REDD+ EMBERÁ WOUNAAN

PART 1

Document prepared by B-Terra Corp and CO2CERO S.A.S. according to the methodology BCR 0002 version 3.1.

Name of the project	*REDD+ Emberá Wounaan*
Project holder	*Comarca Emberá Wounaan*
Project holder's contact information	*Cacique Leonides Cunampia*[1] *Cellphone: +507 6900-7584* *Office Address in Comarca Emberá Wounaan: Plaza Bal Harbour, Local 23 Upper Floor, Panama City.*
Project participants	*41 communities of the Comarca Emberá Wounaan,* *B-Terra Corp and CO2CERO S.A.S.*
Version	*14*

[1] It is important to highlight that the contact cellphone number of the current Cacique, Leonides Cunampia, is a temporary contact detail, considering that this is a position subject to change in accordance with the governance structures of the Comarca Emberá Wounaan.

Date	*20/01/2025*
Project type	*REDD+*
Grouped project	*N/A*
Applied Methodology	*This project has been developed based on the BioCarbon Registry. 2023. BCR STANDARD. From differentiated responsibility to common responsibility. Version 3.2. September 23, 2023* *Quantification of GHG emissions in REDD+ projects BCR0002 version 3.1*
Project location (City, Region, Country)	*Darién Province in eastern Panama, Capital: Unión Chocó*
Starting date	20/04/2018
Quantification period of GHG emissions reduction	(20/04/2018 to 31/12/2022)
Estimated total and average annual GHG emission reduction amount	The total amount of GHG emissions reductions during the quantification period is 71,184,852 tCO_2e The estimated average annual amount of GHG emission reductions is 2,296,286 tCO_2e/year
Sustainable Development Goals	*2. Zero hunger* *4. Quality education.*

	5. Gender equality. *6. Clean water and sanitation.* *13. Climate action.* *15. Life on land.*
Special category, related to co-benefits	*N/A*

Table of contents

Equations index

Figures index

Tables index

1 Project type and eligibility

1.1 Scope in the BCR Standard

Table 1. Scope in the BCR standard.

The scope of the BCR Standard is limited to:	
The following greenhouse gases, included in the Kyoto Protocol: Carbon Dioxide (CO_2), Methane (CH_4) and Nitrous Oxide (N_2O).	
GHG projects that use a methodology developed or approved by BioCarbon Standard, applicable to GHG removal activities and REDD+ activities (AFOLU Sector).	x
Quantifiable GHG emission reductions and/or removals generated by the implementation of GHG removal activities and/or REDD+ activities (AFOLU Sector).	
GHG projects that use a methodology developed or approved by the BioCarbon Standard, applicable to activities in the energy, transportation, and waste sectors.	
Quantifiable reductions in GHG emissions generated by the implementation of activities in the energy, transportation, and waste sectors.	

Source: BioCarbon Standard, 2023.

Its main activity is the Reduction of Emissions from deforestation and forest degradation and is consolidated under the methodology Quantification of (GHG) Greenhouse Gas Emission Reduction for REDD+ Projects methodology BCR 0002 version 3.1 by BioCarbon Standard.

1.2 Project type

The REDD+ Emberá Wounaan project falls into the categorized of AFOLU (Agriculture, Forestry, and Other Land Uses) sector project, within sectoral scope 14 forest. Its main activity is the Reduction of emissions from deforestation and forest degradation.

The project solely involves the Emberá Wounaan community, which comprises two sectors, Cémaco and Sambú, and does not require the inclusion of new instances and/or parameters in its development.

Table 2. Type of Project.

Activities in the AFOLU sector, other than REDD+	
REDD+ Activities	x
Activities in the energy sector	
Activities in the transportation sector	
Activities related to waste management and disposal	

Source: BioCarbon Standard, 2023.

1.3 Project scale

Not applicable to this project according to the REDD+ category under which it is designed.

2 General description of the project

REDD+ Emberá Wounaan is an initiative that creates governance, culture, sustainable economic development, and environmental conservation through the enhancement of social, economic, and ecological capital. During the development of the initiative, governance and resource management involve capacity building and the design of governance structures; transparency includes learning management and leadership; planning and foresight comprise a set of activities that help recognize culture and social dynamics while creating strategies that rescue ancestral knowledge. Additionally, there is support for sustainable agricultural models and production chains. On the other hand, training covers theoretical elements on a REDD+ project, socio-environmental safeguards, sustainable forest management (SFM), and the identification of reforestation and restoration areas available for plantation establishment.

The REDD+ Emberá Wounaan Project is in the Province of Darién (Panama), including 41 communities with approximately 10,000 inhabitants to benefit and 436,551 hectares distributed in two sectors. The Cémaco Region has three townships: Cirilo Guaynora, Manuel Ortega, and Lajas Blancas, which account for 72% of the total area, while the Sambú Region has two townships: Río Sabalo and Jingurudó, covering 28% of the total area. In Cémaco, the topography consists of rolling plains with elevations ranging from 50 to 500 meters above sea level (masl) up to the foothills of the Darién mountain range to the northeast. Its mountainous area has elevations between 500 and 1,700 masl, with the highest point being Cerro Tacarcuna at 1,850 masl. In the case of Sambú, located to the southeast of Darién, 35% consists of rolling plains in the valley of the Sambú River, with a

maximum elevation of 830 masl. The temperature in valleys and plains ranges from 27°C to 30°C, with an average annual precipitation of 3,000 mm, and December, January, and February being the driest months. In the mountain and foothill areas, precipitation can reach up to 8,000 mm annually with no dry season, and temperatures range between 17°C and 25°C.

