carbon** - A default soil carbon rate is used from the methodology to determine the loss of soil carbon in the soil carbon pool over time in the "without-project" reference scenario. The methodology assumes that this rate be applied only to projects located in tropical or semi-arid tropical regions. The project is in a tropical region.

**Agents of deforestation** - The methodology assumes the foreign agents of deforestation are unlikely to shift their activities outside the leakage area. This assumption has been met as the leakage areas are defined with in the same proximity to the agents of deforestation as the project area and represent some of the last accessible forested areas available to the agents. The agents are not foreign.

**Organic soils** - The methodology assumes that the project does not contain organic or peat soils. This assumption has been met as the project area does not contain any organic or peat soils (see Section G.1.1).

**Availability of imagery** - The methodology assumes that the imagery is available for the historical reference period of the reference area used to estimate the Cumulative Deforestation Model. This assumption has been met, as the image dates are 1986, 1989, 1996, 1999, 2002, 2005, 2007, and 2010, which provide adequate coverage per section 6.4.2 of VM0009.

**Leakage area** - The methodology assumes that the leakage areas are accessible to the project proponent. This assumption has been met because the leakage area is accessible.

### Data

The primary data used to estimate carbon stock changes associated with the "without-project" reference scenario are from image point interpretation of the reference area over a historic reference period. Per VM0009, these data are used to parameterize the Cumulative Deforestation Model. Figures 20-27 show the results of the image interpretation of the 2202 points on a grid over the reference area. Point interpretation was checked for possible errors per Section 6.4.6 of VM0009. All possible interpretation errors were examined and a few interpretation errors were rectified.

### Non-CO₂ gases

 $Non-CO_2$  emissions in the baseline scenario would be largely due to methane emissions through increased cattle ranching, which are expected to be negligible given the extremely low density of cattle per hectare and the grass-based diet of cattle in the project zone.



Figure 20: Reference Area Interpretation Grid (1986).

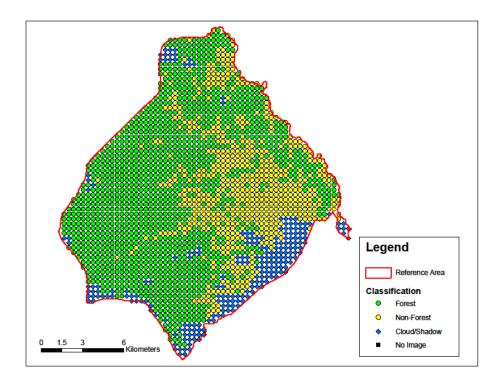


Figure 21: Reference Area Interpretation Grid (1989).

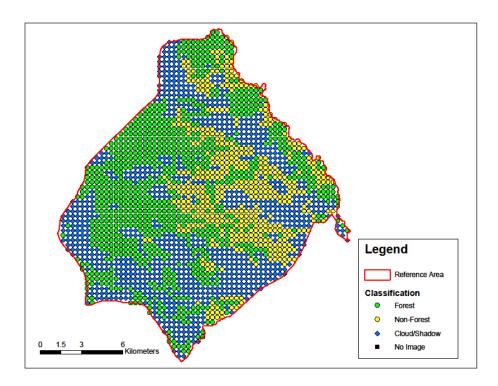




Figure 22: Reference Area Interpretation Grid (1996).

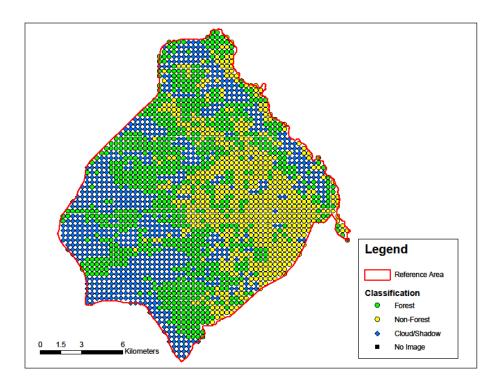


Figure 23: Reference Area Interpretation Grid (1999).

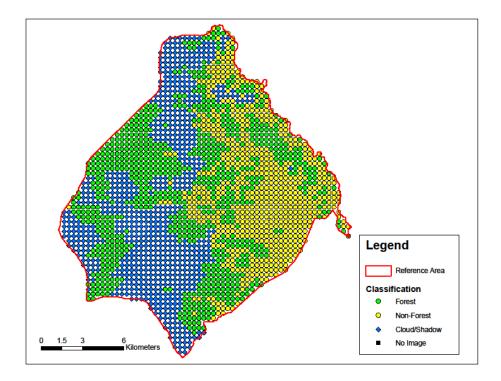




Figure 24: Reference Area Interpretation Grid (2002).

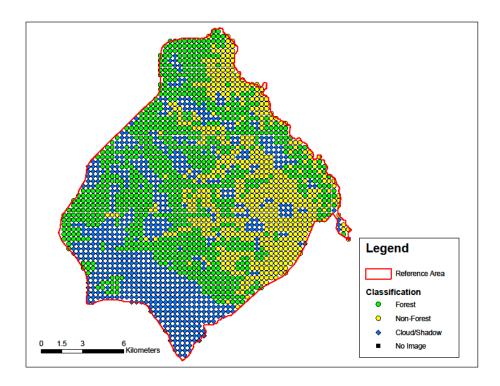


Figure 25: Reference Area Interpretation Grid (2005).

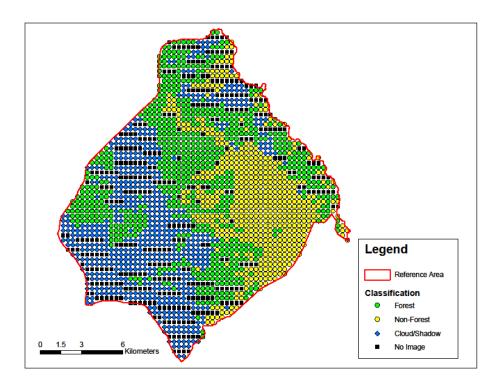




Figure 26: Reference Area Interpretation Grid (2007).

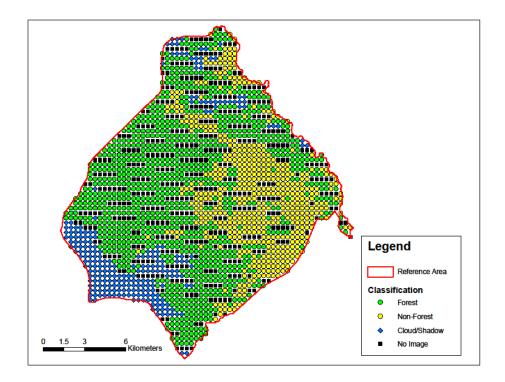
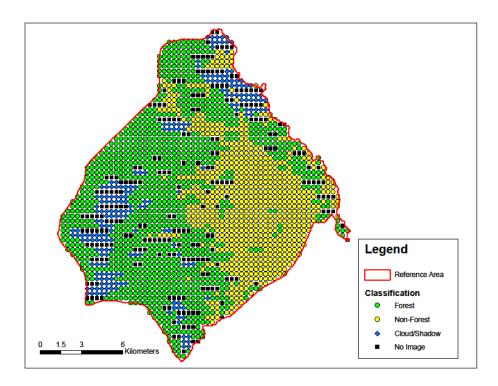


Figure 27: Reference Area Interpretation Grid (2010).





### **G.2.4** Impact of the Baseline Scenario on Communities

Erosion of territorial rights, dignity and identity - The project provides essential resources for preventing further degradation of the forests of the collective territory via the strengthening of its territorial governance mechanisms to enable alternative practices to be adopted and maintained in an equitable fashion. In recognition of its contribution to strengthening common pool resource management and territorial identify among Afro-Colombian collective landholders, Anthrotect was selected as one of 11 finalists in the prestigious Omidyar Network-Ashoka Changemakers competition, Property Rights: Identity, Dignity and Opportunity for All. The competition drew a total of 211 entries from 47 countries, and recognized innovative approaches to formalizing property rights. The project has already enabled the work of cultural recovery to begin by documenting the traditional ecological knowledge of community elders regarding dispute resolution and the forest, infusing new vigor into the collective governance building process.

Forest, ecosystem and livelihood degradation - Without the project, the forests of the territory would be continually degraded and encroached upon by neighboring landowners, resulting in a loss of territorial control and an increasing likelihood of land conflicts. The loss of access and decline in the state of the forest would impact the livelihoods of the communities who depend on them for a range of needs—timber for building materials and fuel-wood, medicines, food, non-timber products, and cultural identity, as well as indirectly for hydrological services that support agricultural productivity and resilience to drought and flooding. Decreasing access to forest resources would create further hardship in the communities and undermine their ethno-territorial development as well as progress toward achievement the human development indicators of the Millennium Development Goals. The loss of territory due to encroachment, coupled with a debilitated environmental services provision and low maintenance capacity, could result in social and economic decline, potential migration or displacement, and even conflict as migrants and powerful adjacent landowners take advantage of a vulnerable territory.

Low income and productivity – The local economy of Acandí is based on subsistence agriculture, artisanal fishing, and limited commerce and small business concentrated in the more touristic areas along the coast, several hours in some cases from the communities of Cocomasur. After years of abandonment, people who fled during the violent years of the past decade are returning to their land

parcels to farm. Agricultural and fisheries production is still at low volumes and is affected by seasonal rains and winds, overfishing by commercial fishermen, and a lack of infrastructure for transportation, cold chain and post-harvest storage (Marín Marín et al., 2004). Income and purchasing power are very low, and often are contingent on irregular and unpredictable opportunities, such as logging or wage labor on cattle ranches, which is mostly limited to a handful of young men. Ranching is characterized by large areas of pasture with low numbers of cattle, and creates little local employment. Access to credit is limited and generally provided by local, informal lenders at very high rates of interest.



Subsistence cultivation in the project zone, Acandí, Chocó. Photo by Brodie Ferguson.



In the absence of the project, selective logging is expected to accelerate. Loggers sell timber boards to middlemen at very low prices, and using dangerous logging practices inconsistent with proper techniques for forest management and enhancement—a short-term return with a long-term impact. Opportunities for alternative income-generating activities or employment would be stagnant, causing out-migration to more urbanized areas. Opportunities and income levels would not increase among the general population or among vulnerable and marginalized groups (i.e., women). Access to employment, education, health services and microfinance are not likely to increase significantly without a significant project to invest in these areas. The historic absence of government, and lack of investment by third sector or private entities are reasons why this region remains isolated and underdeveloped.

### Food system

Despite the common assumption of "tropical abundance," the region is nevertheless subject to limitations and periods of scarcity. The population depends on products imported from other regions to supplement what they produce from subsistence agricultural and fishing. Food production in the area is neither sufficient to achieve food security in the region nor to export. Low levels of purchasing power require alternative strategies to face scarcity, such as exchanges, loans, and purchases in very small quantities.

Food security is compromised due to poor access and a narrow variety of locally available foods within each food group, limited volume of locally produced foodstuffs, and a lack of disposable income to purchase the costly food imported from Turbo and Cartagena. Harvests are seasonal and local production of rice, corn, cassava, yam, coconut and borojó is not sufficient to meet local needs (Marín Marín et al., 2004).

Overfishing by commercial fishery operations in the regions has had destructive impacts on the marine ecosystem and in the stocks of species once found in much greater abundance (Marín Marín et al., 2004). The river systems in the project area have accumulated silt decreasing their provision of fish. Most fishing occurs along the coast, though artisanal fishing occurs at a disadvantage to commercial boats, which operate in deeper waters with capacities for industrial catches.

The diet in the project area is monotonous and nutrient-deficient. Except for sugars and fats, all other food groups are consumed at levels well below national nutritional guidelines (Marín Marín et al., 2004). The capacity of households to cover their basic needs is affected by poor access to credit, agricultural inputs, and the decline in agriculture due to violence during the last decade. Dependence on costly goods brought from other regions and the lack of productive opportunities and monetary income compromises the capacity of households to cover their basic nutritional needs, and this in turn, compromises the capacity of future generations (Marín Marín et al., 2004).

In the without project scenario, agricultural practices would continue at subsistence levels without adequate inputs and investments in improving techniques and access to markets. The lack of diversity in food production would continue as soil fertility declined from shifting cultivation, cattle ranching and forest degradation that impacts the hydrological services and productivity of areas used for agriculture and fishing.



# G.2.5 Impact of the Baseline Scenario on Biodiversity

In the absence of the project, degradation and destruction of this moist forest ecoregion considered to be one of the most species rich lowlands in the world in the world continue on an incremental scale. The area is already recognized as one with insufficient conservation, multiple threats and high biocultural value (Davis, Heywood, Herrera-MacBryde, Villa-Lobos, & Hamilton, 1997). The completion of the Inter-American highway would increase pressures on habitat in this distinctive biological region from logging, clearing and encroachment of ranches, degrading the density and composition of the forest understory, disrupting the age distribution of trees due to uncontrolled logging and resulting in a significant conversion of habitat of the abundant and endemic taxons that include plants birds, mammals, amphibians and butterflies.

Severe erosion and disruption in the hydrological services provided by the forest is already being experienced in the territory due to removal of forest cover. The torrential wet season (*invierno*) has grown more catastrophic, with this past year being a prime example of the costs of conversion and degradation. Forest conservation is a key element of any strategy to preserve the region's hydrological systems and avoid further loss of soil and further impact the capacity of river systems to provide species habitat.

Continuing deforestation and a likely increase due to population growth would reduce species abundance as habitat is reduced and fragmented. The vulnerable and declining jaguar population is affected by habitat fragmentation and loss, and would be further endangered without conservation efforts by the project. Increased poaching and hunting of at risk mammals with slow reproductive cycles, such as the tapir, owing to increasing human populations, is likely. Hunting and poaching of the already vulnerable Central American tapir is likely to increase without intervention due to population growth. The abundant amphibian population is of concern because frogs are very sensitive to local temperature and humidity, and the clearing of only a few trees can be enough to disturb them. The conversion of forests threatens the 58 species found in the project area.

Without the project, the conversion of habitat supporting the ecoregion's highly diverse and endemic flora and fauna would place additional pressure on already threatened, vulnerable, endangered and

near-endangered species. There are 22 species categorized as experiencing some degree of threat according to the Red Book of Colombian Mammals (Rodríguez-Mahecha et al., 2006), including the critically endangered Colombian Spider Monkey, Cotton-top tamarin, and Central American tapir. These conservation efforts currently suffer from limited resources that need additional support from the carbon project to be effective. Undertaking additional efforts to control hunting and poaching of other species would not be implemented without project funds.



Selective logging, an important livelihood in the project zone. Photo by Nicolas Arms.



Of the bird species in the project zone, six are endemic to Colombia and 40 are near-endemic. Some 29 species are placed in a category of threat according to IUCN (L. M. Renjifo, 1998; L. M. Renjifo et al., 2002), 88 species are migratory, almost all (86) nest in North America and winter in South America, and two species nest in southern South America and spend their winter further north. This represents the last opportunity to conserve relatively large areas of intact lowland and medium elevation forests that allow the natural altitudinal migration of many species of birds, mammals and invertebrates. In the case of bats, some authors claim that 66.3% of the species in the Chocó region are outside a radius of 30 km from conservation areas such as the parks system and are exposed to pressures threatening its conservation. This group includes endemic species and those that have only recently been described for which there is no further information available (Mantilla-Meluk & Jiménez-Ortega, 2006).

The project provides the last opportunity to conserve relatively large areas of intact lowland and medium elevation forests that allow the natural altitudinal migration of many species of birds, mammals, and invertebrates that would otherwise be destroyed by increasing road access and commercial pressures. In addition, the region has great potential for ecotourism and scientific research. Its forests are of great interest because some of them may be secondary forests that are nearly 500 years old, which would clearly allow for studies on the subject of the regeneration of tropical forests (Davis et al., 1997).



# **G.3 Project Design and Goals**

# **G.3.1 Summary of Project's Major Objectives**

The project leverages carbon finance to reduce greenhouse gas emissions while maintaining the biodiversity values of the collective territory and enhancing economic and social development with sustainable livelihoods and governance capacity of collective landholders.

### Climate Objectives

The Chocó-Darien Conservation Corridor project is designed to mobilize 31 local communities organized among 8 local councils to avoid further deforestation and degradation as well as facilitate the natural regeneration of 13,458 hectares of project area. This will lead to mitigation of approximately 2.3 million MTCO<sub>2</sub> over the project's 30-year lifetime.

### Community Objectives

With clear land titles and improved security conditions, Afro-Colombian communities have returned to the project area to pursue their own visions of territorial development. This project will provide a stream of income to reinvest in reinforcing the dignity and territorial autonomy of Afro-descendent communities, so that neither the forests nor the residents' traditional ways of life are lost. The impacts of armed conflict and displacement on traditional patterns of agriculture and resource use resulted in disorderly exploitation to meet basic needs. The project will strengthen organizational and financial capacities, provide training and technical support for improving agricultural practices, support microfinance groups and educate communities in improved forest management and biodiversity conservation and sustainable use.

Specific objectives of the community component include:

- Improved wellbeing of Cocomasur members;
- Maintenance and enhancement of cultural identity;
- Expansion of educational and leadership opportunities;
- Effective and inclusive territorial governance;
- Access to health services; and,
- Livelihood security.

### **Biodiversity Objectives**

The project aims to protect and enhance forest cover in the Serranía del Darien, maintain connectivitiy with neighboring Darién National Park, and contribute to the conservation of the many endemic, threatened, and endangered species that make this one of the most biodiverse places on earth. A related objective is the maintenance and enhancement of high conservation values identified in the project zone in Section G.1.8 that include critical hydrological services, conservation of a protected area, conservation of two designated Important Bird Areas (IBAs) and one Endemic Bird Area (EBA), protection of unique ecosystems (e.g., oak forest), and protection of threatened species.



# **G.3.2 Description of Project Activities**

The project will use carbon financing to avoid threats posed by cattle ranching, agriculture, and selective logging by undertaking 11 different activities to reduce degradation and deforestation. Table 21 shows how each of these activities targets one or more of the above identified deforestation drivers. The project will be implemented incrementally as per the strategic plan with corresponding annual action plans developed by Cocomasur with technical guidance from Anthrotect. Foundational activities such as territorial demarcation, land use planning, and strengthening local governance will be prioritized in the first year. As additional activities commence, additional project benefits will accrue.

Specifically, the project enables landholders to generate a revenue stream linked to the carbon value of conservation and reforestation activities by 1) solidifying nascent governance structures, 2) consolidating existing land titles, 3) resolving and preventing land disputes, and 4) implementing sustainable livelihood alternatives. The local ownership model of the project will reduce risk and ensure long-term performance in project activities around three themes:

1. Building governance capacity - raising awareness of collective identity and rights, demarcating title boundaries, resolving land disputes, implementing best practices for administration and financial management, and constructing collective visions and strategic plans for land use;

### Expected impacts:

*Social* - improvements in wellbeing; strengthened operational capacity for project implementation; increased ability to manage land according to landuse plans;

Climate - reduced incidence of encroachment and conversion; improved land use planning and adaptive capacity.

*Biodiversity* - better regulation of hunting of endangered species, improved management of high conservation values through planning and activity implementation.

2. Forest patrols and monitoring - community surveillance and monitoring, restoring degraded areas, watershed management and high conservation value forest management.

#### Expected Impacts:

Social - employment in forest patrols and monitoring activities and watershed management;

Climate - emissions reductions

Biodiversity - maintenance and enhancement of high conservation values, protection of habitat of endemic and endangered species in the Serranía del Darién, and improved connectivity with neighboring Darién National Park in Panama.



3. *Investing in climate compatible development* - in the medium term, investments to improve technologies and agricultural practices and other activities such artisanal gold mining (e.g., Oro Verde), will include securing markets for other community products in line with project goals.

### **Expected Impacts:**

Social - Improved wellbeing, nutrition, access to credit and markets, improved land use;

*Climate* - Reduced pressure on forests in the project area and maintenance of permanent climate benefits beyond the life of the project.

*Biodiversity* - habitat protection, prevention of loss of connectivity, maintenance of high conservation values, sustainable business models for biological goods and services (bionegocios).

Table 21: Drivers of Deforestation and Major Project Activities.

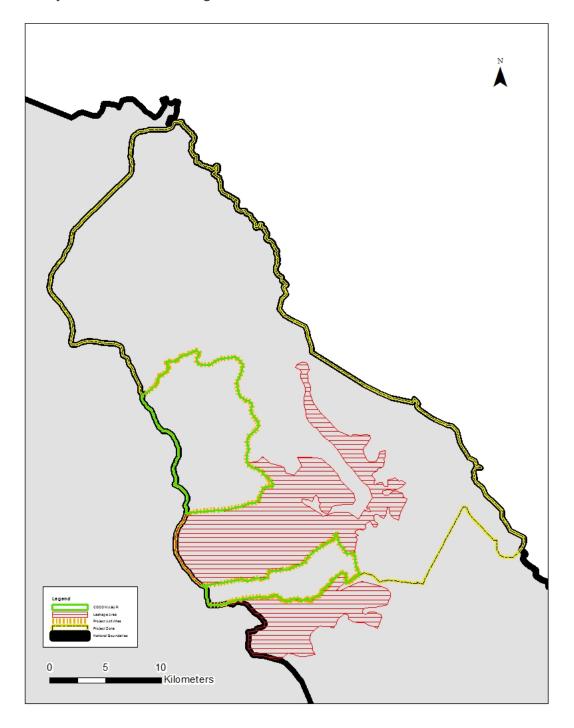
	Project Activity										
Driver of Deforestation	Land use planning	Agricultural intensification	Territorial demarcation	Strengthening local governance	Forest monitoring and patrols	Silvopastoral systems	Reforestation and regeneration	Non-timber forest products	Forest biomass harvesting	Improved forestry management	Certified artisanal mining
Subsistence agriculture	•	•					•	•			
Uncontrolled logging			•	•	•		•			•	
Cattle ranching		•	•	•		•	•				
Large-scale agriculture				•			•				
Infrastructure projects				•							
Land speculation			•	•							
Licensed timber harvesting								•	•	•	
Timber harvesting (local use)								•	•	•	
Mining	•						•				•



# **G.3.3 Location of Project Areas and Leakage Areas**

The project will monitor leakage by tracking deforestation and forest degradation in the surrounding project zone, corresponding to the areas in red shown in Figure 28.