The objective of the REDD+ Emberá Wounaan project is to reduce deforestation and degradation of the natural forests owned by the region through conservation and restoration strategies. This involves all groups of the indigenous communities, including women, elders, and youth, ensuring gender equality, participation, forest governance, and the application of skills that enhance rural development. Education and training on topics related to individual development and community management are focal points of this project, with the understanding that deep learning is the best tool for implementing successful activities, achieving the initiative's permanence and stability. In 30 years, REDD+ Emberá Wounaan will avoid the emission net of 56,947,881 tCO_2e, with an annual average net of 1,837,028 tCO_2e, estimated from an emission factor of 637.18 tCO_2e/ha corresponding to Mature Mixed Broadleaf Forest covers and 380.16 tCO_2e/ha for Secondary Mixed Forest covers. These emission factors were generated from the methodological reconstruction of Panama's National Reference Level through the establishment of monitoring plots, which is consistent with the ecosystem's reality. This project is built with multiple activities, including the reduction of emissions from deforestation and the reduction of emissions from forest degradation.

2.1 GHG project name

REDD+ Emberá Wounaan Emissions Reduction from Deforestation and Degradation Project.

2.2 Objectives

To reduce deforestation and forest degradation of the natural forests present in the Emberá Wounaan Region and its 41 communities.

- Ensure free, prior, and informed consent, and the participation of all stakeholders involved in the GHG mitigation initiative, consolidating a continuous flow of information between parties.
- Assess deforestation and forest degradation factors through community diagnosis and verification of field actions.
- Ensure compliance with the regulatory, socio-environmental, and governance framework related to the REDD+ project for a period of 30 years.

- Design activities to mitigate and prevent the increase of deforestation and forest degradation factors at the local level for a period of 30 years.
- Evaluate emissions avoided by the region through its conservation, restoration, and sustainable management actions over a period of 30 years.
- Ensure transparent and equitable distribution of benefits according to the resources obtained from the commercialization of avoided greenhouse gas emissions within the project boundaries for a period of 30 years.

2.3 Project activities

The Emberá Wounaan REDD+ project aims to strengthen the socio-cultural, economic, and natural capital by involving conservation, restoration, and preservation activities of the natural forests within the project boundary. It also aims to improve productive activities to more sustainable and efficient models, reduce the trend of deforestation and forest degradation, and improve territorial governance. Additionally, the project aims to improve soft skills and education within the community, achieving an integration of capacity building with the implementation of activities in the territory, appropriating to the communities' fundamental concepts and criteria to generate self-management.

To comply with the above, and from the VCR 002 methodology version 3.1, for the REDD+ project a matrix[2] is designed where the ID of the activity, responsibility of the actor to implement the activity, indicators, its objectives, results, and development schedule are exposed. For this, REDD+ activities are distributed in four (4) strategic lines, nine (9) investment lines that translate into 21 activities, in turn, linked to goals and indicators.

The following is a description of the categorization of the strategic lines, investment lines and activities for the Emberá Wounaan REDD+ project.

Table 3. Strategic line of governance and sense of belonging.

Strategic line of governance and sense of belonging.
1. **Governance and sense of belonging:** The REDD+ Emberá Wounaan project aims to establish a foundation in governance that ensures equity and transparency during the execution of conservation activities, highlighting the importance of natural resources for the communities and their inhabitants. At the same time, it is important for people to increase their sense of belonging in relation to their territory and resources, maintaining the defense and recognition of natural, cultural, and social values. This strategic line focuses on

[2] See in: *02_Cobeneficios\3_Actividades REDD+\ActividadesREDD+_Emberá Wounaan_V4.xlsx*

Strategic line of governance and sense of belonging.	
governance and transparency, preventing corruption and the destruction of collective well-being.	
Investment lines	**REDD+ Activities**
1.1 Goverment and administration.	1.1.1. Guidance in defining governance structures and well-being.
	1.1.2. Training in Project management, finance and resource administration.
1.2 Transparency and participation.	1.2.1. Creation of consultation and decision-making spaces by the authorities and members of the Emberá Wounaan community.
	1.2.1. Training in good leadership practices.

Source: B-Terra Corp and CO2CERO S.A.S., 2022.

Table 4. Strategic line of culture and society.

Strategic line of culture and society	
2. **Culture and society:** This strategic line promotes social and territorial development through current and prospective plans, which will guide the use and management of natural and non-natural resources to support the community's social, economic, and cultural well-being. These activities aim to involve development and planning tools within the community, enhancing welfare, participation, and management of sustainable goods and services.	
Investment lines	**REDD+ Activities**
2.1 Planning and foresight	2.1.1. Development of community planning and development tools.
	2.1.2. Design of strategies for the conservation of indigenous ancestral knowledge.
	2.1.3. Assessment of provision and availability status of basic services, sanitation, health and education.
2.2 Boundaries and territory	2.2.1. Identification of territorial boundaries.
	2.2.2. Strategies for protecting territorial boundaries.

Source: B-Terra Corp and CO2CERO S.A.S., 2022.

Table 5. Strategic line of sustainable economic development.

Strategic line of sustainable economic development.	
3. **Sustainable economic development:** This strategy aims to provide the necessary elements and tools to enhance economic activities by adjusting existing production chains, which involve ancestral knowledge and respect the cultural value of the Emberá Wounaan people. These activities include technical support, training, and verification of effectiveness in economic development, health, and food security within the community's daily activities. Ultimately, it consolidates inclusive spaces hand in hand with women and youth.	
Investment lines	**REDD+ Activities**
3.1 Indigenous productive improvement.	3.1.1. Technical support in sustainable family production models.
	3.1.2. Design of economic alternatives and sustainable production chains.
3.2 Strengthening of productive capacities.	3.2.1. Training in Good production practices.
	3.2.2. Improvement of tools and work materials.
	3.2.3. Institutionalization of Good practices for economic development and well-being.

Source: B-Terra Corp and CO2CERO S.A.S., 2022.

Table 6. Strategic line of environmental conservation.

Strategic line of environmental conservation
4. Environmental conservation: This line is directly involved with the REDD+ project, with recognition, protection, and management of natural resources being fundamental. The forest is the most important source, including carbon reservoirs and resources used by communities and their customs. Forest conservation includes Sustainable Forest Management (SFM), forest restoration, and reforestation, promoting the REDD+ activities scenario defined at the international level while strengthening the economic and cultural values of communities.

Investment lines	REDD+ Activities
4.1 Resources management	4.1.1. Training in REDD+ and socio-environmental safeguards.
	4.1.2 Monitoring of vegetation and biodiversity.
	4.1.3. Training in sustainable forest management (SFM).
4.2 Enhancement of carbon reservoirs.	4.2.1. Establishment of the Emberá Wounaan forest nursery.
	4.2.2. Forest restoration.
	4.2.3 Reforestation.
4.3 Forest-based economic alternatives.	4.3.1. Non-timber forest product production.

Source: B-Terra Corp and CO2CERO S.A.S., 2022.

The above activities are designed from the social, environmental, cultural, and economic needs that currently live the territories and ethnic peoples linked to the project, bearing in mind the management of land and forests, as the synergy between the living space, biodiversity, traditional knowledge, livelihood strategies, occupations and lifestyles of indigenous peoples, achieving short, medium and long term, the project objectives. In addition, complying with the Cancun safeguards, the SDGs and the regulatory framework that concerns the project, in accordance with the regulation of collective rights and land ownership of ethnic peoples.

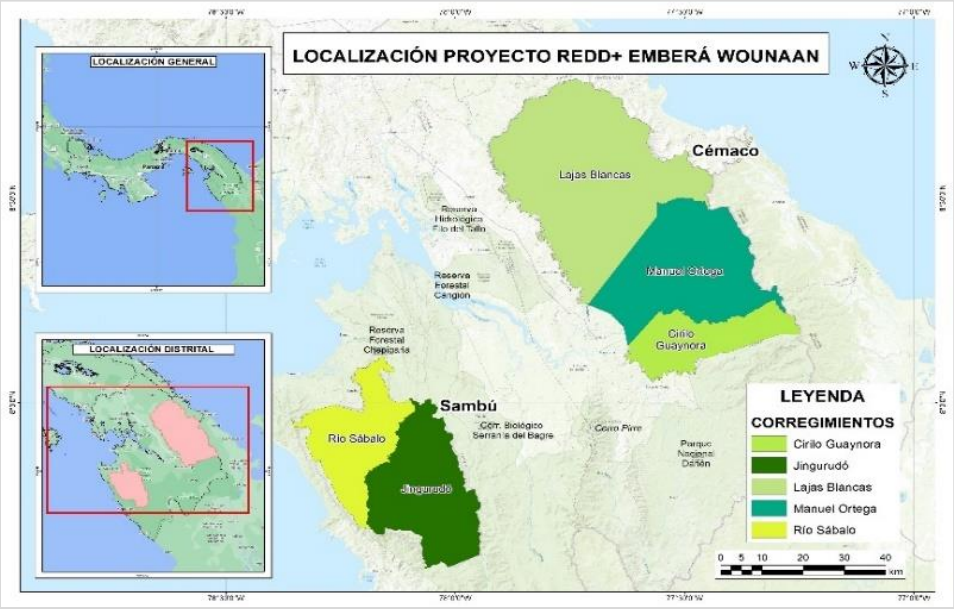
Finally, since the beginning of the project, and under the leadership of the legal representatives as community members, the implementation of various REDD+[3] activities has been progressing, which does not require a high economic investment, and which is in accordance with the technical knowledge of the social manager, technical developer, and disposition as autonomous availability of the population, seeking an awareness of the care of forests, environment and what is derived from it, mechanism and methods that in the measure of time achieve the reduction of GHG.