Figure 28: Project Activities and Leakage Areas.





# G.3.4 Project Lifetime and GHG Accounting Period

The project lifetime and the GHG accounting period are 30 years (see Annex CA 26). The project started on January 1, 2011 and will end on December 31, 2040. The project lifetime was preceded by a 6-month project preparation period that involved community training, stakeholder consultations, participatory mapping, and negotiations. During the first 5 years (i.e. Years 1-5), the project is focusing on:

- 1. Strengthening internal governance structures;
- 2. Developing community capacity in administration and finance;
- 3. Clarifying project boundaries;
- 4. Controlling drivers of deforestation and degradation;
- 5. Regenerating degraded forest lands and riparian zones;
- 6. Building community capacity for monitoring social and environmental impacts;
- 7. Identifying viable opportunities for livelihood generation.

During Years 6-30, the project activities and management will be gradually transitioned to Cocomasur. Net revenues from carbon payments during this period will be used to benefit local communities by enhancing livelihoods and improving the quality of the forest.



# G.3.5 Natural and Human-Induced Risks and Mitigation Strategies

Flooding and seismic activity constitute the most significant natural risks in the project zone. The project zone is not at risk of wildfire or volcanic activity.

### Flooding

The bi-annual rainy season (*invierno*) is a particular threat to communities living alongside rivers. Flooding endangers homes, crops, and household gardens, and damages infrastructure such as roads and bridges. Rains affect livelihoods and mobility as well as the land. Heavy rains and flooding can cause landslides and wash away significant amounts of topsoil, causing sedimentation downstream in the deltas of the rivers. Sedimentation is a serious problem in Acandí, affecting the livelihoods of fishermen who can no longer make a living on the river due to its decreased productivity. Riverine communities are vulnerable to damage caused by water erosion as rivers rise and carve out new courses where houses once stood. Degradation of forests along riverbanks and at the heads of rivers and tops of watersheds exacerbate these negative impacts, though the inordinate scale of damage incurred during 2010-11 is also attributable to global climate patterns (i.e., La Niña) that have affected communities throughout Colombia.

Mitigation measures include reforestation alongside riverbanks and in upper watersheds with appropriate species proposed by Cocomasur to prevent tragedies and reinforce vulnerable ecosystems that are rapidly degrading. Such measures will also sustain the integrity of ecosystem's flora and fauna. Investing in retaining walls and other infrastructure measures to protect vulnerable communities are also planned.

#### Seismic risk

Western Colombia has traditionally been viewed as an area of high seimic activity, and the Chocó in particular has been classified as high seismic risk (Meyer & Velásquez, 1993; Sarria, 1985). Although the Darién is characterized by less seismic activity relative to areas further south in the Chocó, research conducted by the National Seismological Network in the Colombian Darién, and the University of Panama in the Panamanian Darién, show that between June 1993 and August 1997, there were 280 earthquakes on the Colombian side (Ingeominas, 1997) and in eastern Panama, a total of 142 earthquakes were recorded between October 1992 and August 1996 (Camacho-A & Benito, 2008).

Mitigation measures include a monitoring of seismic activity using data available online courtesy of the nearest Global Seismographic Network (GSN) station at the Smithsonian Tropical Research Institute (STRI) in Panama. Although Colombia has building codes for constructions in areas of seismic risk, such codes are not followed in most rural areas. Dwellings in the Chocó are considerably less vulnerable insofar as they consist largely of one or two-storey wood and thatch structures that are safer in the event of collapse. However, community settlements are typically located along riverbeds, which are more prone to liquefaction in the event of seismic activity. In order to partially mitigate these risks, the project avoids the use of brick and concrete in construction and encourages the use of bamboo, a fast-growing and locally available material.



# Post-conflict/security

The project's community-based approach creates attractive local employment opportunities that are critical for resilience to armed groups and durability of peace. Vulnerability to armed actors who aim to monopolize trade and intimidate those who assert their legal and territorial rights is best mitigated via strengthened community organizational structures and improving livelihoods—especially via carbon-based income alternatives, which offer important advantages associated with their intangibility.

The enhanced social organization required to implement a REDD+ project includes a process of education about territorial rights not undertaken in such depth or scale until now. There will be continued efforts to reinforce this knowledge among members of the collective territory and the enhancement of economic opportunities that result from the project will contribute to community resistance to these actors. With more economic prospects and a more organized and resourced territorial governance, there will be less vulnerability to the pressures or tactics of these actors, and it is likely to act as a deterrent to the entry of armed groups to the project region.



Community member at a General Assembly in Peñaloza, Acandí, Chocó. Photo by Emily Roynestad.

### Corruption and mismanagement

Cocomasur has not had the opportunity to manage a project of this size in the past. As such, the project will focus on building the administrative and financial management capacity of project management staff to reduce the financial risk of the organization in partnership with Fondo Acción. Risks will be continually assessed and appropriate controls put in place to mitigate them. Funds for the Chocó-Darién project will be administered by Fondo Acción, which has a 10-year track record as an Environmental Trust Fund (ETF) in Colombia, until Cocomasur meets internationally recognized and audited standards for administering its project resources.

### Illegal logging

Domestic timber consumption in Colombia represents the largest proportion of the total trade in timber and is organized in informal ways. Improving forest management to achieve certifiable, sustainable timber production is key for the success of the project but requires access to markets for sustainable products. Without policy incentives to stimulate demand for better forest management from national and international markets, efforts to bring domestic producers into a formal framework will fall short of providing the social and economic benefits promised from improved forest governance from the fair distribution of forest benefits. Currently, loggers sell bundles to middlemen who sell on to larger buyers up the chain, retaining very little value at the bottom of the chain. A value chain development approach for certified timber products will mitigate these risks, by adding value and investing in skills and diversified income opportunities with loggers, such as forest guards and monitors and agroforestry production.



# Opportunity costs of REDD

To effectively reduce carbon emissions, the project must understand the near-term opportunity costs of conservation and sustainable livelihood activities while reinforcing the dignity and territorial autonomy of indigenous communities, so that neither the forests nor residents' traditional ways of life are lost. Preliminary field research indicate that benefits from REDD will provide sufficient economic incentives for a successful project. Time preference exercises carried out among project participants revealed very high individual discount rates (a mean of 0.38), where the average respondent preferred to receive a lump sum payment of \$800 USD versus a payment of \$25 USD each month for the next 30 years (Ferguson, 2010).

Given the above preferences, the project has been careful to include tangible short-term benefits, such as employment in project development and monitoring activities. However, the project also includes measures designed to mitigate the opportunity costs of REDD over the long term. First, participating communities are co-owners of the project who share 50% of carbon revenues. Second, pre-sales of carbon offsets to finance the project have been limited in order to guarantee that Cocomasur has a stake in future price increases which would likely correlate with opportunity costs. Lastly, the project prioritizes activities with high conservation impact that generate additional revenue for participating families, such as green ranching, mining, and forest products.

# Viability of REDD offsets

Despite recent growth in the voluntary carbon market, REDD offsets are still risky and the possibility remains that markets will not develop as needed to provide sufficient carbon revenue for the project. Project costs have been estimated and budgeted for the life of the project and the capacity for carbon revenue to cover these costs is based on estimates of potential net carbon income. Depending on the price of carbon and schedule for carbon payments, the project will seek supplementary revenue in the form of grants or donor funding to ensure that unanticipated levels or fluctuations in demand do not threaten project activities. Project activities include administrative and financial capacity strengthening on the part of Cocomasur, as well as regular financial audits of key project participants, to ensure eligibility for such alternate funding sources.



### G.3.6 Ensuring the Maintenance and Enhancement of High Conservation Values

Owing to the unique composition of its ecosystems, high species endemism and associated conservation designations at the national and international levels, as well as the ecological social and cultural values it provides to the local communities of Cocomasur and its neighbors, the project area demonstrates elements of all six High Conservation Value (HCV) as summarized in Table 22. HCV management and monitoring measures specific to the maintenance and enhancement of each HCV identified are summarized in Section G.1.8 and Annex CA22.

The positive impacts on HCVs expected as a result of project activities project are summarized in Table 22. Specific measures included in project design to ensure the maintenance and enhancement of HCVs include:

### HCV 1: Globally, regionally or nationally significant concentrations of biodiversity values

- Forest protection activities
- Eliminate hunting of large to medium size mammals
- Reduce timber extraction to minimum levels, specially of endangered or keystone tree species
- Maintain and if possible increase connectivity with neighboring Darien National Park

### HCV 2: Globally, regionally or nationally significant large landscape level forests

- Maintain and if possible increase connectivity with neighboring Panamanian national park
- Protect continuous forest cover along the altitudinal gradients and key water catchments

### HCV 3: Forest areas that are in or contain rare, threatened or endangered ecosystems

- Arresting forest conversion in areas of rare ecosystems
- Monitoring indicator species

# HCV 4: Forest areas that provide basic services of nature in critical situations

- Protection of continuous forest cover along the altitudinal gradients and key water catchments;
- Maintain and/or recover forest cover along rivers and streams and to protected forest along steep slopes and on mountain tops;
- Monitoring the amount and the quality of water flowing down the Tolo and Tanela catchments, thus monitoring the forest's role in regulating the water cycle in the area.

### HCV 5: Forest areas fundamental to meeting basic needs of local communities

- Protection of continuous forest cover along the altitudinal gradients and key water catchments;
- Maintenance or recovery of forest cover along rivers and streams, steep slopes and mountain tops;
- Establishment of plantations of fast growing tree species to provide fuel wood and construction materials for local populations on degraded lands close to settlements.



# HCV 6: Forest areas critical local communities' traditional cultural identity

- Forest conservation and enhancement measures undertaken by the project contribute directly to the maintenance and enhancement of the way of life, identify and culture.
- Activities to safeguard at-risk traditional knowledge
- Integration of traditional community outings in the forest, *recorridos territoriales,* into monitoring activities involving multiple generations.
- Preservation and enhancement of habit for species to allow for the maintenance of traditional hunting practices within a threshold.
- Strengthening territorial governance
- Reforestation activities, monitoring and management of water resources--particularly rivers-which are critical to the worldview of people in the territory.

Table 22: Expected Benefits to HCVs in the Project Area.

HCV	High Conservation Value	Net Positive Benefit
HCV 1	Globally, regionally or nationally significant concentrations of biodiversity values (protected areas, rare or threatened species or endemic species)	Maintenance and enhancement of forest cover and habitat with Darien National Park and Mt. Tacarcuna critical for migratory birds, endemic species with limited distribution and endangered species.
HCV 2	Globally, regionally or nationally significant large landscape level forests	Conservation of the unique biome of the Serranía del Darién and continued and enhanced connectivity with Darien National Park.
HCV 3	Forests that contain rare, threatened or endangered ecosystems	Conservation of rare forests and ecosystems in the Serranía del Darién dominated by <i>Dipteryx oleifera</i> , <i>Cedrela odorata</i> , <i>Aspidosperma dugandii</i> , <i>Anacardium excelsum</i> and <i>Quercus humboldtii</i> (Classes 13 – 21) threatened by rapid deforestation in the rest of the Colombian Chocó.
HCV 4	Forests that provide basic services of nature in critical situations	Protection of the critical watercatchments responsible for the provision of hydrological resources to the municipalities of Acandí and Unguía; especially the Tolo and Tanela watersheds which supply water to the communities and neighbors of Cocomasur.
HCV 5	Forests fundamental to meeting basic needs of local communities	Maintenance of forest cover in the Serranía del Darien ensures continued provision of hydrological resources essential to communities for meeting their basic household, agricultural and productive needs.
HCV 6	Forests critical to local communities' traditional cultural identities	Maintenance and enhancement of identity, culture, traditional ecological knowledge, sense of belonging, way of life and self-governance. Importance of rivers and water resources in the worldview of Cocomasur member is a significant cultural value.



# G.3.7 Measures to Maintain and Enhance Benefits Beyond the Project Lifetime

The project's value chain development approach is designed to develop and support sustainable enterprises, cooperatives and associations within the territory to create permanent and sustainable income streams using kick-start carbon finance. These businesses include FSC-certified wood products from sustainably managed forests, sustainable collection, cultivation and processing of non-timber forest products including bamboo, toga and resin, medicinal and aromatic plants (MAPs) such as acai, sacha inchi, tumeric, and agro-forestry commodities (i.e., borojó, cacao, mango, vanilla, camu camu). This also includes improved agricultural production including traded in local, and national and international markets, and micro-enterprises.

Investments in communications infrastructure will bring internet and mobile phone coverage to many areas for the first time, and boost the capacity in other areas that already have minimal, but insufficient coverage. These investments will increase access to services and information for the members of the territory, opening up new possibilities for livelihoods and education that will, in turn, enable other development dividends.

Providing education and training to develop territorial capacity to manage the project is an investment in the long-term viability of not only the project but also in the territories' future well beyond the lifetime of the project. A cultural shift will occur as a result of these investments in education during the projects' lifetime, translating into permanence of climate, biodiversity and community benefits as a climate and conservation-compatible development model is built.

Furthermore, by eliminating the threat of deforestation, this project will contribute to climate benefits regionally and globally. Additionally, by keeping these natural ecosystems intact, this hotspot of biodiversity is ensured continued protection, benefiting the large number of at-risk species in the project area.

The incentives for keeping these natural ecosystems intact will extend beyond the life of the project. Measures such as investments in education, alternative income generation, and sustainable business models will maintain and enhance the climate and biodiversity benefits beyond the lifetime of the project.



### **G.3.8 Community Involvement and Stakeholder Consultation**

Anthrotect's relationship with the communities of Cocomasur began over three years ago, during a trip to the Darién region in 2008 when Anthrotect Founder and Director Brodie Ferguson first met with community leaders to explore the opportunities and challenges associated with the recent recognition of collective property rights over their traditional lands. Discussions began to explore how a partnership could bring together the community's determination to conserve remaining forest and restore degraded lands, and Anthrotect's interest in developing innovative finance mechanisms for conservation and sustainable development could be combined in a forest carbon project that would infuse dignity and vigor into these new collective entities while providing an invaluable service to the rest of the world.

Law 70 grants collective territorial rights and autonomous governance powers to Afro-Colombian landholders, including the power to develop and approve projects with third parties. As a collective project, the input of the members of the territory was the foundation of the project's design and approval, including its objectives, scope and activities. Direct project stakeholders include the governing entities of the territory, its members and neighbors, and participating communities organized into 9 Local Councils (see Figure 29).

ASAMBLEA GENERAL
COCOMASUR

JUNTA DIRECTIVA CONSEJO
LOCAL DE
LOCAL DE
LOCAL DE
CONSEJO
LOCAL DE
COCAL DE
COCAL

Figure 29: Local Councils and Governing Body of Cocomasur.



The consultation process was carried out with community stakeholders from the local councils, and followed the procedures established in the bylaws of Cocomasur, including formal permissions granted from the territories' highest authority, the *Junta Directiva*, authorizing Anthrotect to conduct the consultation with their full support and trust. The recent history of armed conflict and displacement in the Chocó region makes it especially important to build trust and operate through the governance structure of the territory in order to be able to establish the kind of relationship necessary to effectively discuss the details of complex projects such as REDD.



Community assembly to discuss environmental services. Peñaloza. Photo by Emily Roynestad.

The consultation process reviewed the concept of PES, the components and activities of REDD projects, the benefits and risks, and how a project would impact that. This information was essential for assessing feasibility and formulating a project proposal based on the actual drivers of deforestation and environmental degradation in the communities and the territory as a whole. High levels of illiteracy required visual presentations at community meetings and effective facilitation techniques to gather input from all participants.

The consultation phase of the project included the following steps:

- 1. Training a team of local leaders to facilitate workshops on climate change, and payment for environmental services using adapted Technology of Participation (ToP®) facilitation methods;
- 2. Workshops covering the nine local councils in the territory and involving close to 300 participants;
- 3. Analysis and documentation of the results of each workshop including photos, attendance lists, and workshop outputs;
- Preparation of a detailed project proposal based on information gathered in the consultation phase; There were several iterations of the proposal reflecting stakeholders inputs;
- Dissemination of the project proposal to communities for review and study;
- 6. Pre-Assembly (Oct 3, 2010) to incorporate feedback prior to the General Assembly;
- 7. General Assembly (Oct 9, 2010) to debate and authorize a study commission;



Everildys Córdoba discussing environmental services and local governance in Peñaloza, Acandí, Chocó. Photo by Emily Roynestad.



- 8. Study Commission (Oct 18, 2010) to review final contractual details (Annex CA9);
- 9. Signing of the contract (ERPA) between Cocomasur and Anthrotect (Oct 29, 2010) (Annex CA21).

### Stakeholder Participation in Project Design

Continued participation of community stakeholders has been integrated into the projects' design phase including project planning workshops, high conservation value consultations, and an institutional stakeholder forum disseminate and solicit feedback on project design.

In August, an action planning workshop facilitated by the Institute of Cultural Affairs with Technology of Participation (ToP®) methods was held involving 35 participants from Cocomasur, Anthrotect, the Fund for Environmental Action, and municipal stakeholders to define objectives, indicators and activities and required resources for the completion of project design and validation. Further stakeholder

identification and analysis exercises were conducted with a view to project design and implementation, resulting in a plan for stakeholder communication (Annex CA19).

On-going communication information exchange between project management and community members is facilitated through project coordinators elected by consensus in each local council. Inclusive planning methodologies will be continually developed and improved, with personnel trained to facilitate them in partnership with the Institute of Cultural Affairs (ICA) Chile, an international organization with over 30 years of practical experience developing and testing participatory methods with communities around the globe.



Action planning workshop with project stakeholders. Photo by Emily Roynestad.



### **G.3.9 Procedure to Publicize CCB Public Comment Period**

In addition to posting the project design document on the **CCBA website** for public commenting, the document is available in Spanish and was disseminated through the Local Councils to provide members of the territory and stakeholders the opportunity to provide comments. The Spanish version is available in the Cocomasur office in Acandí and has additionally being distributed to local government officials and NGOs. Comments collected during the public commenting period were collected by Cocomasur, sent to Anthrotect, translated into English, and submitted to CCB.

The public commenting period was announced to the communities of the territory during a 10-day territory-wide campaign to present the PDD in each local council during workshops facilitated by Cocomasur and Anthrotect. Comments were collected during the visits and afterwards via the local council members and the anonymous commenting mechanism.

All project documents including this design document are disseminated in Spanish to communities in the collective territory. Focal points and local council members ensure wide publicity of any documents through informational feedback meetings. The project proposal was prepared in Spanish and disseminated in this manner, and successfully enabled an orderly and productive general assembly meeting in October 2010, when the project was approved. Cocomasur has consistently demonstrated their commitment to the wide dissemination of information to its constituents with regards to this project, which is evidenced by the overwhelming support for the project despite the difficulties in reaching communities located in remote areas, especially when rains cause rivers to become impassable. The lack of telecommunications infrastructure has proven to be the most significant barrier to a the flow of information and communication between the project proponents, Cocomasur, and the communities in the territory. As a result, investing in telecommunications infrastructure is a first level priority of the project, and alternatives are currently being assessed for cost and power supply.

### **G.3.10 Process for Handling Unresolved Conflicts**

Any complaints, petitions, and grievances related to the project will be handled by the Office of Internal Control of the Municipality of Acandí, which is mandated to investigate complaints regarding to projects in the Municipality. Although the mechanism already exists, a manual for the project was developed and disseminated to raise awareness among the members of the communities about the existence of the Office of Internal Control, its role, and procedures for contacting and registering a complaint (see Annexes). The mechanism ensures an effective and transparent response within 30 days.

The mechanism integrates the projects' Executive Committee into the existing municipal complaints process. The system documents all complaints, resolutions and decisions regarding the project and assures that the Office of Internal Control is made aware of each, including those that are resolved internally by Cocomasur that do not require further referral.



# G.3.11 Adequacy of Financial Mechanisms for Project Implementation

Estimates of project costs are based on extensive socio-economic analyses of livelihoods in the Darién region and reflect an appropriate degree of risk and uncertainty in opportunity costs. Estimated net carbon revenues from the project, totaling approximately US\$21 million over 30 years, are expected to exceed all inflation-adjusted implementation and monitoring costs for the project. While the project would be financially viable in the absence of additional funding, a distinguishing feature of this project is that rather than receive direct payments, participating families will leverage revenues from emissions reductions to pursue additional profitable and sustainable land use strategies for which start-up capital would not otherwise be available. This encourages the development of community-owned enterprises and decreases dependence on conventional timber extraction and agricultural models that predominate in the region.

At the same time, an innovative partnership with the Fund for Environmental Action, a Bogota-based environmental trust fund, will facilitate matching contributions from donors and philanthropists. The Fund administers the Enterprise for the Americas initiative in Colombia, capitalized by a debt-swap yielding over US\$50 million to finance projects of environmental conservation and child welfare. The Fund for Environmental Action works by strengthening the management capacities of nongovernmental and community-based organizations in order to achieve superior stewardship of natural resources. The Fund's stringent administrative and accounting standards combined with its exceptional track record in strengthening management capacity of community organizations will encourage additional opportunities and benefits through an array of complementary funding sources. Independent, third-party audits will regularly measure progress towards these capacity milestones.



# **G.4 Management Capacity and Best Practices**

# **G.4.1** Identification and Roles of Project Proponents

Project implementation will be overseen by a Steering Committee responsible for approving the annual disbursement of funding conditional on project milestones being achieved. The specific roles of each of the project partners are outlined in Table 23. Each year, the implementing partners and Technical Committee will prepare a joint annual report on progress, achievements, and needs to present to the Project Steering Committee as well as the Executive Board of Cocomasur. Action plans are developed through a bottom-up process organized by the Technical Committee and reviewed quarterly by project managers and members of the Steering Committee. At the field level, Cocomasur oversees the daily administration and monitoring have REDD activities in cooperation with the implementing partners, the fiduciary partner, and Anthrotect, in coordination with local government and technical agencies.



Table 23: Role of Participating Organizations in the Project.