[3] See in: *02_Cobeneficios\3_Actividades REDD+\ActividadesREDD+_Emberá Wounaan_V4.xlsx*

2.4 Project location

The total area of the REDD+ Emberá Wounaan project corresponds to the territories of the Emberá Wounaan indigenous communities, located in the Darién province in eastern Panama, Central America, with its capital in Unión Choco. According to the country's political-administrative organization, these territories correspond to the Emberá Wounaan Region, created by Law 22 of 1983, which defines a total area of 436,551.48 ha. The Emberá Wounaan Region consists of two territories: the Cémaco district and the Sambú district is in the northeastern part of the province in the Darién mountain range, with an area of 305,852 ha, divided into the townships of Lajas Blancas, Manuel Ortega, and Cirilo Guaynora. The Sambú district is in the southwestern part of the Darién province, comprising the townships of Jingurudó and Río Sábalo, which include the Pirre, Jungurudo, El Bagre, and El Sapo mountain ranges, with an area of 130,699 ha.

Figure 1. REDD+ Emberá Wounaan Project location.



Source: CO2CERO S.A.S., 2023.

The districts of Cémaco and Sambú and the province of Darién are located within the Biogeographical Chocó area, also known as the Chocó-Darién ecoregional complex. Ecoregions are known as relatively broad units of land composed of multiple communities and species, with boundaries very similar to those of the predominant areas before more abrupt land-use changes and are commonly used in conservation activities. This ecoregion extends from eastern Panama, through the Colombian Chocó, to the city of Guayaquil in

Ecuador. This strip lies between the Pacific Ocean and the eastern cordillera of the Andes (Olson , and others, 2001), (WWF Colombia, Fundación Ecotróopico y Cecoin, 2008) and is divided into several subregions. For the present project, the Darién province of Panama is involved.

2.5 Additional information about the GHG Project

2.5.1 Environmental characterization

This subsection presents the biophysical characteristics of the project area, such as geography, geology, climate, and diversity.

2.5.1.1 Geographic description

The Emberá-Wounaan Region is in the Darién province in eastern Panamá, Central America, and covers a total area of 4,393.9 km². Its capital is Unión Chocó. Specifically, the Emberá-Wounaan Region is composed of two territories: the Cémaco district and the Sambú district. The former is in the northeastern part of the province in the Darién mountain range, with an area of 3,097.5 km², while the latter is located in the southwestern part of the Darién province in the Pirre, Jingurudó, El Bagre, and El Sapo mountain ranges, and covers an area of 1,296.4 km². The Cémaco district is divided into three townships: Cirilo Guaynora, where the capital of the Region, Unión Chocó, is located, Lajas Blancas, and Manuel Ortega. Additionally, within this district, there is the Afro-descendant community of Yape. The Sambú district is divided into two townships: Río Sábalo, where the district capital, Puerto Indio, is located, and Jingurudó.

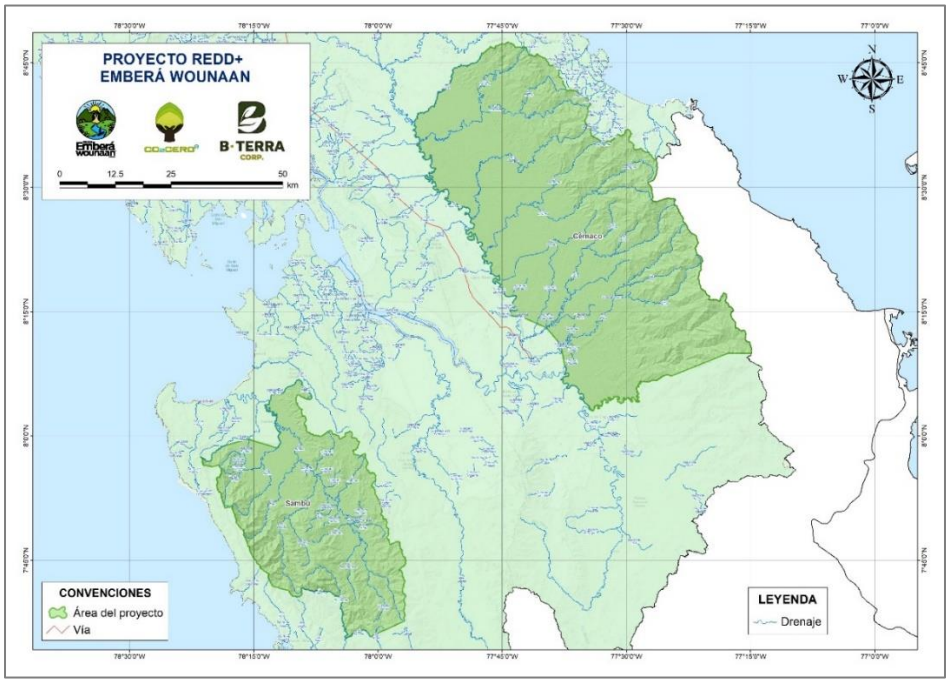
The Darién Mountain range has been considered one of the most rugged mountain barriers in the world, not so much for its size and exuberance but for the presence of swampy gullies and alluvial wet plains (Banco de Occidente, 1999) . It is a morphological unit projecting onto the Caribbean coastal axis, from the Diablo River in its northernmost extreme to the Atrato River valley in the north of the Chocó department in Colombia (Banco de Occidente, 1999). Its average height is approximately 500 meters above sea level, with its highest peak reaching 1,875 meters above sea level on Cerro Tacarcuna. It is also worth noting Cerro Anachucona at 1,340 meters above sea level located in the northern area of the mountain range. It is on this mountain range that the Cémaco district of the Emberá-Wounaan is located. To the north of the Darién Mountain range lies the San Blas Mountain range, parallel to the Caribbean Sea through the province of Panama in a northwest direction. Its highest point is 748 meters above sea level on Cerro Cartí.

Returning to the Darién province, on its eastern side along the Pacific Ocean slope, there are a series of mountain formations that correspond to the northern extensions of the

Baudó mountain range. This range was formed by the uplift caused by the collision of the Nazca Plate and the South American Plate. It extends southward from the Baudó River in the central southern part of the Chocó department in Colombia to the Gulf of San Miguel in the Darién province of Panama, where it is also known as the Sapos Mountain Range. In the Darién province of Panama, these mountains are known as the Pirre Mountain Range, which includes Mount El Nique at 1,730 meters above sea level, marking the border between Colombia and Panama. The Jingurudó Mountain Range, the Bagre Mountain Range, and the Sapo Mountain Range are in the northern foothills, where the Sambú district of the Emberá-Wounaan is situated.

In the central and lower areas of the Darién province, the valleys of the Tuira and Chucunaque rivers are found. The former is the second longest river in Panama, with a length of 230 km. It originates in the headwaters of the Darién and Baudó mountain ranges on the border with Colombia and flows north until it reaches the town of El Real de Santamaria, where it merges with the Chucunaque River and the Pirre River. Upon reaching La Palma, the capital of the Darién province, it receives more rivers, becoming significantly wider, and flows into the Pacific Ocean in the Gulf of San Miguel. The Chucunaque River is the longest river in Panama, with a length of 231 km. It originates in the San Blas Mountain range and flows southeast parallel to the Darién Mountain range until it joins the Tuira River before flowing into the Gulf of San Miguel.

Figure 2. Map of main drainage systems.



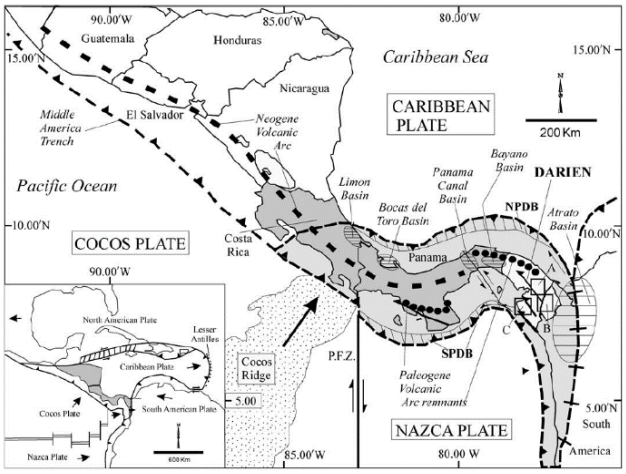
Source: (National Government of Panama, 2010)

2.5.1.2 Geological description.

The Isthmus of Panama, the geographic feature upon which the study area is situated, connects North America with South America, and separates the Pacific Ocean from the Atlantic Ocean. It has a length of 700 km and a width ranging between 50 and 70 km. The entirety of the Republic of Panama is located on it, along with a small portion of the Chocó Department in Colombia. The geology of the Panamanian isthmus is crucial in understanding tropical biodiversity patterns and changes in fauna, coinciding with the onset of Northern Hemisphere glaciation and the formation of the Modern Caribbean Sea (Montes & Hoyos, 2020). It is also relevant to understand how the area became a critical area for biodiversity conservation.

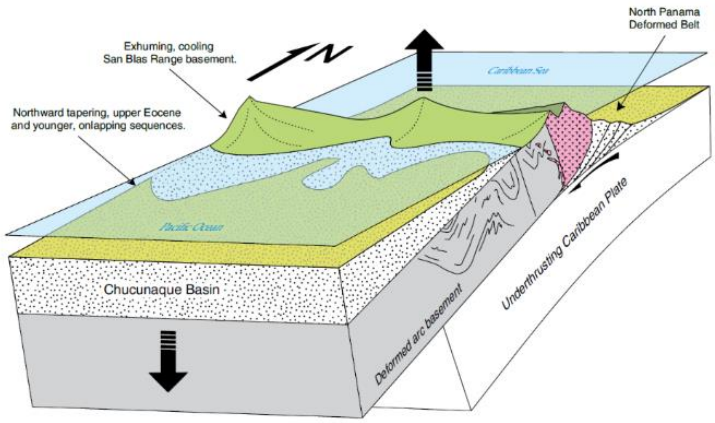
In general terms, the Isthmus of Panama was formed by the collision of the Caribbean Plate on its southwestern margin with the South American continent, specifically the areas of the Cocos, Nazca, and South American plates (see **Figure 3**) (Coates, Collins , Aubry, & Berggren W, 2004). Initially, approximately 14.8 to 12.8 million years ago, the Cocos Plate moved southeastward until it collided with South America and the Caribbean Plate. Between 12.8 and 7.1 million years ago, the Isthmus of Panama began to rise. The Cocos Plate is observed as a deformed arc sliding over the Caribbean Plate, causing its exhumation and uplift, especially around the San Blas Cordillera (see **Figure 4**) (Montes & Hoyos, 2020). Subsequently, this process continued until approximately 3.5 million years ago when the Pacific and Atlantic Oceans were completely separated, and South America joined North America.