Organization	Role
Anthrotect	<ul> <li>Project design and planning (with Cocomasur)</li> <li>Oversight of project implementation, monitoring, and verification</li> <li>Capacity building for local communities, stakeholder consultation and conducting forest inventories</li> <li>Carbon calculations, development of Project Design Documents, creation of management system to gather monitoring data, technical assistance</li> <li>Monetization and marketing of project carbon credits. Support with training of local communities, stakeholder consultation and integration</li> </ul>
Cocomasur (Executive Board)	<ul> <li>Highest territorial governance body overseeing project governance and the legally constituted entity for territorial administration</li> <li>Appoints representative to the project Steering Committee, Assists with coordination of project actions. Support forest protection and enforcement</li> <li>Participation in project design</li> <li>Facilitation between various stakeholders, and government agencies, ensuring accountability, transparency in use of revenues, and good governance</li> <li>Activities to monitor community, ecosystem, and climate impacts</li> </ul>
Cocomasur (Communities)	<ul> <li>Protect and manage forest resources</li> <li>Assist in planning and implementing activities to improve livelihoods and forest quality</li> <li>Participate in project design, action planning and implementation</li> </ul>
Fund for Environmental Action	<ul> <li>Administration of operational resources based on the Action Plan approved by the Steering Committee</li> <li>Supports COCOMASUR in building the capacity and systems necessary to independently manage project resources and profits</li> <li>Supports the implementation of field-based activities related to financial management, administration and oversight</li> <li>Supports the training of local community entities in administration, financial and project management</li> </ul>
Project Steering Committee	<ul> <li>Comprised with equal representation from: COCOMASUR, Anthrotect, and the Fund for Environmental Action (voice no vote)</li> <li>Project review and control, approval of action plans and budgets for project activities submitted by technical committees in line with the Strategic Plan</li> <li>Oversees project implementation and monitoring processes</li> </ul>
Cocomasur (Local Councils)	<ul> <li>Participate in project design and implementation as indicated in action plans and governance arrangements</li> <li>Ensure widespread participation in project planning and design, implementation, enforcement, data collection and impact monitoring</li> </ul>
Carnegie Institution	Technical support in estimation of carbon stocks, analysis and modeling of land use change, as well as monitoring of climate and biodiversity impacts
Gestión Ambiental Estratégica	<ul> <li>Legal advice on emissions reduction purchase agreements</li> <li>Due diligence on land title and ecosystem services rights</li> </ul>
Mayor's Office	Maintenance and oversight of the project complaints mechanism as well as additional conflict resolution and mediation services.



### G.4.2 Key Skills and Experience of Project Management Team

Cocomasur does not yet have the requisite financial, administrative, and technical capacity to independently implement a carbon project. One of the core objectives of the project is to develop local administrative autonomy so that the collective landholders themselves may manage project funds and activities over the medium- to long-term. Therefore, a transitional arrangement is necessary to guarantee proper technical implementation, financial oversight, and administration while reaching progressively sophisticated capacity milestones.

Technical aspects of the project, including estimation of carbon stocks, methodological revisions, and forest monitoring protocols and plans are supported by ecoPartners, LLC, a California-based advisory firm specializing in remote sensing and forest measurement for carbon offset projects. Additionally, the Carnegie Institution is providing remote sensing support via the Carnegie Airborne Observatory for the monitoring and measurement of carbon stocks as well as the biodiversity inventory and monitoring plan. Lastly, the Medellin Botanical Garden is providing taxonomic identification of flora in the project area as well as guidance on road and trail maintenance with a special emphasis on water resources and erosion control.

In addition, ICA-Chile is supporting the project by training facilitators in participatory community development methods, participatory planning, research and evaluation, adaptive management, and leadership development. ICA is an international organization with over 30 years of practical experience developing and testing participatory methods with communities around the globe.

Financial and administrative capacity building will be achieved through a partnership with Fondo Acción, a non-profit, non-governmental organization responsible for administering the Enterprise for the Americas Initiative in Colombia. As the fiduciary partner for the project, Fondo Acción serves as the transitional institutional arrangement for the receipt and disbursement of project operational resources according to the jointly-established Action Plan approved by the project Steering Committee.

Fondo Acción was established in 2000 with the sole purpose of supervising and managing funds from a debt for nature swap program between the United States and Colombian governments under the Enterprise for the Americas Initiative, and has quickly become one of the most important sources of funding for conservation and sustainable development initiatives in Colombia. It invests in conservation projects in threatened ecosystems, focusing on habitat protection and restoration, sustainable development, local participation, and capacity building of nongovernmental and community-based organizations. The Fund is a member of the USAID-sponsored Network of Latin American and Caribbean Environmental Funds, RedLAC, and will host the network's Presidency and Executive Secretariat in 2012.

In 2004, the Fund's bylaws were modified in order to allow the organization to manage new accounts set up by third parties, provided these accounts were in line with the Fund's mission (to generate significant and sustainable changes in Colombian society with respect to: (a) the conservation, sustainable and equitable use of biological diversity, and (b) the protection and development of children. These bylaws preclude it from acting in a manner similar to a for profit entity. The Fund's assets and earnings may only be used for its designated purpose and, accordingly, may not inure to the benefit of any private shareholder or individual.



# **G.4.3 Orientation and Training of Project Employees**

Anthrotect has prioritized training of community members since the very start of the consultation and is committed to developing relevant training programs for project employees and the members of the community over the life of the project. Employees of the project receive orientation and training from Cocomasur, Anthrotect, and the Fund for Environmental Action as required. On-going identification of training and capacity building needs is built into the project planning, with trainings organized to meet specific needs of the various project components by qualified organizations. In a recent planning workshop involving 35 participants from Cocomasur, a training plan was developed for the areas of forest carbon inventory skills, social research methods, administration, human resources, and financial and project cycle management. The training plan has been provided to the validator (Annex CA 14).

In addition, external consultants will be required to work with a community apprentice to transfer skills as well as share the results of their work with members of the community. Project employees who receive training must commit to working with the project for at least one year. To prevent loss of capacity from staff turnover, handover procedures will be defined and included in a human resources manual (Annex CA 14).



Table 24: Key Skills Required for Project Implementation and Source of Expertise.

Key Technical Skills	Source of Expertise
Community engagement	ICA is an international organization with over 30 years of practical experience developing and testing participatory methods with communities around the globe.  Cocomasur Project Coordinator, Everildys Cordoba is a recognized leader with substantial experience working with communities from her work as a trained mediator for the Mercy Corps Peaceful Conflict Resolution Project. She has excellent social communication and facilitation experience, and natural leadership abilities. In addition, she has substantial commercial experience, serving as a Sales Director for a cosmetics company.
Biodiversity assessment and monitoring	The Carnegie Institution Airborne Observatory will contribute new scientific approaches that integrate taxonomic, chemical and spectral remote sensing perspectives to map canopy function and diversity.  The Medellin Botanical Garden carries out basic research <i>in situ</i> as well as applied research on tropical plant diversity in Antioquia and throughout Colombia, and will assist the project in taxonomic identification as well as trail design and maintenance.
Carbon measurement and monitoring	Anthrotect and ecoPartners are training Cocomasur teams in techniques for measurement and monitoring of carbon stocks and land use change.  The Carnegie Institution Airborne Observatory will support land cover analysis through state of the art remote sensing techniques empowering Cocomasur with 3D maps of the project area.
Project management and administration	Ms. Everildys Córdoba coordinates field level project activities in the territory, reporting to the tri-partite Steering Committee and Executive Board of Cocomasur.  The Fund for Environmental Action will provide technical support and oversight for management of project resources against action plans. Further training and technical support will be provided through a competitive bidding process managed by the Fund for areas of specific need.



### **G.4.4 Opportunities for Community Employment**

As a matter of policy, local community members will be prioritized in hiring decisions. Where there is a lack of local talent that meets the job requirements, the project will recruit from the region, nationally or internationally, as appropriate. When local talent is not available, at least one local counterpart will be assigned to accompany and assist the person recruited to carry out the work, thereby integrating a capacity building component into each Terms of Reference. The hiring process will adhere to policy and procedures agreed upon by the Steering Committee to ensure fairness, equal opportunity and representation. Efforts will be made to focus on developing local human resources for all project roles, including apprenticeships and other practices to transfer skills and knowledge between those employed in roles now with those who will carry out the responsibilities in the future. This intergenerational component also reinforces territorial identity. Strategies to attract and prepare women to various project employment roles will be developed and monitored. Women who are already involved in leadership roles in the project will play a key role in recognizing women's contributions and aptitude for taking on a wide range of project-related roles, with the support of male territorial leaders.

### **G.4.5 Worker Rights**

All project activities and contracting of personnel will respect and take into account relevant Colombian labor laws (Annex CA 15). The project contracts each person who participates or works with the project, regardless of his or her membership in Cocomasur. The most common form of contracting is through fixed term service provision contracts. This type of contract guarantees three important elements: 1) the activity is carried out directly by those who have been contracted to do the work, 2) continuous subordination or dependency of the worker from the employer, and 3) a salary as compensation for their service.

Cocomasur will ensure that each person meets theses requirements. Tax and labor compliance are included in the financial management and administration training provided by the Fund for Environmental Action to Cocomasur, and are a condition of funds disbursement. The Fund has assisted over 500 community based organization and NGOs to understand and comply with Colombian national standards regarding workers rights and social security. Payments will not be disbursed until these requirements are met.

Workers will be informed about their rights during orientation and training. The human resources manual for the project will include procedures for communicating worker rights (see Annex CA 14).



### G.4.6 Communicating and Minimizing Risks to Worker Safety

Risks to worker safety are systematically identified and addressed by Anthrotect and Cocomasur in accordance with ILO guidelines for safety and health in the forestry sector. Hazards and risks are communicated and mitigated through training of personnel and human resource procedures and policy development (see Annex CA14). Risk evaluations are carried out for all project activities.

Upon hiring, each person is informed of the risks associated with their work and affiliated with an appropriate level of professional risks insurance, should an accident or injury occur. In addition to affiliation to the national scheme for professional risks, field workers with higher risk are trained in best practices and safe operating procedures (see Annex CA14). Field teams will be trained and equipped to use safety equipment and first aid supplies.

# **G.4.7 Financial Health of Implementing Organization**

Cocomasur, Fondo Acción, and Anthrotect are jointly implementing the project. Anthrotect is a registered limited liability company governed by Californian laws that ensure the company is financially solvent and able to meet its liabilities. Estimated net carbon revenues from the project, totaling approximately US\$21 million over 30 years, are expected to cover all implementation and monitoring costs (see Annex CA 25). Fondo Acción has a demonstrated capacity for successfully managing resources for conservation projects, and has stringent financial controls in place to ensure compliance with donors' aims. Currently, Fondo Acción manages accounts from debt swaps (Enterprise for the Americas Account and Tropical Forest Conservation Account) as well as other accounts entrusted by the private sector and other donors. Since 2001, the Fund has disbursed \$53 million, administered 38 calls for

proposals and facilitated the implementation of projects by more than 500 civil with organizations, in partnership local environmental authorities, the private sector, international NGOs, and the national government. In 2011, the Fondo Acción investment budget of \$7,790,000,000 COP for the Enterprise for the Americas Initiative (environment and childhood) and \$4,326,000,000 COP from other donations childhood). (environment and The procedures for calls for proposals, monitoring and reporting, financial management and capacity building have been certified by Bureau Veritas Quality International and ANAB as compliant under the ISO 9001:2008 International Quality Standard.



A display of local fruits and forest products at a COCOMASUR community meeting. Photo by Emily Roynestad.



# **G.5 Legal Status and Property Rights**

# **G.5.1** Relevant Laws and Assurance of Compliance

Anthrotect is committed to complying with all relevant international treaties and agreements as well as national laws. A complete list of these applicable laws and treaties and the requirement for demonstrating compliance has been provided to the validator (Annex CA 16). Table 25 highlights some of the more salient constitutional norms relevant to the project.

Table 25: Articles of the Colombian Constitution Relevant to Environmental Services.

Article	Scope	Implications
Article 8	Protection of cultural and national wealth	Natural and cultural heritage of the Darién region deserve the attention of the state and its citizens.
Article 49	Right to health and a clean environment	The Darién region, due to its marginalization, is characterized by the lowest indicators of health and availability of basic services.
Article 58	The social and ecological function of property	Conservation and protection of natural resources of the region is a task fro all citizens and supersedes individual interests.
Article 63	Inalienable character of the land of ethnic groups and their archaeological heritage	Safeguarding and protection of lands once and currently occupied by indigenous and black communities is a priority in the region
Article 80	Obligation to plan the territory, control and sanction any environmental damage incurred	Legal basis for giving priority to land use planning in the region and to take effective measures to control and repair environmental damage.
Article 80	International cooperation for ecosystem protection	A region such as the Darién requires policies and efforts to protect it that are transnational in character.
Article 81	Protection of genetic resources	The high biodiversity of the region requires regulating commercial activities related to genetic resources.

Other relevant laws include the following:

### 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 Colombian Darién. In this sense, and although the program stems from a national initiative, departmental and



municipal authorities are called on to harmonize their programs, plans and projects for local investment, to be established as part of this proposal.

#### Law 388 of 1997

By this standard, the national government established the mechanisms for municipalities to advance the management of their territories, guiding actions to rational and equitable use of land, the preservation and protection of ecological and cultural heritage, and disaster prevention. The law constitutes a basic tool for planning and managing the physical development of land in each of the municipalities in the country, specifically in regard to land use.

In developing their skills, departments will coordinate their policies, guidelines and strategies for physical and territorial management at the departmental level with the programs, projects and actions of the regional and local levels by adopting management plans for all or specific portions of its territory. The municipalities and districts must develop and adopt territorial management plans that regulate land use in urban areas, promote rural development in accordance with the law, optimize use of available land, and coordinate sector-wide plans in line with national and departmental policies and plans.

### Agrarian Reform

The Agrarian Reform Act (Law 160 of 1994), partially regulated by Decree 1031 of 1994, defines procedures for voluntary negotiation between farmers and landowners so as to facilitate negotiations and diminish conflict. For events that cannot be voluntarily negotiated, Decree 2666 of 1994 establishes procedures for rural land acquisitions by INCODER.

To address situations with respect to the demarcation and delimitation of Los Katíos National Park, indigenous reserves, and lands of black communities, areas affected by serious conflicts of possession and territorial dominance may apply the provisions of Decree 2663 of 1994, which establishes procedures for the acquisition of rural land with these characteristics. Since the region also includes untitled lands that traditionally do not belong to black or indigenous communities, Decree 00982 of 1996 can be applied in the awarding of these vacant lands, which is also regulated by INCODER.

### Regional Development

The environmental planning functions of local authorities are defined in Law 99/93, Articles 64, 65, 66 and 67. They emphasize the need to harmonize regional plans with the national level. In practice, the municipalities use the environmental guidelines outlined in national policies such as the National Development Plan by the Ministry of Environment or other regional environmental authorities, in order to submit projects for local councils.

# National Parks

Resolution 1426 of December 1996 contains important legislation with respect to regional planning and development of the region given that Los Katíos National Park is included within the Darién Special Management Area. This legislation is an important legal instrument for the reorganization and restriction of activities to prevent colonization as well as monitor forestry activities. However, the development and implementation of these instruments first requires strengthening regional



environmental corporations (CORPOURABA and CODECHOCO) followed by consensus strategies for the preservation and protection of natural and cultural heritage, and options for social and economic development to enable communities to achieve improved standard of living.

Other regulations with respect to legal status and protection categories include: Law 002/59, which regulates aspects of the nation's forest economy and conservation of natural resources and is the basis of the creation of the Pacific Forest Reserve; Decree 2811/74, particularly Articles 47, 48 and 49 pertaining to the creation of reserves, and Decree 0622/77 of Decree 2811/74, which defines different classes of reserves, delimits and defines management criteria, and establishes systems for granting of concessions, rights and obligations of users, prohibitions, penalties, surveillance and control.

### Frontier Zones

Congress passed Law 191 of 1995 that enacts provisions on "Border Zones", seeking primarily to protect human rights and improve the living conditions of communities living in these areas. In the case of the Sustainable Development Program of the Colombian Darién, this law provides the tools necessary to strengthen integration and cooperation with Panama, with the prior consent of the Chocó Department Assembly and Council of the four municipalities.

Part of this Law is dedicated to the preservation and sustainable exploitation of natural resources, providing an additional policy tool to advance environmental conservation and restoration. Article 4, for example, defines the municipalities of Unguía, Acandí, Juradó, Turbo, and Riosucio as border municipalities eligible for the benefits provided by the Act.

Article 8 protects the traditional knowledge associated with genetic resources that indigenous communities have developed in frontier areas. This rule enables the protection of botanical and zoological knowledge and promotes patenting with the Ministry of Development thereby potentially opening new sources of funds for indigenous communities.

Also relevant is Article 9, regarding "areas of parks and nature reserves and other special forest located in the border areas" and Article 20, which mandates special protection of the cultural manifestations of indigenous and local communities.



# **G.5.2** Approval from Relevant Authorities

Black collective and indigenous territories have the authority to develop and implement forest conservation plans, programs and projects. This territorial autonomy allows for issuing regulations to control deforestation and for conservation in line with the strategies of the Ministry of the Environment and regional environmental authorities (WWF, 2009). Act 99 of 1993 assigns Indigenous entities the same roles and duties regarding environmental issues as municipalities, which were empowered by the 1991 Constitution to regulate land use within their jurisdictions.

The existing national legal framework determines the obligation of the communities in the project area, and their compliance with the procedures established for the collective title of "Land of Black Communities," according to Law 70 of 1993, Decree 1745 of 1995 and Decree 1300 of 2003 before INCODER.

The Special Prosecutor for Ethnic Affairs of the Attorney General's Office, the Legal Representative of the applying Community Council and the Legal Representatives of the adjacent Community Councils are also involved in the titling process. Once the collective title is granted to the community, the newly established territory must prepare and approve its plan of ethnic development through the bodies established internally by the community (See Figure 29).

The highest authority is the General Assembly, which represents all the interests of the territories' members. Members of the Junta Directiva are elected by the General Assembly and are responsible for executing the instructions issued by the General Assembly.

The General Assembly decision-making is conducted by vote. The Assembly formally approved the project on October 9<sup>th</sup>, 2010. A study commission was formed which, after receiving and incorporating additional comments, granted final approval for the two parties to sign the contract (see Annexes CA8, CA9, CA12, and CA21).

### **G.5.3 Guarantees Regarding Property Encroachment**

The project will not encroach uninvited on private property, community property, or any other government property. According to Article 13 of the Law 70 of 1993—the legal framework of black communities, "land grants will be subject to any necessary easements for the development of adjacent lands. Similarly, bordering lands that are property of the State will be subject to the necessary easements for the benefit of the lands of the communities in accordance with the current legislation."

Therefore, in the event that access is required to areas of the project that have been previously delimited and zoned, this can be managed by establishing easements without affecting the rights of the neighboring landowners. At present, no formal easements are in place as it has been customary for the community to access its territory with the permission of neighboring landowners and formal easement has not been required.



#### **G.5.4 Guarantees Regarding Involuntary Resettlement**

The project activities will not involve the resettlement of any communities or households. The collective territory where project activities are undertaken is not located in the populated areas corresponding to the 9 local councils and their respective 31 villages where the members of the territory live. Since there is a clear separation of individual from collective land, there is no threat of resettlement due to project activities because individual land is outside of the collective territory. The project will not exclude members of the territory from the project area nor impede the continuation of cultural and livelihood activities. It is the aim of the project, in fact, to encourage increased visits to the territory and a recovery of these practices to sustain territorial identity and protect the forest resources.

#### G.5.5 Identification and Mitigation of Illegal Activities

Certain illegal activities occurring in the project zone constitute potential threats to the project. Many of these threats will be directly mitigated through specific policies and activities in the project area and amongst participating partners. The project will undertake to detect and mitigate any illegal activities that occur within the project area with pre-defined protocols as per the approved territorial land use plan and subsequent Specific Agreement referred to in Section G.5.3, which outlines the location and extent of project activities in addition to sanctions for violators. In general, broad community engagement in project design, activities, and benefits will create a strong deterrent to most illegal activity occurring in the project zone (see Table 26).

Of the threats detailed in Table 26, selective logging and encroachment are the two illegal activities most likely to affect the project area. Any illegal logging or encroachment that is detected in the project area will be reported to the Cocomasur governing council and resolved according to internal regulations. A plan is in place to form patrol teams to detect and investigate illegal activities within the project area (see Annex CA14), including protocols for responding to suspected violations of the territorial land use plan and their sanctions. These Protocols will be developed and piloted by Mar 31, 2012.



Table 26: Potential Illegal Activities in the Project Zone.

Activity	Description	Mitigation
Smuggling	The Darien is a frontier zone through which goods are brought from Panama to Colombia without paying duties.	The project procurement policy ensures legal purchase and/or importation of all project assets.
Drug trafficking	Colombia is the primary exporter of cocaine to Central America, North America, and Europe.	Any drug trafficking detected by patrols in the project area will be reported to the Cocomasur governing council and to local/national authorities.
Human trafficking	The Darien is a significant corridor for human trafficking of Caribbean and South American migrants to North America.	Any human trafficking detected by patrols in the project area will be reported to the Cocomasur governing council and to local/national authorities.
Encroachment	Illegal encroachment driven by land speculation as well as lack of awareness and respect for local land rights is common in the project zone.	Informational campaigns and demarcation activities with monitoring by airborne remote sensing and community patrols will prevent illegal encroachment.
Armed groups	Illegal armed groups (e.g. paramilitary and guerilla) have been active in the project zone.	Community vigilance and contact with the Armed Forces.
Illicit crops	Illicit crops are grown in neighboring regions and may be present in the project zone.	Satellite and airborne remote sensing and community patrols will detect and prevent any illicit cultivation in the project area.
Selective logging	Selective logging is an important livelihood in the project zone.	Loggers have been engaged in project design and implementation. Airborne remote sensing and community patrols will detect illegal selective logging in the project area.
Evasion of taxes	Only a small percentage of individuals and businesses comply with Colombian tax codes, even less in the project zone.	The project is fully compliant with Colombian tax requirements and encourages best practices among project partners and providers. Disbursement of funding is conditional on passing regular audits.
Evasion of labor obligations	Few businesses properly comply with all labor requirements (e.g., minimum wage, social security) as required by Colombian law.	Project fund disbursement is conditional on proper contracts, health, pension, and other social security payments for all project employees and partners.
Intellectual property violations	There is little or no respect for intellectual property in impoverished rural regions of Colombia.	Intellectual property and intangible assets form the basis of project credit generation. The project respects IP by purchasing and respecting permissions and licenses (e.g. software).
Fraud/deceit	Misrepresentation of ownership of land and other assets with the intent to deceive potential buyers is common in the project zone.	Project activities include information and education to raise awareness of land title. Fraud and disputes will be reported to the MercyCorps Red Tierras Land Dispute Resolution Program.



#### **G.5.6 Land Tenure Status and Carbon Rights**

The environmental services (including from forests and soil) generated on the lands of black communities that have been granted collective titles as Afro-Colombian collective territories are clearly owned by the community landholders, according to Article 6 of Law 70 of 1993 (see Annex CA1). Article 15 of Law 70 establishes the rights to the sustainable use of renewable natural resources of collective territories, and obliges them to observe the rules of conservation, protection and rational use of renewable natural resources and the environment. The community's exclusive access as collective owner to the use and exploitation of its territory is also established in Decree 2811 of 1974.

Collective title as a form of private property clearly establishes the *ius fruendi* of the title-holder as the right to use the property to which one exercises ownership rights. Inherently, this includes use of the forest, including the environmental service of reducing CO<sub>2</sub> emissions that forest conservation could provide. Law 70 mandates that use and exploitation of natural resources in a collective territory conform to the principle of protecting the environment and strict adherence to the social and ecological functions of the property, which includes environmental services.

Sustainable stewardship of forest resources is an explicit intention of Law 70, which contains provisions for the loss of these *collective rights* when the *collective responsibility* of sustainable use is not upheld. A community landowner could forfeit its collective territorial rights by failing to uphold its responsibility of sustainable resource use embodied in Law 70 rather than pursuing a course of sustainable use such as offering to reduce CO<sub>2</sub> emissions (i.e. REDD). Activities such as over-exploitation of the forest (beyond the established limits) or planting illicit crops are examples of grounds for the loss of a collective land title (see Annex CA10).

Subsoil rights in Colombia belong to the state, while the soil belongs to the landowner. As such, the rights to the carbon stored in roots and soil belong to Cocomasur, as soil rights are differentiated from the subsoil estate. In the case of Cocomasur, there is no conflict between soil and subsoil ownership rights and the use of renewable natural resources, including forests and their ecosystem services. In order for the Colombian state to explore or exploit subsoil resources, a consultation process regulated by Decree 1320 is required to guarantee the rights of the community landowner, and to establish mechanisms of compensation for foreseeable social, economic, cultural or ecologic damages to be incurred from the project. This would include those from lost revenue from the commercialization of environmental services in the case of Cocomasur.



## **CL.1 Net Positive Climate Impacts**

#### **CL.1.1** Net Change in Carbon Stocks due to Project Activities

The net climate impact assuming 20% leakage and an allocation of 20% to a VCS buffer pool is 2.3 million tCO₂e per VM0009 (see Table 27). Appendix CA 26 delineates calculations for NERs, leakage, and total credit generation. Changes in carbon stocks are expected to occur via:

- 1. Building governance capacity- raising awareness of collective identity and rights, demarcating title boundaries, resolving land disputes, implementing best practices for administration and financial management, and constructing collective visions and strategic plans for land use.
  - a. The assumptions implicit in the implementation of this project activity is that empowering and building capacity in communities in the project area will allow them to effectively enforce the ban on deforestation in the project area. The community in the project area would not be able to implement conservation of the project area at its current capacity, nor would it have the capacity to arbitrate land disputes. Moreover, collective administration of such large areas of land is not in the experience of the community members. These project activities are thus indispensable for the success of the project.
- 2. Forest Patrols and monitoring community surveillance and monitoring, restoring degraded areas, watershed management and high conservation value forest management.
  - a. The assumption behind this project activity is that the project area will continue to be illegally degraded and deforested in the absence of active enforcement of the ban on deforestation. This is reasonable as evidenced by common practice in the area, which has been to establish inholdings on the edge and within the forest and begin to cut for timber and to establish crops. The community has been in the process of communicating the new status of the project area to persons engaging in deforestation. That negotiation will have to continue since de jure protection has little effect in the area without enforcement.
  - b. It is assumed that restoring degraded areas and watershed management will lower pressure on the forested areas. This might be considered a leakage mitigation activity in addition to an activity to protect the project area in that it will help reduce pressure on forests in the area. The rivers in the project zone are highly sedimented. Banks outside of the forest are quickly eroded and the riverbeds are shallow as result of the loss of streamside vegetation to cattle grazing. This restoration will help communities maintain the productivity of the land that is actually deforested.
- 3. *Investing in climate compatible development* in the medium term, investments to improve technologies and agricultural practices and other activities such as artisanal gold mining, will include securing markets for other community products in line with project goals.
  - a. The assumption of this project activity is that alternatives to deforestation will have to be provided to community members for the project to be successful. This is reasonable



and can be defended by realizing that conserving the project area is a considerable opportunity cost for the persons in the project zone. Incomes and livelihoods that would have come from deforestation will have to be replaced or these activities will occur either in the project area or in activity-shifting leakage. Climate and capacity compatible development will help ensure the success of the alternative practices in the community.

Table 27: Net Changes in Carbon Stocks Due to Project Activities (2011-2040).

Year	Gross NERs (tCO2e)	Leakage Tonnes	Buffer Tonnes	Project Emissions	Net NERs
2011	119,861	23,972	23,972	299	71,618
2012	124,215	24,843	24,843	448	74,081
2013	126,857	25,371	25,371	598	75,516
2014	128,458	25,692	25,692	523	76,552
2015	129,430	25,886	25,886	448	77,210
2016	130,019	26,004	26,004	374	77,638
2017	130,377	26,075	26,075	374	77,852
2018	130,594	26,119	26,119	374	77,983
2019	130,725	26,145	26,145	374	78,061
2020	130,805	26,161	26,161	374	78,109
2021	130,853	26,171	26,171	374	78,138
2022	130,883	26,177	26,177	374	78,156
2023	130,900	26,180	26,180	374	78,167
2024	130,911	26,182	26,182	374	78,173
2025	130,918	26,184	26,184	374	78,177
2026	130,922	26,184	26,184	374	78,179
2027	130,924	26,185	26,185	374	78,181
2028	130,926	26,185	26,185	374	78,182
2029	130,926	26,185	26,185	374	78,182
2030	130,927	26,185	26,185	374	78,183
2031	130,927	26,185	26,185	374	78,183
2032	130,928	26,186	26,186	374	78,183
2033	130,928	26,186	26,186	374	78,183
2034	130,928	26,186	26,186	374	78,183
2035	130,928	26,186	26,186	374	78,183
2036	130,928	26,186	26,186	374	78,183
2037	130,928	26,186	26,186	374	78,183
2038	130,928	26,186	26,186	374	78,183
2039	130,928	26,186	26,186	374	78,183
2040	130,928	26,186	26,186	374	78,183



#### CL.1.2 Net Change in Emissions of Non-CO<sub>2</sub> Gases

No net change in emissions in non-CO $_2$  gases is foreseen as a result of the project. Deforestation and degradation are not significant sources of non-CO $_2$  gases such as CH $_4$  and N $_2$ O. For this reason, they have not been included in calculations for the with project scenario because they amount to less than 5%. The adoption of forest patrol and monitoring, agroforestry, and forest management activities will not produce an increase of these gases. Forest patrol, monitoring, and management activities will entail increased travel within the territory by horse and mule, which are the most common form of transport given the rough terrain. Furthermore, their natural diet of grass and forage maintains their digestive health, unlike cattle ranching that is often associated with increased CH $_4$  emissions from grain-based diets. There is no cattle ranching occurring or allowed within the project area, though future research on CH $_4$  emissions in the project zone will be considered given the extensive conversion of forests for this purpose.

#### **CL.1.3 Other GHG Emissions from Project Activities**

No burning is planned as part of project activities, since there is no need for construction of firebreaks, for example, in such a wet region. Table 28 shows the GHG emissions expected to result from project activities. The largest predicted emissions are those resulting from electricity, vehicles, and flights by project staff. Project emissions were calculated using values from the U.S. Environmental Protection Agency Carbon Calculator (<a href="http://calculator.carbonfootprint.com/calculator.aspx">http://calculator.carbonfootprint.com/calculator.aspx</a>) and were estimated to total 1,400 tonnes over 30 years, representing 0.1% of total project carbon benefits. A multiplier was applied to the annual estimated value of 35.91 tonnes to reflect above-average emissions during the startup phase of the project (2011-2015). Agricultural activities are not planned within the project area, therefore no significant sources of  $N_2O$  emissions are foreseen as a result of project activities.

Table 28: Estimated Annual Project Emissions (2011-2040).

Category	Туре	Annual Tons (metric)
Administration	Office and electronic equipment	
	900 kwh of electricity at the project office	0.11
Travel	Regional Trips: 30 RT flights Acandi - Medellin	1.92
Travel	International Trips: 12 RT flights (MDE-LAX)	13.39
Travel	National Trips: 15 RT flights Medellin - Bogota	0.56
Travel	Local Trips	
	Motorbike: 21,900 km per year for 2 (125-500cc) bikes	2.68
	Car: (2 large 2.0 liter petrol vehicles) x 7800 km/year	5.36
Operations	Diesel generators (1181 gallons/year @22.2 lbs/gallon)	11.89
	Total	35.91

\*Multipliers of 2,3,4,3, and 2 were applied to years 2011-2015, respectively, to more accurately reflect increased project emissions during the design phase.



#### **CL.1.4** Net Climate Impact of the Project

Per VM0009 the project is expected to prevent the emission of an estimated 2.3 million tCO₂e over the 30 year project lifespan, representing a clear positive climate impact (see Table 27). This calculation was derived using VM0009 and assumes 20% leakage (Annex CA 26). As per methodology VM0009, there will be no commercial harvesting of timber in the project area. Similarly, infrastructure development in the project area will be limited to trails and other low-impact structures designed to facilitate patrols, measurement, research, and tourism. Other emissions associated with the project amount to less than 5% of total emissions reductions and have been presented in Section CL.1.1.

### **CL.1.5 Avoiding Double Counting**

The carbon credits generated from the project will be registered under the Voluntary Carbon Standard and sold under that mechanism. Credits from the project will not be registered or sold under any current regulatory scheme, as these schemes currently only allow for Afforestation or Reforestation credits to be sold. If and when the credits become eligible under a regulatory scheme, proper procedures will be taken to ensure that credits are not sold twice. In addition, Anthrotect (as the Seller and aggregator of credits) maintains an exclusive agreement with community landholders to ensure that credits are only sold by Anthrotect and that duplicate sales of the same credits cannot occur.



## **CL.2 Offsite Climate Impacts**

### **CL.2.1** Determination of Types and Extent of Leakage

Potential leakage has been analyzed based on the framework of Aukland and colleagues, which conceptualizes off-site effects in terms of the actors responsible, or "baseline agents" (Aukland, Costa, & Brown, 2003). Following this logic, we divide leakage into primary and secondary categories.

*Primary leakage* occurs when the GHG benefits of a project are entirely or partially negated by increased GHG emissions from similar processes in another area.

- 1. **Shifting of cultivation activities** Traditional practices of shifting cultivation and clearing or felling to open up new areas for subsistence farming are potential sources of leakage that will be addressed in the project's territorial planning and organization processes. The project explicitly aims to organize agricultural land use within the territory to improve yields, and preserve forest.
- 2. **Shifting of ranching activities** The expansion of cattle ranching in the project zone by large private landholders is a significant cause of deforestation. Shifting of these ranching activities to neighboring communities is a potential source of leakage given the vulnerability and lack of organization of these groups.
- 3. **Outsourcing of selective logging** Some participating families depend on timber from the project area, particularly for the construction of homes and fences. The outsourcing of this timber extraction to a neighboring supplier is a potential source of leakage given the availability of and access to the same timber species in neighboring communities.

Secondary leakage occurs when a project's outputs create incentives to increase GHG emissions elsewhere, and is not directly linked to, nor carried out by, the original "baseline agents".

Timber market effects - As part of its conservation commitment, Cocomasur has forgone legal
permits to harvest commercially valuable timber. Impacts on the supply and demand of these
particular timber species at local and regional sawmills are a potential source of leakage in the
project.

An overarching strategy of investing in forest-friendly livelihoods that decrease reliance on deforestation and degradation-causing activities will aim to minimize primary and second leakage.



### **CL.2.2 Documentation and Quantification of Leakage Mitigation**

The risk of leakage will be minimized through specific project activities that improve livelihood alternatives thereby reducing the likelihood of additional land conversion outside of the project area (see Figure 28). These include forest patrols, forest and biodiversity monitoring, reforestation, regeneration and enrichment planting, and agroforestry and agricultural activities, including improving the efficiency of existing farm and pasture land (Table 29).

Table 29: Activities Designed to Mitigate Leakage.

Туре	Mitigation Actions	Project Area <sup>1</sup>	Project Zone <sup>1</sup>	Impact <sup>2</sup>
Shifting of cultivation activities	Designation and demarcation of areas for community agriculture activities using improved techniques and inputs that decrease participating families' demand for land within the project area.	20%	80%	Medium
Shifting of ranching activities	Designation and demarcation of areas for community grazing and enrichment planting to improve soil quality and fodder on existing community pasturelands. Direct employment in carbon and biodiversity monitoring activities and through micro-businesses seeded by the project.	10%	90%	Low
Outsourcing of selective logging	Reforestation of degraded lands titled to participating families outside the project area but within the project zone in order to meet local demand for timber (e.g., bamboo for housing construction).	0%	100%	High
Timber market effects	Reforestation of degraded lands titled to participating families outside the project area but within the project zone for sale to local sawmills and timber distributors.	0%	100%	High

<sup>&</sup>lt;sup>1</sup>These percentages indicate the apportionment of the leakage mitigation activities between the project area and project zone.

### **CL.2.3 Subtracting Project-Related Leakage from Carbon Benefits**

As per methodology VM0009, project-related leakage of 20 percent was subtracted from the net emissions reductions (Annex CA 26).

## CL.2.4 Inclusion of Non-CO<sub>2</sub> Gases in Calculations

 $Non-CO_2$  gases account for far less than 5% of emissions (0.3%), and are easily offset by mitigation activities described in CL.1.1 (see Annex CA 26 for calculations).

<sup>&</sup>lt;sup>2</sup>Impact refers to the effect of the mitigation activities on leakage from the project area.



## **CL.3 Climate Impact Monitoring**

## **CL.3.1 Plan for Selecting and Monitoring Carbon Pools**

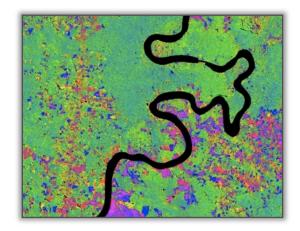
Estimates of carbon stocks and changes in the project area thus far include only above-ground tree biomass (estimated on the basis of local allometric equations using fixed plot sampling) and below-ground tree biomass (estimated using the IPCC 2006 root to shoot ratio for tropical forests). In order to ensure that activities planned for the project area do not result in unanticipated GHG emissions and in order to minimize leakage, the project partners are developing a comprehensive plan for monitoring a broader range of carbon pools. These include all pools expected to decrease as a result of leakage. Transects will be located in the leakage belt as the area where activity shifting leakage will take place, identified per VM0009 and delineated in Annex CA 27. These leakage transects will be sampled using standard statistical sampling methodologies that guarantee a sufficient degree of certainty per VM0009 10.3.2, p65. Transects will be monitored throughout the life of the project and/or at least five years after leakage – causing activities take place. A field protocol has been established to measure plots on these transects (see Annex CA 24 and VM0009 10.3.2). No project activities will lead to the production of non-CO2 GHG emissions above that of the baseline. There will be no draining of currently inundated lands or inundation of currently dry areas in the project above and beyond the baseline.

#### **CL.3.2** Development of a Full Monitoring Plan

Project emissions reductions and their associated social and environmental benefits will be monitored through a transparent platform integrating state of the art remote sensing with community participation on the ground. Community forest patrols will be trained and employed to collect monitoring data on the

forest and its biodiversity and submit regular reports, building on traditional practices such as the territorial discovery excursions (*reconocimiento del territorio*) carried out every few weeks by Cocomasur.

On-the-ground field monitoring will be complemented with space-based high-resolution satellite imagery (ASTER 1:25,000 and Quickbird 1:10,000) and remote sensing using light detection and ranging (LIDAR) and RADAR methods developed by Dr. Greg Asner at the Carnegie Institute for Science. Novel methods for integrated space and terrain-based monitoring developed at the National University of Colombia, and the Colombian Institute for Hydrology, Meteorology, and Environmental Studies (IDEAM) will enable state-of-the-art measurements and mapping in this notoriously cloudy region.



CLAS images of deforestation. Asner Lab, Department of Global Ecology, Carnegie Institution.



Anthrotect and its partners commit to developing a full plan for monitoring carbon pools in the project area within 12 months of validation against the CCB standards. An open monitoring platform through a partnership with Carnegie Institution and Google Earth for the storage and display of forest biodiversity and carbon data will enable external donors, policymakers and the global public to understand the ecosystem services being provided by the communities, as well as ensure transparency and wide distribution of the data to the scientific community and greater public.

## **CM.1 Net Positive Community Impacts**

#### **CM.1.1 Methodologies for Assessing Community Impacts**

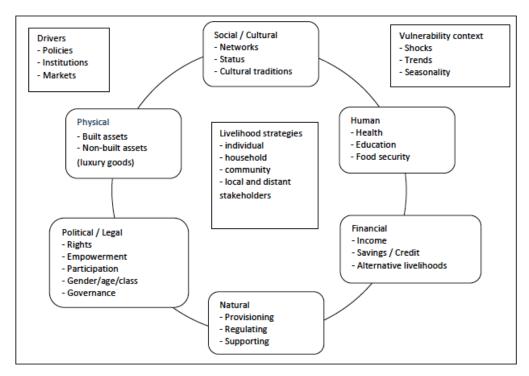
A causal theory of change model has been applied during the consultation and design phase to establish a framework for later monitoring and evaluation. A modified sustainable livelihoods framework for land-based carbon projects frames the methodology for assessing social and economic community impacts of the project (see Figure 30).

Objective and subjective data on socioeconomic impacts will be gathered. Subjective measures of wellbeing will be achieved using tools that draw on positive psychology which aims to, "discover and promote the factors that allow individuals and communities to thrive" using tools from the wellbeing in development (WeD) approach (Ruta, Garratt, Leng, Russell, & MacDonald, 1994). This approach defines wellbeing as, "a state of being with others, where human needs are met, where one can act meaningfully to pursue one's goals, and where one enjoys a satisfactory quality of life" (see Annex CA 33).

Participatory impact analysis workshops conducted during the consultation and design phases (see Section G.3.8 and Annex CA 18) using Technology of Participation (ToP) methods identified the vision of project success and the key changes and actions required. A final set of outcomes and indicators will be refined during the next strategic planning workshop in March 2012.



Figure 30: Social Analysis of Protected Areas Initiative Modified Sustainable Livelihoods Framework



Source: Schreckenberg et al. 2010



### **Positive Community Impacts**

The socio-economic impacts from this project that enables landholders to generate a revenue stream linked to the carbon value of conservation and reforestation activities are expected to be transformational for the communities of the Cocomasur. Neighboring indigenous reserves (Chidima and Pescadito) are also expected to experience positive spillover effects from forest patrol activities along shared boundaries and watershed management activities.

The project will finance a range of activities that will yield socio-economic and cultural development dividends including:

- Strengthened territorial governance structures;
- Improved capacity for collective land management, including spillover effects to neighboring indigenous reserves;
- Improved access to basic health and education services;
- Expanded opportunities for vocational training and secondary education;
- Expansion of internet and mobile phone coverage;
- Resolution and prevention of land disputes;
- Investments in green commodity production (agro-forestry, NTFPs, medicinal and aromatic plants, artisanal gold mining, sustainable ranching);
- Improved access to markets for green products and staple crops;
- Improved agricultural yields and food security;
- Reinforced dignity, territorial autonomy and traditional ways of life;

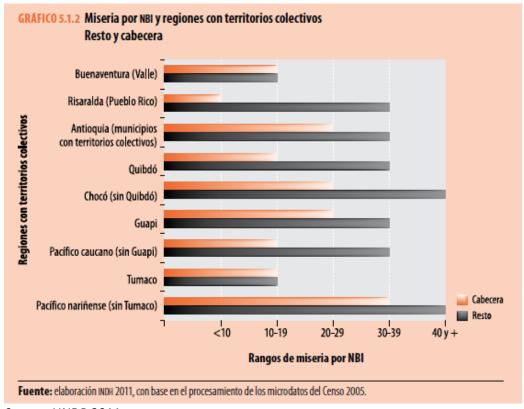
The baseline scenario is characterized by poverty and unmet basic needs (collective and usufruct rights are poorly understood and enforced), resulting in outcomes such as:

- Members of the territory illegally selling land from within the territory and leaving the territory to buy property in Apartadó;
- Members of the territory requesting a permit from the Junta Directiva to clear a hectare of forest to plant corn;
- Members of the territory without legal title their farms (outside the collective territory) pay
  exorbitant interest rates informal lenders for loans to start small businesses;
- Uninformed decision-making by a limited group of individuals who transfer natural resources into the hands of outside individuals and companies (e.g., logging) with limited or no distribution of benefits;
- Conversion of forest into pasture, agriculture land and increasingly uncontrolled logging resulting in deterioration of environmental services and livelihoods;
- Accelerated logging of forests enabled by the completion of the Pan-American highway;



- Increasing poverty, social marginalization and weakened capacity of local governance institutions to respond, especially in rural areas (see Figure 31);
- Loss of a globally-unique forest and its biodiversity.

Figure 31: Unmet Basic Needs in Regions with Collective Territories by Urban/Rural Area.