Figure 3. Map of the Caribbean, Cocos, Nazca, and South American Plates forming the Isthmus of Panama. The lines with arrowheads mark convergence zones. The dark dashed line delineates the location of the Neogene volcanic arc.



Source: (Coates, Collins , Aubry, & Berggren W, 2004)

Figure 4. Conceptual diagram showing the elevation of the isthmus of Panama.



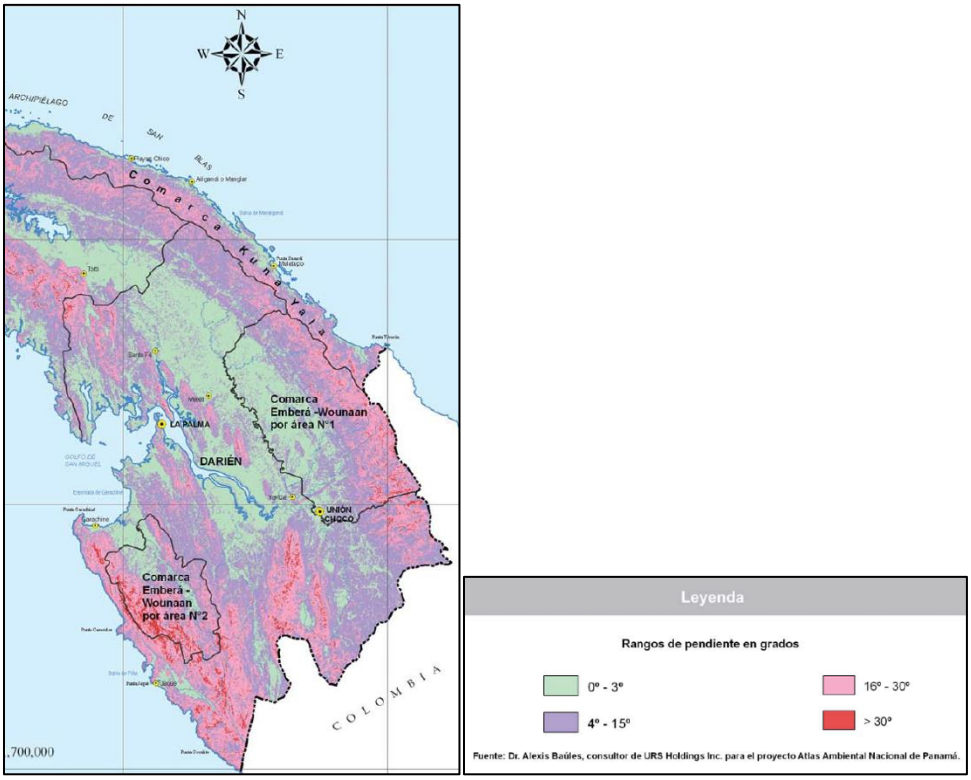
Source: (Montes & Hoyos, 2020).

2.5.1.3 Land description

Regarding the soil in the study area, the characteristics of slope and soil agrological capacity are presented. Slope refers to the steepness of the terrain, with steeper slopes indicating greater incline. This characteristic is related to soil usability, as steeper slopes entail greater instability, increased risk of soil loss, higher erosion, or mass movement, thus imposing more restrictions on soil use. The study area encompasses all types of slopes. In the case of the Cémaco district, nearly half of its extension is situated on gently sloping terrain (0° - 3°), nearly flat, primarily found in the Chucunaque River valley. The remaining area comprises strongly inclined slopes (16° - 30°) and even steeper slopes (greater than 30°), primarily located in the Darién Mountain range. As for the Comarca

Sambú, approximately 70% of its extension consists of strongly inclined slopes (16° - 30°) and steeper slopes (greater than 30°), predominantly found in the Jingurudó, Bagre, and Sapo mountain ranges. The remaining 30% corresponds to flat areas in the lower Sambú River valley (see **Figure 5**).