Source: UNDP 2011

Compared to the without project scenario, there will be overall Net Positive community benefits:

- Community members will benefit by improved participation in decision-making processes with regards to the natural resources of the territory;
- Resources from the project will be distributed collectively, meaning improved access to the resources of the territory, which at present are only accessed and enjoyed by a minority;
- Members will be able to access credit from collectivized funds established by the project to improve livelihoods;
- Territorial planning that regulates land use and access for given purposes, and is constructed with broad input from the community, including sanctions for infractions and illegal activities, such as land speculation;
- Employment to undertake sustainable forest management, monitoring and administration activities;
- Strengthening land tenure of Afro-Colombian collective territories and raising the profile of collective landholder models for REDD in the Colombian Pacific;



- Generating a revenue stream from the carbon values of conservation activities that the territory
  can reinvest in areas such as health facilities and schools, improved agricultural systems,
  establishment of small enterprises for agro-forestry, non-timber forest products and medicinal
  and aromatic plants.
- Neighboring Chidima and Pescadito indigenous reserves benefit from improved watershed management and border patrols along shared boundaries.
- Provision of water resources to local stakeholder communities in the project zone via improved management of watersheds in the project area that supply these communities.

The project will work in alliance with municipal and regional environmental agencies as well as with other local stakeholders, including the Chidima and Pescadito indigenous reserves. Beyond enhancing tenure security within the territory including definition of usufruct rights, the project will create direct and indirect employment opportunities, funds for community enterprises and infrastructure initiatives, and resources for building territorial governance over the project's 30-year life time.

#### CM.1.2 Demonstration of Neutral or Positive Impact on HCV Areas

High conservation values identified in G.1.8 will be positively impacted by project activities as summarized in Table 21 in Section G.3.6.

Cocomasur has prioritized identified reforestation activities along riverbanks and upstream sources due to the recognized urgency of reducing vulnerability to flooding that threatens the homes of communities along their banks, and for the cultural and practical importance of rivers in daily life.

The expansion of a predatory economic model seen in other parts of the Chocó that converts forest to banana plantation or cattle ranches, such as has been observed in Urabá, would bring enormous ecological cost and devastating socio-economic impact as well as preventing any real chance to empower the collective territory to develop according to its ethno-development plan and carry out its governance responsibilities established by the Law 70.

Expansion of large cattle ranches in the project zone would increase forest and biodiversity loss, further compact soils and change the water table—effects which are already being seen as a result of ranches established within the last 10 years. A third likely scenario is accelerated deforestation along the planned Pan-American Highway. All of these potential investment models would not actually serve community development or biodiversity conservation.



## **CM.2 Offsite Stakeholder Impacts**

## CM.2.1 Identification of Negative Offsite Stakeholder Community Impacts

We do not foresee any major negative offsite stakeholder impacts outside the project area as a result of project activities. Neighboring communities in the project zone include large private landowners who came to the region purchasing speculated land for cattle ranches located in the alluvial planes east of the project area. These ranches stand to benefit from the project because of their dependence on the forest cover that is protecting their only water supply. A communication plan based on the results of a stakeholder analysis conducted during a planning workshop in August 2011 has been provided to the auditor (Annex CA 18, 19).

Other neighbors in the project zone are migants from Córdoba or Antioquia who have lived in the vicinity of the project area for many years in some cases. There are no expected negative impacts from the project; rather, they stand to benefit from project activities that protect the ecosystems they also depend on for agricultural production. Cocomasur maintains and "open door" policy to their neighbors in the community regardless of race or ethnicity. Many such migrants attended workshops and meetings held during the consultation phase and were present at a general assembly meeting held in October 2010 to approve the project.

The neighboring Embera Katío indigenous group is also aware of the project from outreach efforts by Anthrotect and Cocomasur. The Chidima reserve is located between the two segments of territory and stands to gain from the increased monitoring efforts along its borders as well as from the protection of forest cover connecting to Mt. Tacarcuna, a sacred site. There is a small chance that, as a result of the project's investment in demarcation of boundaries and forest patrols, ranchers will encroach onto the Embera or Chidima reserves.

#### **CM.2.2 Offsite Impact Mitigation Strategies**

As mentioned in Section CM.2.1, a stakeholder communication plan has been developed to continue to disseminate information about the project's activities and objectives and identify any potential negative offsite impacts.

The project will continue to engage with Chidima leaders, located between the two spheres of the project area, to maintain communication about any threats perceived during forest monitoring activities.

#### CM.2.3 Demonstration of Neutral or Positive Impact on Other Stakeholder Groups

The project will have a neutral or positive impact on other stakeholder groups in the project zone, all of whom depend on the hydrological services provided by the Serranía del Darién. The goodwill of Cocomasur towards its neighbors to share information about the project, promote the benefits of conservation, and explore opportunities for cooperation will ensure that no harm is done as a result of project activities. To the contrary, wellbeing should be maintained among stakeholders at the very least due to conservation of critical watersheds and environmental services.



## **CM.3 Community Impact Monitoring**

#### **CM.3.1 Selecting Community Indicators for Monitoring**

A causal theory of change model has been applied during the consultation and design phase to establish a framework for later monitoring and evaluation. The project will monitor variables from the sustainable livelihoods framework adapted to land based carbon projects as outlined in Figure 32 (Schreckenberg et al., 2010). These indicators will be developed and refined by March 2012 using participatory methods and tools. The initial framework for monitoring community impact has been provided to the auditor (Annex CA 33).

Community objectives (as identified in Section G.3.1):

- Improved wellbeing of Cocomasur members;
- Maintenance and enhancement of cultural identity;
- Expansion of educational and leadership opportunities;
- Effective and inclusive territorial governance;
- · Access to health services; and,
- Livelihood security

Monitoring and reporting will occur annually or as required by the finalized survey instrument. The territory will also develop its statistical database and data collection plan for territorial governance and project impact assessment.

### CM.3.2 Assessing Effectiveness of High Conservation Value Monitoring

High Conservation Values 4-6 will be monitored with indicators to assure effectiveness of measures to maintain and enhance these values as well as to detect any negative impacts (see Annex CA 22 and CA 30). Proxy indicators will be used to assess wellbeing and socio-economic indicators that are subjective or difficult to measure, including cultural values. Table 30 presents initial indicators for HCV 6, while the indicators shown in Table 31 correspond to values 4 and 5.

Table 30: Framework for Monitoring "Cultural Visions, Uses, and Practices".

Criteria	Indicator
	Population and settlements in the area over time
	Cultural patrimony
Ethnic and cultural divorcity	Areas of environmental importance—rivers and forest
Ethnic and cultural diversity	Popular celebrations
	Maintenance of cultural and ancestral practices
	Myths and customs around resource use
	Continuity of vegetative cover
National management and attack	Mosaic patterns of use
Natural resource management practices	Protection of cultural and natural patrimony
	Prevention of illicit sale of cultural or natural goods

Source: (Rangel-Ch., et al. 2004)



Table 31: Framework for Monitoring "Sustainable Environmental Demand".

Criteria	Indicator
	Demographic indexes
Population Structure	Mortality rate
	Life expectancy/projected yearly population
	Food security
	Structure of services (roads, water, energy)
0	Uses of water
Quality of Life	Quality of hydrologic resources
	Utilization of biologic diversity
	Final disposal of waste
	Who owns the land?
Land Tenure	What is the area owned?
	For what is the land used
l a mada	Location of productive systems in the area
Land use	Suitability of land use
	Amount of extracted water resources
Water use	Type of use (e.g., self-subsistence, commercial)
	What is water used for in the area?
	Which resources are used? (Flora and Fauna)
	What is predominantly planted? Or hunted?
	What is the predominant way of managing the resource?
	For what is it used? (e.g., extraction, enjoyment, tradition)
	Forms of traditional management
	Predominant form of collection
	Area occupied by the system (of production or extraction)
Forest resource use	Quantity of resource used
	Frequency of resource use
	Scale of use (local, national, regional)
	Benefitting population and number of beneficiaries (according to type of
	benefit)
	Type of benefit (self-subsistence, commercial, enjoyment)
	Profits
	Investments
Futura etii ya wa a ala	Type of resource (including wood, non-wood or part of resource used)
Extractive needs	Access to the resource
Equitable distribution of	Ratification of agreements with regards to market systems

Source: (Rangel-Ch., et al. 2004)

## **CM.3.3 Community Impact Monitoring Timeline**

Anthrotect commits to developing a complete social monitoring and communication plan within 12 months of validation against the standard. Indicators for the social baseline and monitoring plan will be developed with community input and disseminated to through the local councils. Results of social impact monitoring will be publicly available on the Anthrotect website or a platform created specifically for the project.



## **B.1 Net Positive Biodiversity Impacts**

The baseline scenario of continued fragmentation of the forest in the Serranía del Darién will continue to comprise the integrity of the unique ecosystems and biodiversity in the Colombian Darién. Ineffective implementation of the Protected Forest Reserve and Special Management Area (SMA) combined with the anthropogenic processes (land conversion) observed along the central alluvial plains and eastern mountains will ensure the continued fragmentation and transformation of the project zone, with negative impacts on biodiversity and ecosystem functioning.

Under the with-project scenario, conservation and management measures will maintain forest cover and ecosystem integrity, prevent fragmentation, and result in retention and enhancement of cover and connectivity with neighboring Darién National Park. The project will yield a net-positive gain for biodiversity in the project zone, including the habitat of the many endemic, endangered and migratory species present in the project zone.

#### **B.1.1 Methodologies Used to Estimate Changes in Biodiversity**

The project will use a minimum representative sampling area of 15 km² (3 sampling modules according to the RAPELD system) in each habitat type (see Stratification) (Magnusson et al., 2005). Each sampling module will be laid out as a grid, 5 km x 1 km, with a trail system that defines 1 km² quadrants. The RAPELD system allows surveys of taxa best surveyed in line transects and species best surveyed in plots (De Castilho, Magnusson, De Arão, & Luizão, 2010), and can be used for a wide variety of taxa and ecosystem processes (Costa & Magusson 2010). Where the landscape configuration does not permit installation of 5-km transects, smaller modules with the same internal configuration should be used. Sampling shall be conducted, and data analyzed and reported, at fixed intervals (see Monitoring Plan).

In order to accommodate the environmental heterogeneity usually present in tropical forests, stratifying sampling among broad, course-grained habitat types shall be done using stratified-systematic sampling or stratified-random sampling. The sampling locations in each habitat type must be at least 1 km apart.

Whether for the initial taxonomically broad biodiversity baseline survey or for the subsequent periodic monitoring of a smaller number of taxa of high indicator value, species must be systematically and scientifically sampled. Sampling techniques will vary by taxonomic group, but in all cases will be conducted using generally accepted survey methods (Hill, Fasham, Tucker, Shewry, & Shaw, 2005), that are specific to each group (e.g., birds, bats, dung beetles, etc.).

For plant inventories, the Humboldt Institute (Villareal et al., 2006) uses the following methods:

- Standardized sampling using selected taxonomic groups Rubiaceae and Melastomataceae in 0.4 ha plots.
- Standardized sampling using selected "guilds" inventory of woody plants in 0.1 ha plots according to an adjusted version of the method proposed by Gentry (1982), to include individuals with DBH = 1 cm. Each plot includes 10 transects 50X2 m, separated by max 20 m.
- General plant collections all plants in the area with flowers and/or fruits at the time of sampling.
- General physiomic profiles of the vegetation, to describe vertical strata present.



For bird inventories, the Humboldt Institute recommends:

- Direct visual and auditory observations along 5km constant speed walk, per each kind of landscape (biome) present in the area, at dawn and dusk. This must be done at least during four days per biome. Recording bird vocalizations to then use them to attract other individuals using playbacks or to compare with reference patterns in "song banks".
- Mist nets the Humboldt Institute recommends working with 200 400 m of mist nets per habitat type, keeping them open during two consecutive days; after two days the nets have to be relocated in a new site, within the same habitat. The number of locations per habitat depends on the habitat's internal heterogeneity. Nets are open at dawn and are kept open until 11:00 am. If necessary, they can be reopened between 3:30 pm and 6:30 pm.

#### **B.1.2** Demonstration of Neutral or Positive Effect on HCVs

Using an indicator species approach, we will select biodiversity surrogates to assess the effectiveness of management measures designed and implemented by the Chocó Darién Conservation Corridor project on the health of ecosystem functions, habitat and species diversity and to be able to track changes in key biodiversity variables. There is consensus on the benefits of using birds as surrogates for animal diversity (Gardner, 2010).

We will use both bird and plant species as indicators in the project area. A short list of these species is provided (Annex CA 29) and includes species sensitive to forest fragmentation, representatives of different bird guilds, those with restricted ranges or in any recognized threat category globally or nationally.

The project will use land cover and vegetation classes as surrogates for monitoring ecosystem diversity and health. Benchmark data will be gathered with fieldwork and LIDAR technology.



Cocomasur consultation in the community of Peñaloza, Acandí. Photo by Emily Roynestad.



#### **B.1.3** Identification of Tree Species to be Planted by the Project

Trees planted in the project area for reforestation will be native species, with an emphasis on those required for forest regeneration and those known for their multiple values by the community. Enrichment planting will be carried out in areas that are identified as priority due to logging, degradation or water catchment restoration in line with the management activities outlined in Section G.1.8. A list of native species corresponding to land class in the project area is shown in Table 32. A full list of native plants is found in Annex CA 27.

Table 32: List of Native Species to be Planted in the Project Area.

Scientific Name	Common Name	IUCN	Land Class Code
		Status	
Dipteryx oleifera	Choibá	EN	15
Cedrela odorata	Spanish Cedar	EN	18
Caryocar amygdaliferum	Almendrón de Mariquita	EN	n/a
Aspidosperma dugandii	Carreto	EN	13
Anacardium excelsum	Wild Cashew	NE	20
Cavanillesia platanifolia	Cuipo Tree	NT	19
Quercus humboldtii	Andean Oak	VU	21
Libidibia ebano	Partridgewood	EN	n/a
Pachira quinta	Pochote	VU	n/a
Prioria copaifer	Cativo	EN	n/a
Myroxylon balsamum	Balsam	-	8

#### **B.1.4** Adverse Effects of Non-Native Species in the Project Area

The conservation of existing forests and restoration of degraded areas in the project area will use native species endemic to the region and will not introduce exotic species. In project zone, exotic species including teak and mango are commonly planted. These specie provide livelihoods benefits and do not carry diseases that threaten native species in the project area. The project will focus on increasing production of the more than 40 endemic and near-endemic fruit tree species in the Chocó. The expansion of non-native species that already occur in the project area and are not considered invasive (e.g., mango and teak) will be considered on a case-by-case basis for cultivation on degraded land outside of the project area to reduce consumption of threatened native species and support livelihoods.

#### **B.1.5 Guarantee to Use No Genetically Modified Organisms**

In accordance with its commitment to protecting and enhancing the unique biological diversity of the Darién region, this project will neither use nor introduce genetically modified organisms (GMOs). Agricultural components of the project such as agro-forestry initiatives within the project area will adhere to this policy as well.



## **B.2 Offsite Biodiversity Impacts**

#### **B.2.1 Identification of Potential Negative Offsite Project Impacts**

The project will have net positive impacts on biodiversity in both the project area and zone. Migratory birds, for example, will benefit from the increased security of their part-time habitat. Although very little hunting occurs in the project area, there is some potential for hunting activities to be displaced from the project area to the surrounding zone. A second potential negative offsite impact could be the overharvesting of wildcrafted medicinal plant species discovered to be valuable through plant surveys and species taxonomy. On the whole, however, there will be strong net positive impacts on biodiversity.

### **B.2.2 Mitigation Strategies for Potential Negative Offsite Biodiversity Impacts**

Early consultations have engaged hunters in the identification of High Conservation Value zones within the project area, and the project will seek their continued support in the implementation of biodiversity inventories and monitoring. If a commercially valuable medicinal plant species is discovered or identified in the project area, the project will adhere to the FairWild® standard for the sustainable collection and harvesting of medicinal and aromatic plants (MAPs) in addition to existing legal protocols for genetic resources. The project will endeavor to mitigate the overexploitation of any such species in the broader project zone by raising awareness and promoting regulation beyond the project area.

## **B.2.3 Unmitigated Negative Offsite Biodiversity Impacts**

There are no expected unmitigated negative biodiversity impacts given the community-driven nature of the project and the exceptional benefits expected from forest conservation on the great wealth of flora and fauna in the project zone.



## **B.3 Biodiversity Impact Monitoring**

### **B.3.1 Biodiversity Monitoring Plan**

The first step of the monitoring scheme is to establish benchmark values for biodiversity and the services provided by ecosystems. This will be done after a field evaluation that allows for a fine selection of the elements to be used for monitoring purposes. The first step of this evaluation is to establish the exact limits of all natural vegetation classes identified in Table 4. Vegetation surveys, satellite images, and LIDAR data will also be used for this purpose.

An initial biodiversity monitoring framework using previously identified indicator species for the project zone based on fieldwork and expert review (see Section G.1.7) has been provided to the auditor (Annex CA 30). Proxy indicators for ecosystem health will also be used. The monitoring framework parameters for ecosystem approach to biodiversity monitoring and management in Colombia are outlined in Table 33, Table 34, and Table 35 below (Fundación Natura, Universidad Nacional de Colombia, & Universidad de Antioquia, 2000; Rangel, Orjuela-R., Zambrano, & Andrade-C., 2004).



Table 33: Framework for Monitoring "Ecosystem Integrity".

Criteria	Indicator
	Climatic units
	Geomorphological units
	Hydrological units
	Aquatic ecosystem units
	Flora species
	Fauna species
	Endemic flora and fauna
Structure and	Vegetation communities
composition of	Dominant species
the ecosystem	Associated species
the ecosystem	Distribution of populations
	Threatened species
	Landscape patterns
	Diversity and structure of habitat
	Ecosystems (richness and diversity)
	Structure of plant skeletons
	Population structure
	Fragmentation
	Type of land use
	Ecological processes on the landscape scale
Ecocystom	Disturbances
Ecosystem Functioning	Inter-species interactions
i diletioning	Changes in demographic processes
	Life histories
	Changes in ecological processes and the ecosystem and community scales

Source: (Rangel-Ch., et al. 2004)

Table 34: Framework for Monitoring "Sustainable Environmental Supply".

Criteria	Indicator
	Invasive species
	Presence of contaminants
Ecosystem Health	Changes in the conservation/state of soil
	Changes in watercourses
	Changes in number of waterfalls and streams
	Biomass
	Basal area
Goods and services	Cover (of forest and vegetation)
	Population density
provided by the ecosystem	Changes in population functions (reproduction, growth, survival)
ecosystem	Changes in species dominance
	Changes in species density
	Changes in carrying capacity

Source: (Rangel-Ch., et al. 2004)



Table 35: Framework for Monitoring "Political and Institutional Capacity".

Criteria	Indicator		
Geopolitical structure of the territory	Municipalities, towns, and villages		
	Inter-institutional links with resources an population		
	Jurisdiction of environmental authorities (governmental		
	and non-governmental)		
	Established community groups		
	Other groups with power (guerilla, paramilitary)		
	Possession of territorial areas		
Decision-making capacity	Technical and professional capacity of local institutions		
	Inter-institutional coordination		
	Local capacity to develop proposals		
	Management policies		
	Efficiency and efficacy of resource management		
	Norms for resource management		
	Conservation policies		
	Existence of territorial ordering plans		
	Land distribution		
Normative framework in relation to renewable	Land tenure		
natural resources	Operationality and application of norms		
	Situations of conflict generated by use of natural		
	resources		
	Incentives and/or regulations		
	Forms of association		
Organizational capacity and participation of			
local communities	Forms of distribution of benefits derived from the use		
	of natural resources.		

Source: (Rangel-Ch., et al. 2004).

### **B.3.2** Assessment of Monitoring Plan Effectiveness

Indicators for biodiversity monitoring selected for the initial monitoring plan enable the project to gather data to assess the effectiveness of measures to maintain and enhance HCVs 1-3 outlined in G 1.8. These indicators are included in the HCV Monitoring Plan (Annex CA 30).

### **B.3.3 Commitment to Biodiversity Monitoring Plan Timeline**

Anthrotect commits to developing a full monitoring plan within 12 months of validation to the standard. The plan and its results will be disseminated to communities and stakeholders in the project zone, and be made publicly available on the internet.



## **GL.1 Climate Change Adaptation Benefits**

#### **GL.1.1 Likely Regional Climate Change Variability**

Scientists propose a variety of regional climate scenarios likely to occur in Colombia as a result of global climate change (Barba et al., 2010; Mulligan, 2000). Indeed, some expect Colombia to be the Latin American country most affected by climate-change related natural disaters in the coming years (Wecker, 2009). Evidence for the Chocó suggests increasing temperatures (Barba et al., 2010; Ochoa & Poveda, 2004), increased rainfall, as well as more catastrophic weather episodes associated with the El Niño and La Niña phenomena (Barba et al., 2010). This is likely to result in higher incidence of vector-borne tropical diseases, such as malaria (Bouma, Sondorp, & Van Der Kaay, 1994; Mantilla, Oliveros, & Barnston, 2009; Poveda, 2011), dengue (Cassab, Morales, & Mattar, 2010), and leishmaniasis (Githeko, Lindsay, Confalonieri, & Patz, 2009). The Chocó is particularly vulnerable to rainfall patterns associated with the La Niña phenomenon; the department has registered a 3.34% increase in average annual rainfall per decade since 1970 (Barba et al., 2010). Potential changes in local land use scenarios owing to these weather patterns include changes in the types of crops cultivated, increasing cultivation on sloping lands that are less prone to flooding, and increased cultivation at higher altitudes.

### GL.1.2 Identification of Risks to the Project and Mitigation Strategies

Conservation of biodiversity in this globally significant and unique biogeographic region relies on maintaining and enhancing the diverse types of forest that are found here despite a changing climate. The high level of endemism will require research and actions to better understand patterns of species occurrence as well as the effects of shifting climatic conditions on the different types of forest—some of which are already threatened and found no where else in the world. Conserving and enhancing forest cover is a strategy to safeguard species adaptation, especially at higher elevations where temperatures are cooler.

#### GL.1.3 Demonstration that Climate Change Impacts Communities and Biodiversity

Soil-damaging erosion is expected to increase with heavy season rains and will severely affect communities who depend on farming to meet their basic needs. In early 2011, heavy rains and flooding caused extensive crop damage (e.g., banana and cassava) leaving farmers with substantial monetary losses in early 2011. Without the project, deforestation would exacerbate the annual rainy season causing even greater loss of life and livelihoods, further degrading the unique ecosystems and posing greater disaster management and recovery challenges to local institutions and communities in their wake.

#### GL.1.4 Demonstration that Project Activities Assist in Climate Change Adaptation

The implications of the REDD+ project for Cocomasur will increase the resilience of the forests themselves, and of its people and institutions. Project activities will enable adaptation in several ways:



Cost-effective investment in hydrological functioning that reduces vulnerability to flooding and improves hydrological security

Project activities such as reforestation of degraded watercatchments and monitoring of hydrological resources provisioning services will improve watercatchment functioning, and reduce the vulnerability of local communities to changes in water service provision that would otherwise occur from further degradation. Specifically, maintaining and enhancing watershed forest cover will conserve the natural hydrological functions and act as a buffer for communities to heavy waterfall that results in, flooding, waterlogging, erosion, and subsequent damage to infrastructure and livelihoods.

Project activities that protect, reforest, and regenerate are cost-effective measures to prevent further damage to the territories' already-battered infrastructure in the municipality of Acandí. The damage from the 2010-2011 rainy season has washed away entire sections of road as rivers change course and erode land exposed from clearing for cattle ranches. The communities of Cocomasur have indicated that reforestation activities will prioritize those areas along rivers most important for stabilizing the watershed and restoring the hydrological functions of the forests as protection from the damages incurred in years of abnormal rainfall such as this past one (Annex CA 22).



Water logging due to changing rainfall patterns is affecting farmers' livelihoods in the Chocó. Photo by Emily Roynestad.

#### Livelihood diversification

Project revenues will be invested in other complementary livelihoods activities to strengthen rural communities and increase opportunities for development. This includes creating viable employment in forest protection and enhancement activities, as well as non-timber, agroforestry, and agricultural business models from sustainable use of resources outside of the project area.

#### Institutional capacity for climate resilient development

A key feature of the project is the strengthening of territorial governance institutions to increase resilience (Annex CA 14, Training Plan). Building this institutional infrastructure at the local level will link communities to higher levels of government at the regional and national levels that is currently lacking (see Annex CA 18 and and Annex CA 19). Institutional infrastructure is recognized as critical for facilitating inter-sectoral collaboration for climate resilient development at scale (see Figure 32). Project activities related to strengthening local governance generate adaptation strategies through participatory processes (e.g., planning events and the HCV consultation) involving local stakeholders and building on already existing cultural norms and address local concerns that create vulnerability to the impacts of climate change.



Figure 32: Sustainable Livelihoods and Environmental Risk.

VULNERABILITY CONTEXT

► shocks ► seasonality ► trends

ASSETS

**ACTIVITIES** 

**OUTCOMES** 

POLICY AND INSTITUTIONAL CONTEXT

▶ government ▶ laws & rights ▶ democracy

Source: Adapted from Scoones (1998) and Ellis (2000)

Source: Forsyth 2007



## **GL.2 Exceptional Community Benefits**

#### GL.2.1 Demonstration that the Project is in a Low Human Development Area

Afro-Colombian communities in the Chocó are among the most politically and economically marginalized in Colombia, making them extremely vulnerable to industrial natural resource extraction and agricultural pressures that have degraded forests (see Figure 31). Despite Colombia's impressive economic growth in recent decades, the Chocó may still be characterized as a pre-modern society compared with the rest of the country (Gosling & Taylor, 2005; Palacio & Bengtsson, 2009). In 2005, more than 57% of the population still lived in rural settings as peasants working in small-scale units of production. The Chocó region exhibits one of the lowest shares of industrial production in the country, contributing only 0.38% of GDP in 2005 and with a declining annual growth rate since 1990. Despite democratic elections, political clientelism impedes the provision of minimum basic public goods such as health, education and utilities (Bonet, 2007). Indeed, indicators of health and wellbeing in the Chocó are among the worst in the country (UNDP, 2011). Recent statistics indicate that infant mortality among males declined from 104 per 1000 in 1985 to 86 per 1000 in 2005, but still remains roughly double the national average (DANE, 2007). In 2005, some 76% of the inhabitants of the Chocó had "basic unmet needs" (see Figure 11), the highest percentage of any department in the country and roughly four times the national average (DANE, 2009).

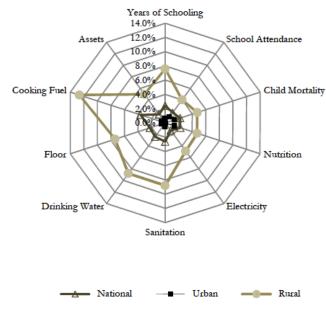
#### **GL.2.2** Demonstration of Project Benefits to Poorest Communities.

The 2011 Human Development Index (HDI) ranks the Chocó second to last of all departments in the country with a score of 0.731 compared to the national average of 0.840 (UNDP, 2011). There is clear evidence that rural muncipalities lag far behind their more urban counterparts in progress towards the Millenium Development Goals (MDGs) (see Figure 10). In rural municipalities, an average of 74.6% of the population has unmet basic needs compared to 33.4% in urban municipalities (UNDP, 2011). The majority of Cocomasur members live in rural communities, and Acandí is a rural municipality that is more isolated than most, given the lack of land access routes. Unfortunately, household census data is incomplete for Acandí, but HDI data shows that socio-economic progress in the Chocó and among collective territories lags far behind the rest of the country by any metric (DANE, 2009; UNDP, 2011). Given the exceptional isolation of the municipality of Acandí and the further remoteness of the communities that comprise Cocomasur, indicators such as the Multidimensional Poverty Index for rural areas (see Figure 33) along with available data on poverty in collective territories (see Figure 11) can be considered sufficient estimates of the prevalence of poverty in the project area. Project benefits will be directly and indirectly targeted at the poorest quartile of households and verified by social impact monitoring.



Figure 33: Multidimensional Poverty Index 2011.

#### D. Percentage of the Population MPI Poor and Deprived



Source: Alkire et. al 2011

## GL.2.3 Demonstration of Neutral or Positive Impact on Vulnerable Households

The project's social impact monitoring and assessment framework will ensure that the principle of "collective rights, collective benefits" is upheld and that benefits flow to poorer households identified in the socio-economic baseline assessment (Annex CA 33). Since data on income and expenditure is often a poor indicator of household wellbeing in regions like the Chocó, the project will identify vulnerable households by constructing indices based on assets in the home, housing material, and other household characteristics in order to provide a more objective measure of the distribution of collective benefits.

After identifying vulnerable households, the next step for achieving positive impacts on vulnerable groups will be to ensure transparency and equal access to information. Poor access to information is a significant barrier to educational opportunities, affordable credit, and markets in the project zone. The project has committed to investing in communications infrastructure to ensure the dissemination of information about project employment, training and capacity building, small enterprise development, and educational opportunities through local coordinators to every household. Special attention to ensuring information reaches the most remote households will ensure that benefits are equitably distributed and reach disadvantaged groups.

In addition, barriers to women's participation in project-related activities or opportunities, such as childcare, will be addressed to ensure women are able to access benefits such as micro-finance and capacity building opportunities.



### **GL.2.4** Demonstration of Neutral or Positive Impact on Disadvantaged Groups

Groups with higher dependency on forest resources for their survival were identified during the HCV community consultation and community profiling activities (Annexes CA 22 and CA34). Communities and households that live closest to the forest were determined to be most dependent on forest resources for their survival, although they do not depend exclusively on the forest for their basic needs (e.g., protein and building materials. They are considered more vulnerable relative to other households in communities that are more accessible. Since they are also considered key groups for the implementation of MRV activities, they are expected to benefit from training employment opportunities in these activities (Annex CA 34).

The community profiling process (Annex CA 34) identifies those who practice selective logging as the ones most likely to be negatively impacted by the project, and recommends mitigation strategies for this group, including direct project employment in forest mensuration and monitoring activities. Measures to mitigate potential negative impacts on these groups or individuals were designed and incorporated into the project plan (Annex CA 14). Other measures, such as childcare to enable women to participate in project-related activities, were also included.

#### **GL.2.5** Community Monitoring of Traditionally Disadvantaged Groups

A distinguishing feature of this project is the strengthening of territorial governance to enable equitable benefit distribution and important advances in the economic, social and cultural situation of its residents. One of the key activities anticipated by the community is the design and implementation of a socioeconomic survey in the form of a census. In a region with health and development indicators comparable to Haiti, in terms of satisfaction of basic necessities, these revenues from carbon sequestration will provide the ability identify the most disadvantaged households and ensure project

benefits not only reach them, but that the mechanisms for participation in the project are easily accessible (Antón-S. & Rangel, 2004). Without Afro-Colombian territories project. Cocomasur face uncertain futures since their institutions are underfunded and weak, and unable to cope with the multiple and complex demands of its constituents who live in a state of poverty affected by recent conflict and violent displacement. Community leaders are eager to have resources available to construct a monitoring system to measure advances in social, economic, and cultural development among all the groups in the territory, including those identified as most vulnerable and disadvantaged.



Members of the Rio Tolo Community Council (Cocomasur), Acandí, Chocó. Photo by Emily Roynestad.

Further information and identification of relative levels of poverty and vulnerability within and among communities in the project area will be gathered during the territorial census and the baseline social assessment in 2012. These will be updated at regular intervals as part of the social impact assessment process (Annex CA 33).



# **GL.3 Exceptional Biodiversity Benefits**

## **GL.3.1** Demonstration of High Biodiversity Conservation Priority

The project will directly contribute to protecting and potentially enhancing populations of IUCN Red List Critically endangered (CR), and Endangered (EN) species that are present in the project zone. Critically Endangered (CR) species include the Colombian Spider Monkey (Ateles fusciceps rufiventris), Cotton-top tamarin (Saguinus oedipus), Central American tapir (Tapirus bairdii), Harlequin Frog (Atelopus varius), La Loma Tree Frog (Hyloscirtus colymba), and Lemur Leaf Frog (Agalychnis lemur).

Endangered (EN) species found in the project zone include the Darién small-eared shrew (*Cryptotis mera*), Myers' Surinam toad (*Pipa myersi*).



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## Appendix 1. Amendments and Adjustments to the Labor Code

Labor Code (adopted by Decree Law 2663 of August 5, 1950 "On the Labour Code," published in Diario Oficial No. 27,407 of September 9, 1950, by virtue of the State, issued by the Extraordinary Decree No 3518 of 1949).

The following amendments and adjustments have since been made to the Labor Code:

- 1. Law 57 of November 15, 1915, 'Reparations for accidents," published in the Official Gazette No 15646 of 17 November 1915.Legislative Act 1st. September 19, 1940, "amending the Constitution. (Labour Court)," published in the Diario Oficial No. 24,468 of September 19, 1940.
- 2. Legislative Act 1st. February 16, 1945, 'reformatory of the Constitution', published in the Diario Oficial No. 25,769, February 17, 1945.
- Amended by Law 90 of December 26, 1946, 'which is set by compulsory social insurance and creating the Colombian Institute of Social Security," published in the Diario Oficial No. 26322 of January 7, 1947.
- 4. Article 153 of Decree Law 2158 of June 24, 1948, "about proceedings in trials of labor ', ordered:" To authorize the government to organize a committee to prepare a codification of the substantive provisions of the work or to make a draft Code on the matter, 'published in the Diario Oficial No. 26,754 of June 26, 1948.
- 5. Legislative Decree 2215 of June 12, 1948, 'which was postponed for the duration of the Decree-Law No. 2158 of June 24, 1948.', published in Official Gazette No. 26,761 of June 12, 1948.
- 6. Legislative Decree 2283 of July 6, 1948, 'by issuing rules on collective agreements on working conditions, "published in the Diario Oficial No. 26,774 of June 22, 1948, was suspended for the Articles 495 and 508 Decree 2663 of 1950.
- 7. Amended by Law 90 of December 16, 1948, 'which is set by the monetary unit and currency of national conferred extraordinary powers to the President and other provisions," published in the Diario Oficial 32 467, 29 March 1968.
- 8. Legislative Decree 4133 of December 16, 1948, 'by which laws are adopted as a provision "contained in special decrees, issued under Article 121 of the Constitution, published in the Official Journal No 26 896 16 December 1948.
- 9. Special Decree No 3518 of November 9, 1949, 'which is declared by the disturbance of public order and under siege throughout the national territory' published in the Diario Oficial No. 27,163 of November 10, 1949.
- 10. Special Decree No 693 of February 28, 1950, 'which is organized by the Commission to formulate the draft Labor Code' published in the Diario Oficial No. 27,273 of 1950.



- 11. The current Labor Code was adopted by Decree Law No. 2663 of August 5, 1950 "On the Labour Code, published in the Diario Oficial No. 27,407 of September 9, 1950, under the rule promulgated by Site Extraordinary Decree No 3518 of 1949. Fulfilling the provisions of Article 153 of Decree Law 2158, 1948, 'Labor Code. Authorizes the government to organize a committee to draw up a code of substantive work over the provisions or to make a draft Code, given permanent effect by Law 141 of December 16, 1961.
- 12. Amended by Decree Law 3743 of December 20, 1950, 'by which amends Decree 2663 of 1950 on the Labour Code, published in the Diario Oficial No. 27,504 of January 11, 1951. In particular Article 46, which states: 'The Ministry of Labor shall make an official edition of the Labor Code."
- 13. Amended by Decree 904 of April 20, 1951, 'which is issued by a provision on collective bargaining agreements." published in the Diario Oficial No. 27,601 of May 12, 1951.
- 14. Amended by Decree Law 905 of April 20, 1951, "Whereby amending Articles 254 and 256 of the Labour Code, published in the Diario Oficial No. 27,601 of May 12, 1951.
- 15. The Official Edition of the Labour Code, as amended, required by Article 46 of Decree Law 3743 of 1950, was published in the Diario Oficial No. 27,622 of June 7, 1951, 2663 and compiling Decrees 3743 of 1950 905 of 1951.
- 16. Amended by Decree 2027 of September 28, 1951, 'which is added by Decree No. 0030 of January 9, 1951." published in the Official Journal No. 27 730 1951.
- 17. Amended by Decree 426 of February 21, 1952, 'On which amends Article 3rd. Decree number 2058 of 1951." published in the Diario Oficial No. 27,882 of 1952.
- 18. Amended by Decree 2017 of August 20, 1952, 'on which dictates certain provisions on the constitution and jurisdiction of the courts or commissions of conciliation and arbitration and employment procedures." published in the Diario Oficial No. 28,005, 18 September 1952.
- 19. Amended by Decree 3153 of November 30, 1953, 'by which regulates labor regulations that apply to certain public employees." published in the Diario Oficial No. 28,367 of December 10, 1953.
- 20. Amended by Decree 616 of February 26, 1954, 'For that modifies the Substantive and Procedural Labour', published in the Diario Oficial No. 28,424, of March 5, 1954.
- 21. Amended by Decree 617 of February 26, 1954, 'On which amends the Labour Code, published in the Diario Oficial No. 28,424, of March 5, 1954.
- 22. Amended by Decree 456 of March 2, 1956, 'By which authorizes the collection of fees and other compensation of a private nature, published in the Diario Oficial No. 28,987 of March 14, 1956.
- 23. Amended by Decree 525 of March 10, 1956, 'On which amends Article 453 of the Labour Code, published in the Diario Oficial No. 28,991 of March 20, 1956.



- 24. Amended by Decree 753 of April 5, 1956, "which is replaced by Article 430 of the Labour Code," published in the Diario Oficial No. 29,019 of April 25, 1956.
- 25. Amended by Decree 931 of April 20, 1956, 'By which authoritatively interprets the special Decree number 456 of 1956." published in the Diario Oficial No. 29,027 of May 7, 1956.
- 26. Amended by Decree 1761 of July 26, 1956, 'For that modifies the Substantive and Procedural Labour', published in the Diario Oficial No. 29,110 of August 22, 1956.
- 27. Amended by Decree Law No. 3129 of December 20, 1956, 'for which are added certain provisions of the Labor Code." published in the Diario Oficial No. 29,272 of February 2, 1957.34. Amended by Decree 2164 of August 10, 1959, 'which are regulated by Articles 450 and 451 of the Labor Code." published in the Diario Oficial No. 30,038 of September 3, 1959.
- Amended by Decree No 59 of March 22, 1957, 'by which they join the Notaries and Registrars to the National Provident Fund and other provisions." published in the Diario Oficial No. 29,330 April 1 1957.
- 29. Amended by Decree 204 of September 6, 1957, 'By establishing rules relating to trade union, published in the Diario Oficial No. 29,516 of October 19, 1957.
- 30. Amended by Decree No 231 of September 25, 1957, 'by which gives a measure of working hours," published in the Diario Oficial No. 29,517 of October 21, 1957.
- 31. Amended by Decree No 284 of November 7, 1957 "by issuing rules on wages and benefits for workers on fixed-price contractors in oil companies," published in the Official Journal No 29 552 4 December 1957.
- 32. Amended by Decree No 18 of February 6, 1958 "by which dictates a labor provisions," published in the Diario Oficial No. 29,598 of February 18, 1958.
- 33. Amended by Decree 2164 of August 10, 1959, 'which are regulated by Articles 450 and 451 of the Labor Code," published in the Diario Oficial No. 30,038 of September 3 of 1959.
- 34. Amended by Law 156 of December 21, 1959, "which is returned by the governors of the departments the power to appoint notaries and registrars," published in the Diario Oficial No. 30,138 of January 22, 1960.
- 35. Amended by Law 188 of December 30, 1959, 'for which regulates the apprenticeship contract," published in the Diario Oficial No. 30,140 of January 25, 1960.
- 36. Amended by article 1. Law 141 of December 16, 1961, "which is adopted by the emergency legislation and enacting other provisions" which adopted as permanent legislation all the legislative decrees issued in reliance on Article 121 of the Constitution, from 9 November 1949 until July 20, 1958, published in the Official Gazette 30694 of 23 December 1961.



- 37. Amended by Law No. 171 of December 14, 1961, 'by which amends Law 77 of 1959 and other provisions on pensions," published in the Official Journal No 30 709 1961.
- 38. Amended by Law No. 1a of January 19, 1962, "which is set for notary fees and other provisions," published in the Diario Oficial No. 31,064 of January 25, 1962.
- 39. Amended by Law 9a April 4, 1963, 'on which issues an exceptional standard for workers affected by TB," published in the Diario Oficial No. 31,064 of April 22, 1963.
- 40. Amended by Decree No 99 of January 22, 1965, 'By which measures are taken to ensure the provision of public services in government and private companies, published in the Diario Oficial No. 31,754 of September 17, 1965.
- 41. Amended by Decree Law No. 2351 of September 4, 1965, "Whereby are reforms to the Labour Code, published in the Diario Oficial No. 31,754 of September 17, 1965.
- 42. Amended by Decree Law No. 2469 of September 17, 1965, 'On which amends Article 35 of Decree 2351 of 1965 and gives a provision related to employment. "Published in the Diario Oficial No. 31,763 of September 28 1965.50. Amended by Decree No 2076 of November 10, 1967, 'On which regulates Article 18 of the Special Decree 2351 of 1965 and section 30 of the Labor Code. "Published in the Official Journal No 32 377 23 November 1967.
- 43. Amended by Decree No 1373 of May 26, 1966, 'which are regulated by Article 4, 7th. Sections 9, 14, 15, 9th, 10, 14 paragraph 2, 17, 20, 25, 26, 39 and 40 of the Special Decree 2351 of 1965." published in the Diario Oficial No. 31970 of July 2, 1966.
- 44. Amended by Decree No 3041 of December 15, 1966, "By approving the rules of the invalidity, old age and death that takes the ICSS." Published in the Official Journal No 32 126 1966.
- 45. Amended by Law 73 of December 13, 1966, "by which introduced some changes to the Labour Act, in development of international conventions," published in the Official Journal of 30 694 December 23, 1961.
- 46. Extraordinary amended by Decree No 13 of January 4, 1967, 'for which are incorporated into the Labour Code provisions of Law 73 of 1966, published in the Diario Oficial No. 32,131 of January 25, 1967.
- 47. Amended by Act 21 of June 14, 1967, 'which was approved by the International Labour Convention on paid leave in agriculture adopted by the Thirty-Fifth Session of the General Conference of the International Labour Organization (Geneva, 1952)," published in the Official Journal of 26 June 32 253 1967.
- 48. Amended by Act 22 of June 14, 1967, "which was approved by the International Labour Convention concerning discrimination in employment and occupation, adopted by the Forty-Second Session of the General Conference of the International (Geneva, 1958)," published in the Official Journal of 26 June 32 253 1967.



- 49. Amended by Decree No 2076 of November 10, 1967, 'On which regulates Article 18 of the Special Decree 2351 of 1965 and section 30 of the Labor Code. "Published in the Official Journal No 32 377 23 November 1967.
- 50. Amended by Law 48 of December 16, 1968, 'why are adopted as permanent legislation some legislative decrees are granted powers to the President and the Assemblies, introduces reforms to the Labour Code and other provisions, 'published in the Diario Oficial No. 32,679 of December 26, 1968.
- 51. Amended by Law 3a of October 13, 1969, "by ordering the delivery workers, shoes and clothing of work, and clarifies the 7th Act of 1967," published in the Diario Oficial No. 32,916 of October 24, 1968.
- 52. Amended by Law 5 of October 13, 1969, "which is clarified by Article 12 of Law 171 of 1961 and Article 5 of Law 4 of 1966 and other provisions," published in the Diario Oficial No. 32,916 of October 24, 1968.
- 53. Amended by Decree No 1393 of August 6, 1970, 'which is issued by the National Land Transport Regulations automotive, published in the Diario Oficial No. 33,131 of August 25, 1970.
- 54. Amended by Law 29 of December 28, 1973, 'by creating the National Notary Fund and other provisions", published in the Diario Oficial No. 34,007 of January 25, 1974.
- 55. Amended by Law 33 of December 12, 1973, "By which they become lifetime pensions of widows," Published in the Diario Oficial No. 34,007 of January 25, 1974.
- 56. Amended by Law 27 of December 20, 1974, 'By establishing rules on the establishment and maintenance of comprehensive care centers for pre-school for children of employees and workers of public and private', published in Diario Oficial No. 34,244 of January 28, 1975.
- 57. Amended by Law 4 of 1976, "On enacting rules concerning the benefits of public, official, semi-private and other provisions", published in Official Gazette No. 34,500 of 1976 and is effective as the 1st. January 1976.
- 58. Amended by the Law on the 6th of 1981, "By which amends Article 161 of the Labor Code," published in the Diario Oficial No. 35,687 of January 26, 1981.
- 59. Amended by Law 20 of January 22, 1982, "On which created the General Directorate of Child Workers under the Ministry of Labour and Social Security and adopted the Statute of the Child Workers," published in the Diario Oficial No. 35,937 February 3, 1982.
- 60. Amended by Law 51 of December 22, 1983, "by which he moved the rest paid for some holidays." Published in the Diario Oficial No. 36,428 of December 30, 1983.
- 61. Amended by Law 11 of February 24, 1984, 'by which some rules are reformed Substantive and Procedural Codes of Labour," published in the Diario Oficial No. 36,517 of March 5, 1984.