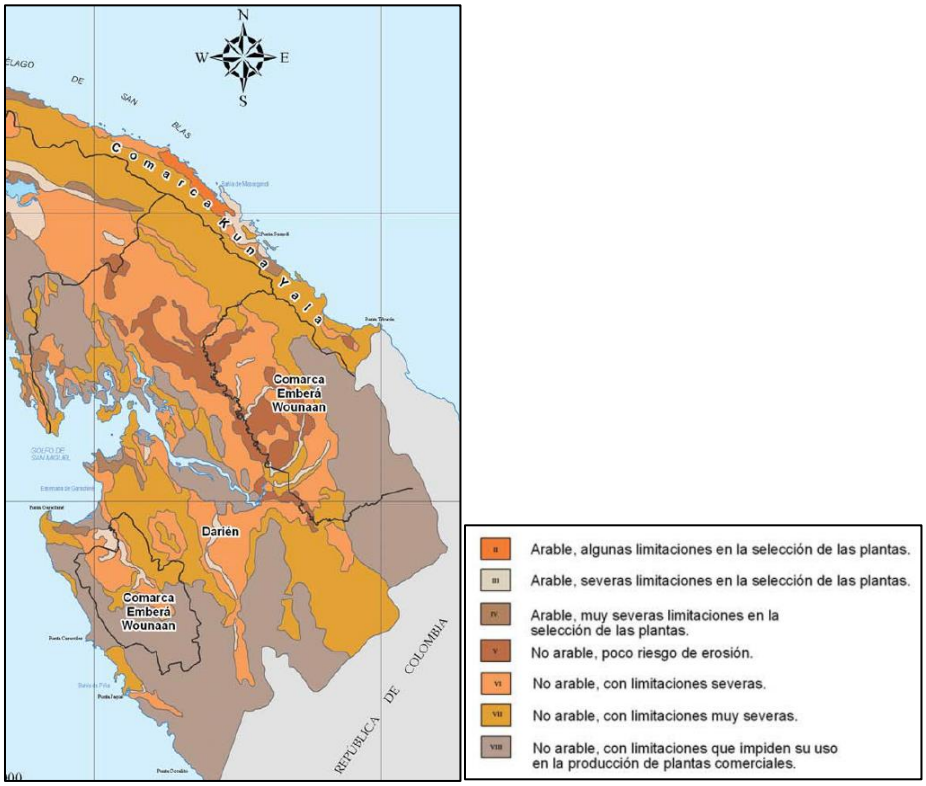
Figure 5. Slope range in the Project area and its surroundings.



Source: (National Government of Panama, 2010).

The agrological capacity of soils is based on the natural suitability of the soil to consistently produce under continuous treatment, specific uses, and sustainable management. It also provides basic information on soil issues under aspects of use limitations. For the study area, lands with agricultural potential are very few, located in low-lying areas along the banks of the Sambú River and some tributaries of the Chucunaque River. As seen in **Figure 6**, light gray areas correspond to arable land, with severe limitations on the selection of crops to be grown. The rest of the areas in the Comarcas correspond to categories V to VIII, which are non-arable and present severe limitations for agricultural activities. It is worth noting the lands in category VIII, where the only activity that can be associated is territories for forest protection and conservation.

Figure 6. The agrological capacity of the soils in the project area and its surroundings.



Source: (National Government of Panama, 2010).