- 62. Amended by Law 39 of February 5, 1985, 'by which amends the terms for the collective bargaining process work. "Published in the Diario Oficial No. 36,867 of February 21, 1985.
- 63. Amended by Article 1. Act 24 of 1986, 'By which is added to Article 236 of Chapter V of the Labour Code', published in Official Gazette No. 37320 of January 28, 1986.
- 64. Amended by Act 75 of 1986, 'On which issue tax rules surveying, building and democratization of capital markets, are granted some special powers and other provisions ", published in the Diario Oficial No. 37,742 of December 24, 1986.
- 65. Amended by Decree No 776 of April 30, 1987, 'by which amends the table of the evaluation of disabilities resulting from accidents, contained in Article 209 of the Labour Code, published in the Diario Oficial No. 37,868 5 May 1987.
- 66. Amended by Decree No 778 of April 30, 1987, 'by which amends the table of occupational diseases contained in Article 201 of the Labour Code, published in the Diario Oficial No. 37,868 of May 5, 1987.
- 67. Amended by Law 54 of December 18, 1987, 'by which the National Labor Council', published in the Diario Oficial No. 38,157 of December 18, 1987.
- 68. Amended by Decree No 778 of April 30, 1987, 'by which amends the table of occupational diseases contained in Article 201 of the Labour Code, published in the Diario Oficial No. 37,868 of May 5, 1987.
- 69. Amended by Law 71 of December 19, 1988, 'why are issued rules on pensions and other provisions," published in the Diario Oficial No. 38,624 of 22 December 1988.
- 70. Amended by Decree Law 2737 of November 27, 1989, "which is issued by the Juvenile Code," published in the Diario Oficial No. 39,080 of November 27, 1989.
- 71. Amended by Act 50 of 1990, 'on which introduced reforms to the Labor Code and other provisions," published in Official Gazette No. 39,618 of the 1st. January 1991.
- 72. Amended by Law 23 of March 21, 1991, 'by which create mechanisms to decongest Judicial Offices and other provisions ", published in Official Gazette No. 39,752 of March 21, 1991.
- 73. The term 'employer' means replaced by the term 'employer', brackets in accordance with Article 107 of Act 50 of 1990, published in Official Gazette No. 39,618 of the 1st. January 1991.
- 74. Modificado por la Ley 100 del 23 de diciembre de 1993, 'por la cual se crea el sistema de seguridad social integral y se dictan otras disposiciones', publicada en el Diario Oficial No. 41.148 del 23 de diciembre de 1993.
- 75. Modificado por la Ley 119 del 9 de febrero de 1994, 'Por la cual se reestructura el Servicio Nacional de Aprendizaje, SENA, se deroga el Decreto 2149 de 1992 y se dictan otras disposiciones.', publicada en el Diario Oficial No. 41.216 del February 9, 1994.



- 76. Amended by Decree 691 of March 29, 1994, "which are incorporated by public servants, the General System of Pensions and other provisions," published in the Diario Oficial No. 41,289 of March 30, 1994.
- 77. Amended by Decree 692 of March 29, 1994, 'by which partially regulates Law 100 of 1993," published in the Diario Oficial No. 41,289 of March 30, 1994.
- 78. Amended by Decree 813 of April 21, 1994, 'on which regulates Article 36 of Law 100 of 1993," published in the Official Journal No 41 328 1994.
- 79. Amended by Decree 1160 of June 3, 1994, "which is complemented by Decree 813 of 1994 and enacted provisions," published in the Diario Oficial No. 41,385 of June 9, 1994.
- 80. Amended by Decree 1295 of June 22, 1994, "which is determined by the organization and administration of the General System of Occupational Hazards," published in the Official Journal no 41405 of June 24, 1994.
- 81. Amended by Decree 1832 of August 3, 1994, "on which adopts Table of Occupational Diseases," published in the Official Journal No 41,473 of 1994.
- 82. Amended by Decree 1836 of August 4, 1994, 'on which adopts the single table valuation manual disabilities single disability rating," published in the Official Journal No 41,473 of 1994.
- 83. Amended by Decree 2709 of December 15, 1994, 'On Regulating the article 7. Law No. 71 of 1988," published in the Official Journal No 41,635 of 1994.
- 84. Judgment modified by C-051-95 of February 16, 1995, issued by the Constitutional Court handed down a ruling of unconstitutionality on Article 252.
- 85. Judgment modified by C-051-95 of February 28, 1995, issued by the Constitutional Court handed down a ruling of unconstitutionality on Article 338.90. Amended by Law 278 of April 30, 1996, by which it creates a permanent Commission affecting labor and employment created by Article 56 of the Constitution," published in the Official Journal No. 42 783 10 May 1996.
- 86. Judgment modified by C-450-95 of October 4, 1995, issued by the Constitutional Court handed down a ruling on the constitutionality of Article 452.
- 87. Amended by Decree 692 of April 26, 1995, 'on which adopts the Single Manual for the Disability Rating," published in the Diario Oficial No. 41,826 of April 28, 1995.
- 88. Judgment modified by C-483 No-95 of October 30, 1995, issued by the Constitutional Court, a ruling of unconstitutionality. Uttered regarding Article 101.
- 89. Amended by Law 278 of April 30, 1996, by which it creates permanent Commission affecting labor and employment created by Article 56 of the Constitution," published in the Official Journal No. 42 783 10 May 1996.



- 90. Amended by Law 311 of August 12, 1996, by creating the National Family Protection Registry and other provisions," published in the Official Journal No. 42855 of August 14, 1996.
- 91. Articles 452, 453, 454, 455, 456, 457, 458, 459, 460 and 461 of the Code were incorporated into the Decree 1818 of 1998, 'through which issues the Statute of alternative mechanisms for conflict resolution," published in Official Gazette No. 43,380 of September 7, 1998.
- 92. Amended by Act 550 of 1999, 'By which establishes a system which promotes and facilitates business recovery and restructuring of local authorities to ensure the social role of business and achieve harmonious development of regions and enacted provisions to harmonize the existing law regime with the provisions of this Act", published in Official Gazette No. 43,836 of December 30, 1999.
- 93. Amended by Act 584 of 2000, published in Diario Oficial No. 44,043 of June 14, 2000, 'By which repealing and amending certain provisions of the Labor Code.
- 94. Amended by Act 755 of 2002, published in Official Gazette No. 44878 of July 25, 2002, 'On which modifies the paragraph of Article 236 of the Labor Code Law Mary'.
- 95. Amended by Act 789 of 2002, published in Diario Oficial No. 45,046 of December 27, 2002, 'by issuing rules to support employment and expanding social protection and amending some articles of the Labour Code."
- 96. In the opinion editor for the interpretation of Article 236 Paragraph of this Act must take into account the provisions of Article 51 of Law 812 of 2003, "On approving the National Development Plan 2003-2006, to an EU state ', published in Official Gazette No. 45,231 of June 27, 2003.
- 97. Amended by Act 962 of 2005, published in Official Gazette No. 45963 of July 8, 2005, 'By enacting provisions on streamlining administrative requirements and procedures of state agencies and entities and individuals engaged public functions or providing public services."
- 98. Amended by Act 995 of 2005, published in Official Gazette No. 46,089 of November 11, 2005, 'By which recognizes the cash payment of rental to private sector workers and employees and workers public administration in different orders and levels".
- 99. Amended by Act 1098 of 2006, published in Official Gazette No. 46,446 of November 8, 2006, "issued by the Code for Children and Adolescents."
- 100. Amended by Act 1210 of 2008, published in Official Gazette No. 47050 of July 14, 2008, 'By which partially amending articles 448 and 451 section 4 of the Labour Code and 2 of the Labor Code and Social Security and creating Article 129A of the Code of Labour and Social Security and other provisions'.
- 101. Amended by Act 1280 of 2009, published in Official Gazette No. 47223 of January 5, 2009, "added by paragraph 10 of Article 57 of the Labor Code and set the License for Grief."



- 102. Amended by Decree 2566 of 2009, published in Official Gazette No. 47404 of July 8, 2009, "On which adopts Table of Occupational Diseases."
- 103. Amended by Law 1429, 2010, published in Official Gazette No. 47,937 of December 29, 2010, "On which issues the Law for the Formalization and Employment Generation."



## Appendix 2. Applicable Legal Framework

Number	Year	Type of Norm	Theme	Responsible Agency	Description
1991 Constitution	1991	Political Constitution	All	Congress	Recognized Colombian society as pluralistic and multicultural.
345	1993	Andean Decision	International	The Andean Community	Recognize and guarantee the protection of the rights of breeders of new plant varieties by granting a certificate of the breeder, promote research areas and technology transfer.
391	1996	Andean Decision	International	The Andean Community	Common regime on access to genetic resources.
486	2000	Andean Decision	Intellectual Property	THE ANDEAN COMMUNITY	Common regime on intellectual property.
523	2002	Andean Decision	International	THE ANDEAN COMMUNITY	Regional strategy on biodiversity for tropical Andean countries.
684	2008	Andean Decision	Pesticides	THE ANDEAN COMMUNITY	Repeal 436 approves the decision on registration and control of agricultural pesticides.
699	2008	Andean Decision	International	THE ANDEAN COMMUNITY	Environmental indicators in the Andean Community.
622	1977	Decree	Ecotourism	Congress	By which partially regulates Chapter V, Title II, Part XIII, Book II of Decree-Law number 2811 of 1974 on "National Park System", Law 23 of 1973 and Act 2 of 1959.
1541	1978	Decree	Agriculture, Fisheries, and Ecotourism	MAVDT	Which is regulated by Part III of Book II of Decree - Law 2811 of 1974: "From sea waters" and part of the Law 23 of 1973. On Regulating the Common
533	1994	Decree	Plants	Congress	Regime of Rights of Breeders of New Plant Varieties.
1768	1994	Decree	Institutional	MAVDT	Which is developed by partially literal h) of Article 116 in relation to the establishment, organization or reform of the Regional Autonomous Corporations special regime created by processing by Act 99 of 1993.



1840	1994	Decree	General	MADR	Which is regulated by Article 65 of Law 101 of 1993.
1791	1996	Decree	Plants	MAVDT	Whereby establishing the forestry regime.
900	1997	Decree	Plants	MAVDT	By regulating the Forestry Incentive Certificates conservation.
1401	1997	Decree	CITES	MAVDT	Which is designated by the Management Authority of Colombia to the Convention on International Trade in Endangered Species of Wild Animals and Plants, CITES, and define its functions.
1420	1997	Decree	General	MAVDT	Which are designated by the scientific authorities of Colombia to the Convention on International Trade in Endangered Species of Wild Animals and Plants, CITES, "and define its functions.
2967	1997	Decree	ALL	MAVDT	Whereby the ports are designated as authorized for the international trade in specimens of wild fauna and plants.
3075	1997	Decree	Health	MPS	By which partially regulates Law 09 of 1979 and other provisions.
1320	1998	Decree	Prior consultation	MIJ	Through which regulations prior consultation with indigenous and black communities for the exploitation of natural resources within its territory.
125	2000	Decree	General	MAVDT	By which amends Decree 1420 of 1997.
309	2000	Decree	Scientific Research	MAVDT	On Regulating scientific research on biological diversity.
2687	2002	Decree	Plants	MADR	Whereby amending Article 7 of Decree 533 of 1994.
3199	2002	Decree	Institutional	Presidency	By which regulates the provision of Mandatory Public Service Direct Rural Technical Assistance under the Act 607 of 2000.
216	2003	Decree	Institutional	MAVDT	By which the objectives are determined, the structure of the Ministry of Environment, Housing and Territorial Development and other provisions.



302	2003	Decree	Institutional	MAVDT	Which is modified by paragraph 1 of Article 309, second Decree 2000, which regulates scientific research on biodiversity.
132	2004	Decree	Biosafety	MRE	Which enacts the "Cartagena Protocol on Biosafety to the Convention on Biological Diversity, done at Montreal on January 29, 2000.
3553	2004	Decree	Plants	MPS	Which amends Decree 2266 of 2004 and other provisions.
4525	2005	Decree	Biosafety	MADR	Regulated by Law 740 of 2002.
1498	2008	Decree	General	MADR	Which is regulated by paragraph 3 of Article 5 of Law 99 of 1993 and Article 2 of Law 139 of 1994.
3257	2008	Decree	General	MAVDT	Which partially amends Decree 2269 of 1993 and other provisions.
2811	1974	Decree Law	RNR	Presidency	Which is issued by the National Code of Renewable Natural Resources and Environmental Protection.
74	1978	Law	International	Congress	Approved the Amazon Cooperation Treaty, signed in Brasilia on July 3, 1978.
17	1981	Law	CITES	Congress	Approved the Convention on International Trade in Endangered Species of Wild Animals and Plants.
29	1990	Law	Scientific Research	Congress	Enacted provisions to promote scientific research and technological development and are granted extraordinary powers.
21	1991	Law	Indigenous Communities	Congress	Approval of Convention No. 169 concerning indigenous and tribal peoples in independent countries, adopted by the 76th. All reunion of the Conference of the ILO, Geneva 1989.
70	1993	Law	Black Communities	Congress	Developed by transitory article 55 of the Constitution.



99	1993	Law	Institutional	Congress	Created the Ministry of Environment, reordering the Public Sector in charge of managing and conserving the environment and renewable natural resources, is organized SINA, the National Environmental System, and other provisions.
101	1993	Law	Agriculture and Fisheries	Congress	Law on agriculture and fisheries
160	1994	Law	Agriculture and Fisheries	Congress	Created the National System of Agrarian Reform and Rural Development, provides a subsidy for land acquisition, reform of the Colombian Institute of Agrarian Reform and other provisions.
165	1994	Law	Biodiversity	Congress	Approved the "Convention on Biological Diversity", in Rio de Janeiro on June 5, 1992.
607	2000	Law	Institutional	Congress	Modified the creation, functioning and operation of the Municipal Technical Assistance Unit Agricultural UMATA and regulating rural direct technical assistance in line with the National Science and Technology.
740	2002	Law	Biosafety	Congress	Approved the "Cartagena Protocol on Biosafety to the Convention on Biological Diversity, Montreal on 29 January 2000.
1152	2007	Law	General	Congress	Dictated by the Statute of Rural Development, reform of the Colombian Institute for Rural Development, INCODER, and other provisions.
573	1997	Resolution	Procedures	MAVDT	By which establishes the procedure for the permits referred to the Convention on International Trade in Endangered Species of Wild Animals and Plants (CITES), among other provisions.



1367	2000	Resolution	Non CITES	MAVDT	Establishes the procedure for authorization of import and export of specimens of biological diversity that are not listed in the appendices of the CITES Convention.
438	2001	Resolution	Safeguards	MAVDT	Establishes safeguards for the national mobilization of specimens of biological diversity.
454	2001	Resolution	Plants	MAVDT	Which regulates the certification referred to by the first paragraph Article 7 of Resolution number 1367 of 2000 of the Ministry of Environment.
1029	2001	Resolution	Safeguards	MAVDT	Assigns the value of evaluation and monitoring services for the issue of safe conduct national mobilization only specimen of biological diversity and other provisions.
3742	2001	Resolution	General	MAVDT	Criteria and conditions for the issuance of Technical Regulations.
584	2002	Resolution	Fauna	MAVDT	Declares which wildlife species are threatened in the country and adopts other provisions.
619	2002	Resolution	Safeguards	MAVDT	Establishes the National Travel Document for mobilization of primary products from forest plantations, Andean Community modified Resolutions 0438 and 1029 numbers 2001 from the Ministry of Environment, and adopts other regulations.
562	2003	Resolution	General	MAVDT	Amends Resolution number 0438 of May 23, 2001 the Ministry of Environment, and adopting other regulations.
572	2005	Resolution	General	MAVDT	Amends Resolution number 0584 of June 26, 2002 and adopts other regulations.



1263	2006	Resolution	CITES	MAVDT	Establishes the procedure and the values to issue the permits referred to in the Convention on International Trade in Endangered Species of Wild Animals and Plants, CITES, and other provisions.
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## Appendix 3. Bird Species in the Project Area by Category of Risk

Family	Species	Endemic	Threat	Migratory
Tinamidae	Tinamus major			
	Crypturellus berlepschi	CE		
	Crypturellus kerriae	CE	VU	
	Crypturellus soui			
Cracidae	Crax rubra			
	Ortalis cinereiceps			
	Ortalis garrula			
	Penelope argyrotis			
	Penelope ortoni	CE	VU	
	Penelope purpurascens			
Odontophoridae	Colinus cristatus			
	Odontophorus dialeucos		EP	
	Odontophorus erythrops			
	Odontophorus gujanensis			
	Rhynchortyx cinctus			
Anhimidae	Chauna chavaria		CA	
Anatidae	Anas cyanoptera		VU	(B)
	Anas discors			В
	Cairina moschata			
	Dendrocygna autumnalis			
	Nomonyx dominicus			
Podicipedidae	Podilymbus podiceps			
	Tachybaptus dominicus			
Pelecanidae	Pelecanus occidentalis			
Phalacrocoracidae	Phalacrocorax brasilianus			
Anhingidae	Anhinga anhinga			
Sulidae	Sula leucogaster			
	Sula nebouxii			
Fregatidae	Fregata magnificens			
Ardeidae	Agamia agami		CA	
	Ardea alba			
	Ardea cocoi			
	Ardea herodias			В
	Bubulcus ibis			
	Butorides striata			
	Butorides virescens			В
	Cochlearius cochlearius			
	Egretta caerulea			(B)
	Egretta thula			(B)
	Egretta tricolor			(B)



	Nyctanassa violacea		
	Nycticorax nycticorax		
	Pilherodius pileatus		
	Tigrisoma fasciatum	CA	
	Tigrisoma lineatum		
	Tigrisoma mexicanum		
Threskiornithidae	Eudocimus albus		
	Mesembrinibis cayennensis		
Cathartidae	Cathartes aura	(B)	
	Cathartes burrovianus		
	Coragyps atratus		
	Sarcoramphus papa		
Accipitridaeae	Accipiter bicolor		
	Accipiter ventralis		
	Accipiter superciliosus		
	Busarellus nigricollis		
	Buteo albicaudatus		
	Buteo magnirostris		
	Buteo nitidus		
	Buteo platypterus	В	
	Buteogallus anthracinus		
	Buteogallus urubitinga		
	Circus cyaneus	В	
	Elanoides forficatus		
	Gampsonyx swainsonii		
	Geranospiza caerulescens		
	Harpagus bidentatus		
	Harpia harpyja	CA	
	Helicolestes hamatus		
	Ictinia plumbea		
	Leptodon cayanensis		
	Leucopternis albicollis		
	Leucopternis plumbea	CA	
	Leucopternis semiplumbea	CA	
	Morphnus guianensis	CA	
	Rostrhamus sociabilis		
	Spizaetus ornatus		
	Spizaetus tyrannus		
Pandionidae	Pandion haliaetus	В	
Falconidae	Falco rufigularis		
	Falco sparverius		
	Herpetotheres cachinnans		
	Ibycter americanus	+	



	Micrastur mirandollei			
	Micrastur ruficollis			
	Micrastur semitorquatus			
	Milvago chimachima			
Aramidae	Aramus guarauna			
Rallidae	Amaurolimnas concolor			
	Aramides axillaris			
	Aramides cajanea			
	Aramides wolfi	CE	VU	
	Gallinula galeata			
	Laterallus albigularis			
	Laterallus exilis			
	Neocrex colombianus	CE	CA	
	Porphyriomartinica			
	Porzanacarolina			
	Porzanaflaviventer			
Heliornithidae	Heliornisfulica			
Eurypygidae	Eurypyga helias			
Charadriidae	Charadrius collaris			
	Charadrius semipalmatus			В
	Charadrius vociferus			В
	Charadrius wilsonia			
	Pluvialis squatarola			В
	Vanellus chilensis			
Scolopacidae	Actitis macularius			В
·	Arenaria interpres			В
	Calidris alba			В
Eurypygidae	Calidris himantopus			В
	Calidris mauri			В
	Calidris melanotos			В
	Calidris minutilla			В
	Calidris pusilla			В
	Catoptrophorus semipalmatus			В
	Gallinago delicata			В
	Limnodromus griseus			В
	Numenius phaeopus			В
	Steganopus tricolor			В
	Tringa flavipes			В
	Tringa melanoleuca			В
	Tringa solitaria			В
Laridae	Chlidonias niger			В
-	Larus atricilla			В
	Larus pipixcan	+		В



	Rynchops niger			A?
	Sterna hirundo			В
	Thalasseus maximus			В
	Thalasseus sandvicensis			В
Columbidae	Claravis pretiosa			
	Columbina minuta			
	Columbina talpacoti			
	Geotrygon frenata			
	Geotrygon goldmani		CA	
	Geotrygon montana			
	Geotrygon saphirina			
	Geotrygon veraguensis			
	Leptotila cassini			
	Leptotila pallida	CE		
	Leptotila verreauxi			
	Patagioenas cayennensis			
	Patagioenas goodsoni	CE		
	Patagioenas nigrirostris			
	Patagioenas plumbea			
	Patagioenas speciosa			
	Patagioenas subvinacea			
Psittacidae	Amazona autumnalis			
	Amazona farinosa			
	Amazona ochrocephala			
	Ara ambiguus		VU	
	Ara ararauna			
	Ara chloropterus			
	Ara militaris		VU	
	Ara severus			
	Brotogeris jugularis			
	Pionopsitta haematotis			
	Pionopsitta pulchra	CE		
	Pionopsitta pyrilia	CE	VU	
	Pionus menstrus			
	Touit dilectissimus			
Cuculidae	Coccycua minuta			
	Coccyzus americanus			В
	Coccyzus erythropthalmus			В
	Coccyzus melacoryphus			Α
	Crotophaga ani			
	Crotophaga major			
	Neomorphus geoffroyi			1
	Piaya cayana			1



	Tapera naevia		
Tytonidae	Tyto alba		
Strigidae	Ciccaba virgata		
	Glaucidium griseiceps		
	Lophostrix cristata		
	Megascops choliba		
	Megascops guatemalae		
	Pulsatrix perspicillata		
	Rhinoptynx clamator		
	Strix albitarsis		
	Strix nigrolineata		
Steatornithidae	Steatornis caripensis		
Nyctibiidae	Nyctibius aethereus		
	Nyctibius grandis		
	Nyctibius griseus		
Caprimulgidae	Caprimulgus maculicaudus		
	Chordeiles acutipennis		(B)
	Chordeiles minor		В
	Lurocalis semitorquatus		
	Nyctidromus albicollis		
	Nyctiphrynus rosenbergi	CE	
Apodidae	Chaetura brachyura		
	Chaetura cinereiventris		
	Chaetura spinicaudus		
	Streptoprocne zonaris		
Trochilidae	Aglaiocercus coelestis		
	Amazilia amabilis		
	Amazilia rosenbergi	CE	
	Amazilia tzacatl		
	Androdon aequatorialis		
	Anthracothorax nigricollis		
	Boissonneaua jardini	CE	
	Chalybura urochrysia		
	Chrysolampis mosquitus		
	Coeligena wilsoni	CE	
	Damophila julie		
	Discosura conversii		
	Doryfera ludovicae		
	Eutoxeres aquila		
	Florisuga mellivora		
	Glaucis aeneus		
	Glaucis hirsutus		
	Goldmania violiceps		



	Haplophaedia aureliae			
	Heliomaster longirostris			
	Heliothryx barroti			
	Hylocharis eliciae			
	Hylocharis grayi	CE		
	Hylocharis humboldtii	CE		
	Klais guimeti			
	Lepidopyga coeruleogularis			
	Phaethornis anthophilus			
	Phaethornis guy			
	Phaethornis longirostris			
	Phaethornis striigularis			
	Phaethornis yaruqui	CE		
	Schistes geoffroyi			
	Thalurania fannyi			
	Threnetes ruckeri			
Trogonidae	Trogon collaris			
	Trogon comptus	CE		
	Trogon massena			
	Trogon melanurus			
	Trogon rufus			
	Trogon violaceus			
	Trogon viridis			
Alcedinidae	Chloroceryle aenea			
	Chloroceryle amazona			
	Chloroceryle americana			
	Chloroceryle inda			
	Megaceryle torquata			
Momotidae	Baryphthengus martii			
	Electron platyrhynchum			
	Hylomanes momotula			
	Momotus aequatorialis			
	Momotus subrufescens			
Galbulidae	Brachygalba salmoni	CE		
	Galbula ruficauda			
	Jacamerops aureus			
Bucconidae	Bucco noanamae	E	CA	
	Malacoptila mystacalis			
	Malacoptila panamensis			
	Monasa morphoeus			
	Nonnula frontalis		+	
	Notharchus hyperrhynchus			



	Notharchus tectus			
	Nystalus radiatus			
Ramphastidae	Capito maculicoronatus			
	Capito quinticolor	E	VU	
	Pteroglossus torquatus			
	Ramphastos brevis	CE		
	Ramphastos sulfuratus			
	Ramphastos swainsonii			
	Selenidera spectabilis			
	Semnornis ramphastinus			
Picidae	Campephilus haematogaster			
	Campephilus melanoleucos			
	Celeus elegans			
	Celeus Ioricatus			
	Colaptes punctigula			
	Dryocopus lineatus			
	Melanerpes pucherani			
	Melanerpes rubricapillus			
	Piculus leucolaemus			
	Picumnus olivaceus			
	Veniliornis chocoensis	CE	CA	
	Veniliornis dignus	-   52		
	Veniliornis kirkii			
Furnariidae	Campylorhamphus pusillus			
	Campylorhamphus trochilirostris			
	Dendrocincla fuliginosa			
	Dendrocincla homochroa			
	Dendrocolaptes sanctithomae			
	Dendroplex picus			
	Glyphorynchus spirurus			
	Lepidocolaptes souleyetii			
	Xiphorhynchus erythropygius			
	Xiphorhynchus lachrymosus			
	Xiphorhynchus susurrans			
	Xiphorhynchus triangularis			
	Anabacerthia variegaticeps			
	Automolus virbiginosus			
	Automolus rubiginosus			
	Certhiaxis cinnamomeus			
	Hyloctistes subulatus			
	Lochmias nematura			
	Margarornis stellatus			
	Philydor fuscipenne			



<b> </b>	Premnornis guttuligera	CE		
	Sclerurus guatemalensis			
	Sclerurus mexicanus			
	Synallaxis albescens			
	Synallaxis brachyura			
	Synallaxis cinnamomea			
	Xenops minutus			
<u> </u>	Xenops rutilans			
	Cercomacra nigricans			
·	Cercomacra tyrannina			
	Cymbilaimus lineatus			
	Dysithamnus mentalis			
	Dysithamnus puncticeps			
	Gymnocichla nudiceps			
<u> </u>	Gymnopithys leucaspis			
	Hylophylax naevioides			
	Microrhopias quixensis			
	Myrmeciza berlepschi	CE		
	Myrmeciza exsul			
	Myrmeciza immaculata			
	Myrmeciza laemosticta			
	Myrmornis torquata			
	Myrmotherula axillaris			
	Myrmotherula brachyura			
	Myrmotherula fulviventris			
	Myrmotherula ignota			
	Myrmotherula pacifica			
	Myrmotherula schisticolor			
	Phaenostictus mcleannani			
	Sakesphorus canadensis			
	Taraba major			
	Terenura callinota			
	Thamnistes anabatinus			
	Thamnophilus atrinucha			
	Thamnophilus multistriatus	CE		
	Thamnophilus nigriceps			
	Thamnophilus unicolor			
	Xenornis setifrons		VU	
Formicariidae	Formicarius analis			
	Formicarius nigricapillus			
Grallariidae	Grallaria guatimalensis			
	Grallaricula flavirostris			
	Hylopezus dives			



	Hylopezus perspicillatus		1	
Conopophagidae	Conopophaga castaneiceps			
	Pittasoma michleri			
	Pittasoma rufopileatum	CE		
Eurylaimidae	Sapayoa aenigma			
Pipridae	Corapipo altera			
	Corapipo leucorrhoa			
	Lepidothrix coronata			
	Manacus vitellinus			
	Pipra erythrocephala			
	Pipra mentalis			
	Pipra pipra			
	Xenopipo holochlora			
Cotingidae	Carpodectes hopkei	CE	CA	
	Cotinga nattererii			
	Lipaugus unirufus			
	Querula purpurata			
	Rupicola peruvianus			
Tityridae	Laniocera rufescens			
	Pachyramphus cinnamomeus			
	Pachyramphus homochrous			
	Pachyramphus polychopterus			
	Piprites chloris			
	Schiffornis turdina			
	Tityra inquisitor			
	Tityra semifasciata			
Tyrannidae	Attila spadiceus			
	Camptostoma obsoletum			
	Cnipodectes subbrunneus			
	Colonia colonus			
	Coryphotriccus albovittatus			
	Contopus cinereus			
	Contopus cooperi			В
	Contopus sordidulus			В
	Contopus virens			В
	Elaenia flavogaster			
	Empidonax alnorum			В
	Empidonax traillii			В
	Empidonax virescens			В
	Fluvicola pica			
	Legatus leucophaius			
	Leptopogon superciliaris			
	Lophotriccus pileatus			



Machetornis rixosa	1	
Megarynchus pitangua		
Mionectes oleagineus		
Mionectes olivaceus		
Mitrephanes phaeocercus		
Myiarchus crinitus		В
Myiarchus panamensis		_
Myiarchus tuberculifer		
Myiobius atricaudus		
Myiobius sulphureipygius		
Myiobius villosus		
Myiodynastes luteiventris		В
Myiodynastes maculatus		
Myiopagis gaimardii		
Myiophobus fasciatus		
Myiophobus pulcher		
Myiornis atricapillus		
Myiotriccus ornatus		
Myiozetetes cayanensis		
Myiozetetes granadensis		
Ochthoeca cinnamomeiventris		
Ochthoeca diadema		
Oncostoma cinereigulare		
Oncostoma olivaceum		
Onychorhynchus coronatus		
Ornithion brunneicapillum		
Phyllomyias griseiceps		
Phylloscartes superciliaris		
Philohydor lictor		
Pitangus sulphuratus		
Platyrinchus coronatus		
Pyrocephalus rubinus		
Rhynchocyclus olivaceus		
Rhynchocyclus pacificus		
Rhytipterna holerythra		
Sayornis nigricans		
Sirystes sibilator		
Terenotriccus erythrurus		
Todirostrum cinereum		
Todirostrum nigriceps		
Tolmomyias assimilis		
Tolmomyias flaviventris		
Tolmomyias sulphurescens		



	Tyrannulus elatus		1
	Tyrannus dominicensis		
	Tyrannus melancholicus		
	Tyrannus savana		
	Tyrannus tyrannus		
	Zimmerius chrysops		
	Zimmerius vilissimus		
Hirundinidae	Hirundo rustica		В
	Neochelidon tibialis		
	Petrochelidon pyrrhonota		В
	Progne chalybea		
	Stelgidopteryx ruficollis		
Corvidae	Cyanocorax affinis		
Vireonidae	Hylophilus decurtatus		
	Hylophilus flavipes		
	Hylophilus ochraceiceps		
	Vireo flavifrons		В
	Vireo flavoviridis		В
	Vireo leucophrys		
	Vireo olivaceus		В
	Vireo philadelphicus		В
Cinclidae	Cinclus leucocephalus		
Troglodytidae	Campylorhynchus albobrunneus		
	Cyphorhinus phaeocephalus		
	Henicorhina leucophrys		
	Henicorhina leucosticta		
	Microcerculus marginatus		
	Thryothorus fasciatoventris		
	Thryothorus leucopogon		
	Thryothorus leucotis		
	Thryothorus nigricapillus		
	Troglodytes aedon		
Polioptilidae	Microbates cinereiventris		
	Polioptila plumbea		
	Ramphocaenus melanurus		
	Polioptila schistaceigula		
Donacobiidae	Donacobius atricapilla		
Mimidae	Dumetella carolinensis		В
	Mimus gilvus		
Turdidae	Catharus fuscater		
	Catharus fuscescens		В
	Catharus minimus		В
	Catharus ustulatus		В



	Myadestes coloratus			
	Turdus assimilis			
	Turdus grayi			
	Turdus obsoletus			
	Turdus serranus			
Bombycillidae	Bombycilla cedrorum			В
Icteridae	Amblycercus holosericeus			
	Cacicus cela			
	Cacicus microrhynchus			
	Cacicus uropygialis		VU	
	Chrysomus icterocephalus			
	Dolichonyx oryzivorus			В
	Hypopyrrhus pyrohypogaster	Е		
	Icterus auricapillus			
	Icterus chrysater			
	Icterus galbula			В
	Icterus mesomelas			
	Icterus spurius			В
	Molothrus bonariensis			
	Molothrus oryzivorus			
	Psarocolius angustifrons			
	Psarocolius decumanus			
	Psarocolius guatimozinus			
	Psarocolius cassinii	E	EP	
	Psarocolius wagleri			
	Quiscalus mexicanus			
	Sturnella militaris			
Parulidae	Basileuterus culicivorus			
	Basileuterus tristriatus			
	Dendroica castanea			В
	Dendroica cerulea			В
	Dendroica fusca			В
	Dendroica magnolia			В
	Dendroica pensylvanica			В
	Dendroica petechia			(B)
	Dendroica striata			В
	Geothlypis aequinoctialis			
	Geothlypis semiflava			
	Geothlypis trichas			В
	Mniotilta varia			В
	Myioborus miniatus			В
	Oporornis formosus			В
	Oporornis philadelphia			В



	Parula pitiayumi			
	Phaeothlypis fulvicauda			
	Protonotaria citrea			В
	Seiurus aurocapillus			В
	Seiurus motacilla			В
	Seiurus noveboracensis			В
	Setophaga ruticilla			В
	Vermivora peregrina			В
	Wilsonia canadensis			В
Thraupidae	Anisognathus notabilis	CE		
	Bangsia aureocincta	E	EP	
	Bangsia melanochlamys	E	VU	
	Bangsia rothschildi	CE		
	Chlorochrysa phoenicotis	CE		
	Chlorophanes spiza	1		
	Chlorothraupis carmioli			
	Chlorothraupis olivacea	CE		
	Chrysothlypis salmoni	CE		
	Cyanerpes caeruleus			
	Cyanerpes cyaneus			
	Cyanerpes lucidus			
	Dacnis cayana			
	Dacnis venusta			
	Dacnis viguieri	CE	CA	
	Diglossa albilatera			
	Diglossa caerulescens			
	Diglossa cyanea			
	Diglossa indigotica	CE		
	Eucometis penicillata			
	Habia cristata	CE		
	Hemithraupis flavicollis			
	Heterospingus xanthopygius	CE		
	Iridosornis porphyrocephalus	CE	CA	
	Mitrospingus cassinii			
	Ramphocelus dimidiatus			
	Ramphocelus flammigerus			
	Tachyphonus delatrii			
	Tachyphonus luctuosus			
	Tachyphonus rufus			
	Tangara florida			
	Tangara icterocephala			
	Tangara inornata			
	Tangara johannae	CE		



]	Tangara larvata			
	Tangara lavinia			
	Tangara palmeri	CE		
	Tangara parzudakii			
	Tangara rufigula	CE		
	Tersina viridis			
	Thraupis cyanocephala			
	Thraupis episcopus			
	Thraupis palmarum			
Cardinalidae	Cyanocompsa cyanoides			
	Pheucticus Iudovicianus			В
	Piranga olivacea			В
	Piranga rubra			В
	Spiza americana			В
Emberizidae	Arremon aurantiirostris			
	Arremon brunneinucha			
	Arremon castaneiceps			
	Arremon crassirostris			
	Arremonops conirostris			
	Oryzoborus crassirostris		CA	
	Oryzoborus funereus			
	Sicalis flaveola			
	Sporophila corvina			
	Sporophila luctuosa			
	Sporophila minuta			
	Sporophila nigricollis			
	Volatinia jacarina			
Fringillidae	Chlorospingus semifuscus			
	Euphonia anneae			
	Euphonia fulvicrissa			
	Euphonia laniirostris			
	Euphonia minuta			
	Euphonia xanthogaster			
	Totals	45	30	88



## Appendix 4. Mammal Species in the Project Area

Subspecies indicated in **bold**.

\*Few specimens recorded for the Chocó. ▶ Considered endemic to the Chocó region.

*Few specimens reco	rded for the Chocó.	Considered endemic to the Chocó region.
Order	Family	Species
	Cervidae (1)	Mazama americana
Cetartiodactyla (3)	Tayassuidaa (2)	Pecari tajacu
	Tayassuidae (2)	Tayassu pecari spiradens
	Carrida a (2)	Speothos venaticus panamensis*
	Canidae (2)	Cerdocyon thous aquilus
		Leopardus pardalis aequatorialis
		Leopardus wiedii
	Felidae (5)	Panthera onca centralis
		Puma concolor
Carnivora (13)		Puma yagouaroundi
		Eira barbara sinuensis
	Mustelidae (3)	Lontra longicaudis annectens
		Mustela frenata*
	Procyonidae (3)	Nasua narica*
		Potos flavus
		Procyon cancrivorus
		Diclidurus ingens
	Fuchallan wide (4)	Rhynchonycteris naso
	Emballonuridae (4)	Saccopteryx bilineata
		Saccopteryx leptura
	Furipteridae (1)	Furipterus horrens
		Eumops auripendulus*
		Molossops temminckii
	Molossidae (6)	Molossus bondae
	Molossidae (6)	Molossus molossus
		Molossus pretiosus*
		Tadarida brasiliensis*
	Mormopidae (1)	Pteronotus davyi*
	Nostilionidas (2)	Noctilio albiventris
	Noctilionidae (2)	Noctilio leporinus
		Anoura cadenai (endémica Colombia)
	Phyllostomidae (65)	Anoura cultrata*
		Anoura geoffroyi*



	eus aequatorialis eus jamaicensis
	eus lituratus
	lia brevicauda
	lia castanea
	lia monohernandezi*
	lia perspicillata
	derma trinitatum
	derma villosum
	derma salvini
	roniscus minor*
Choe	roniscus periosus▶
Derm	anura phaeotis
Derm	anura rava
Derm	anura rosenbergi
Desm	odus rotundus
Diaer	nus youngi
Diphy	ılla ecaudata*
Enchi	sthenes hartii
Gloss	ophaga commissarisi
Gloss	ophaga soricina
Glyph	nonycteris sylvestris
Lamp	ronycteris brachyotis
Licho	nycteris obscura ►
Liony	cteris spurrelli*
Lonch	nophylla cadenai <b>⊳</b>
Lonch	nophylla chocoana*▶
Lonch	nophylla concava
Lonch	nophylla robusta
Lonch	nophylla thomasi*
Lopho	ostoma brasiliense
Lopho	ostoma silvicolum
Macr	ophyllum macrophyllum*
Meso	phylla macconnelli
Micro	onycteris hirsuta*
	onycteris megalotis*
	onycteris minuta



		Micronycteris schmidtorum*
		Mimon crenulatum*
		Phylloderma stenops*
		Phyllostomus discolor
		Phyllostomus hastatus
		Phyllostomus latifolius
		Platyrrhinus chocoensis ►
		Platyrrhinus dorsalis
		Platyrrhinus helleri
		Platyrrhinus matapalensis
		Platyrrhinus nitelinea▶
		Platyrrhinus umbratus
		Platyrrhinus vittatus*
		Rhinophylla alethina <b>▶</b>
		Sturnira koopmanhilli ▶
		Sturnira lilium
		Sturnira luisi*▶
		Trachops cirrhosus*
		Trinycteris nicefori*
		Uroderma bilobatum
		Uroderma magnirostrum
		Vampyressa thyone
		Vampyriscus nymphaea
		Vampyrodes caraccioli
		Vampyrum spectrum*
	Thyropteridae (1)	Thyroptera tricolor*
		Eptesicus brasiliensis*
		Myotis nigricans
	Vespertilionidae (4)	Myotis riparius
		Rhogeessa io*
		Cabassous centralis*
Cingulata (2)	Dasypodidae (2)	Dasypus novemcinctus
		Caluromys derbianus
		Chironectes minimus
Didelphimorphia (9)	Didelphidae (9)	Didelphis marsupialis
		Didelphis pernigra*



Metachirus nudicaudatus         Micoureus phaeus         Philander opossum         Lagomorpha (1)       Leporidae       Sylvilagus brasiliensis         Perissodactyla (1)       Tapirus bairdii ▶         Bradypodidae       Bradypus variegatus         Cyclopes didactylus         Cyclopes didactylus         Megalonychidae (1)       Choloepus hoffmanni         Myrmecophaga tridactylo         Tamandua mexicana         Aotidae	
Philander opossum  Lagomorpha (1)  Leporidae  Sylvilagus brasiliensis  Perissodactyla (1)  Tapiridae  Bradypodidae  Cyclopedidae  Cyclopedidae  Cyclopes didactylus  Megalonychidae (1)  Myrmecophagidae (2)  Myrmecophaga tridactylo  Tamandua mexicana	
Lagomorpha (1)       Leporidae       Sylvilagus brasiliensis         Perissodactyla (1)       Tapiridae       Tapirus bairdii▶         Bradypodidae       Bradypus variegatus         Cyclopedidae       Cyclopes didactylus         Megalonychidae (1)       Choloepus hoffmanni         Myrmecophagidae (2)       Myrmecophaga tridactylo         Tamandua mexicana	
Perissodactyla (1)  Bradypodidae  Cyclopedidae  Cyclopes didactylus  Pilosa (6)  Megalonychidae (1)  Myrmecophagidae (2)  Myrmecophagidae (2)  Tamandua mexicana	
Pilosa (6)  Bradypodidae  Cyclopedidae  Cyclopes didactylus  Megalonychidae (1)  Myrmecophagidae (2)  Myrmecophaga tridactylo  Tamandua mexicana	
Pilosa (6)  Megalonychidae (1)  Myrmecophagidae (2)  Cyclopes didactylus  Choloepus hoffmanni  Myrmecophaga tridactyla  Tamandua mexicana	
Pilosa (6) Megalonychidae (1) Choloepus hoffmanni  Myrmecophagidae (2) Tamandua mexicana	
Myrmecophagidae (2)  Myrmecophaga tridactylo  Tamandua mexicana	
Myrmecophagidae (2)  Tamandua mexicana	
Tamandua mexicana	1
Antidae Antus zonglis	
7.00.000	
Alouatta palliata aequat	orialis <b>▶</b>
Primates (7) Atelidae (3) Alouatta seniculus senicu	lus
Ateles fusciceps rufiventr	is▶
Cebidae (1) Cebus capucinus capucin	us
Caviidae (2)	ris
Hydrochoerus isthmius*	
Handleyomys alfaroi	
Isthmomys pirrensis ►	
Melanomys caliginosus	
Neacomys tenuipes	
Nephelomys pectoralis	
Cricetidae (13) Oryzomys couesi*	
Oryzomys gorgasi*	
Sigmodontomys alfari*►	
Rodentia (31) Transandinomys bolivaris	*•
Transandinomys talaman	cae*
Zygodontomys cherriei	
Cuniculidae Cuniculus paca	
Dasyproctidae Dasyprocta punctata	
Dinomyidae Dinomys branickii*	
Diplomys labilis* ►	
Echimyidae (3) Hoplomys gymnurus▶	
Proechimys semispinosus	
Erethizontidae (1) Coendou rothschildi*►	
Geomyidae (2) Orthogeomys dariensis*▶	



		Orthogeomys thaeleri* ▶
	Heteromyidae (2)	Heteromys australis
		Heteromys desmarestianus▶
	Sciuridae (3)	Microsciurus alfari
		Microsciurus mimulus*▶
		Sciurus granatensis
Sirenia (1)	Trichechidae	Trichechus manatus