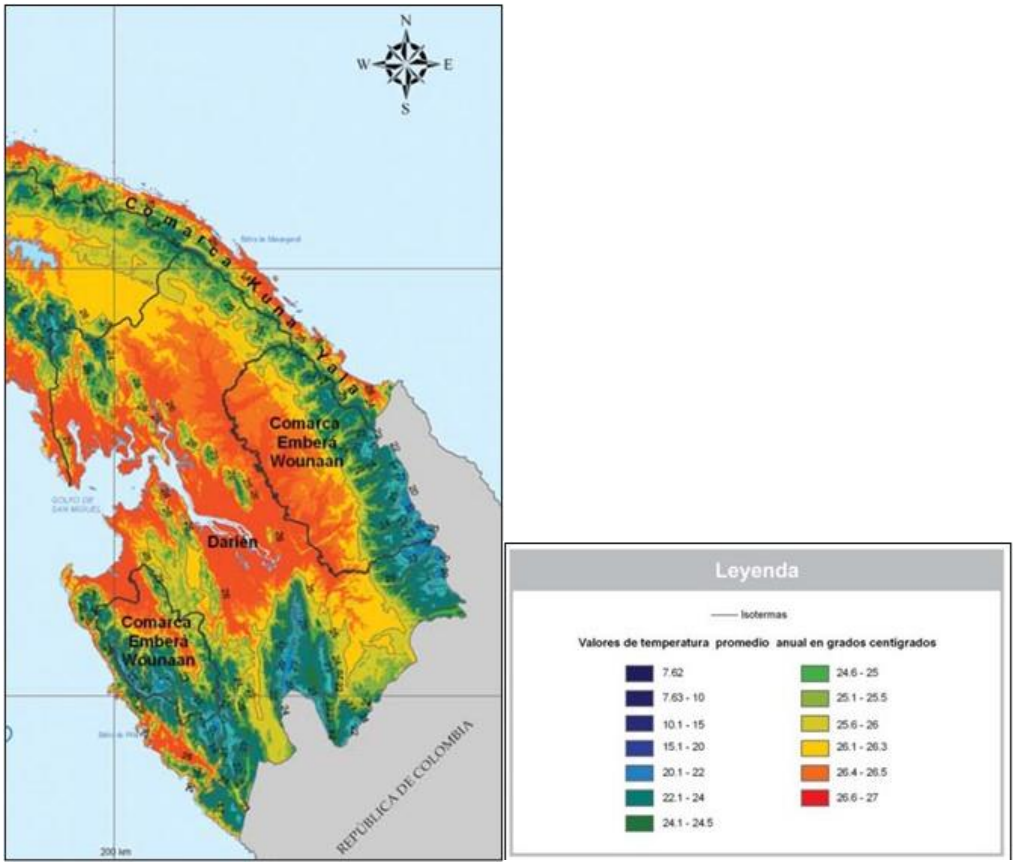
2.5.1.4 Climate description

The Chocó-Darién ecoregional complex exhibits significant climate diversity, particularly in terms of precipitation. Some areas in this region are among the rainiest on Earth, with annual rainfall reaching up to 13,670 mm in the middle part of the San Juan de Micay river basin in the Cauca department of Colombia and in the upper reaches of the San Juan and Atrato river basins in Chocó, also in Colombia. (Rangel Ch., 2004. The areas with lower precipitation are located(Rangel Ch., 2004). Specifically, in the Darién province, in the Darién and northern Baudó(Rangel Ch., 2004).

According to the environmental atlas of the Republic of Panama (2010), the Emberá-Wounaan regions of Cémaco and Sambú fall into the categories oftropical climate with a prolonged dry season and a subequatorial climate with a dry season. The first category corresponds to the lowland areas of the regions, with an average temperature between 27 to 28°C. The second category is found in the higher elevations of the mountains, where

the average temperature is between 26.5 to 27.5°C and decreases with altitude to 20°C at 1,000 meters above sea level (see **Figure 7**).

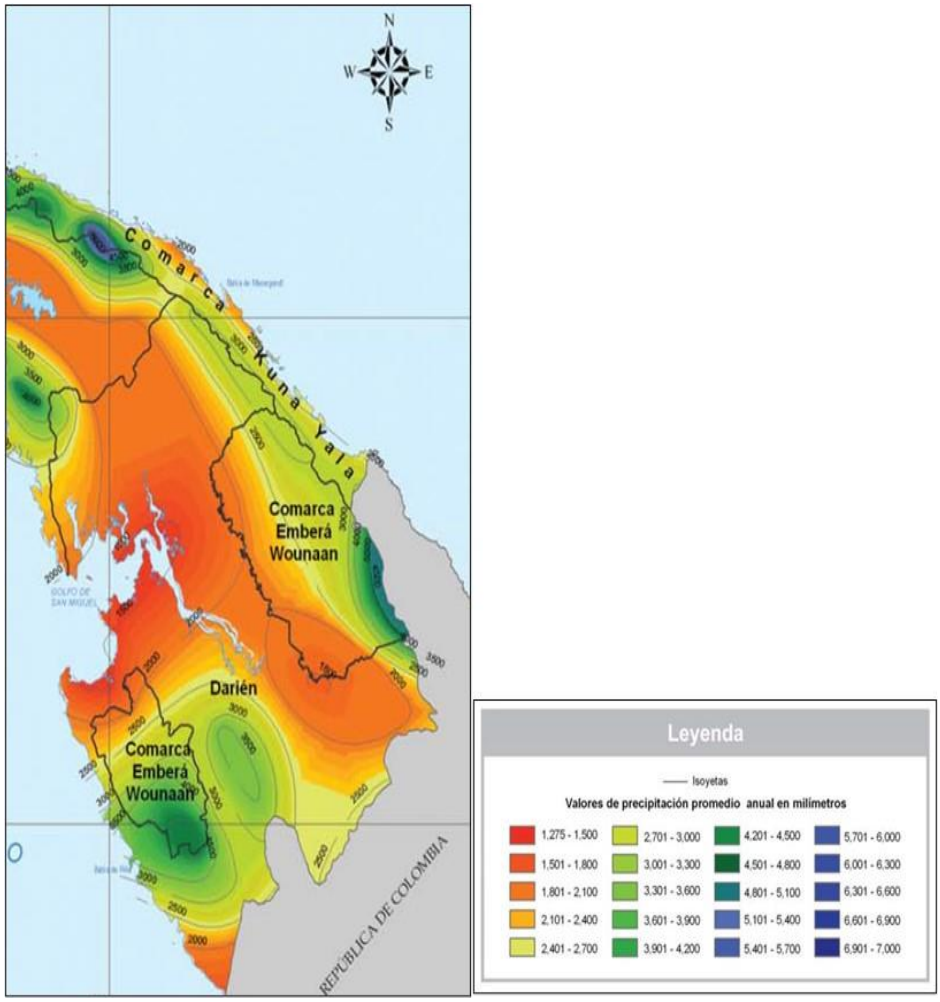
Figure 7. Average annual temperature in the Project area and its surroundings.



Source: (National Government of Panama, 2010).

Regarding precipitation, in the Emberá-Wounaan regions, it increases with altitude in the mountains; ranging from 1,501 mm in the lowlands of the Sambú region to 3,600 mm in the upper part of the Jingurudó mountains. In the Cémaco region, precipitation in the lower areas is 1,801 mm, reaching up to 4,800 mm in the upper part of the Darién mountains. Rainfall is concentrated in a wet period from April to November and a dry period from December to March (see **Figure 8**).

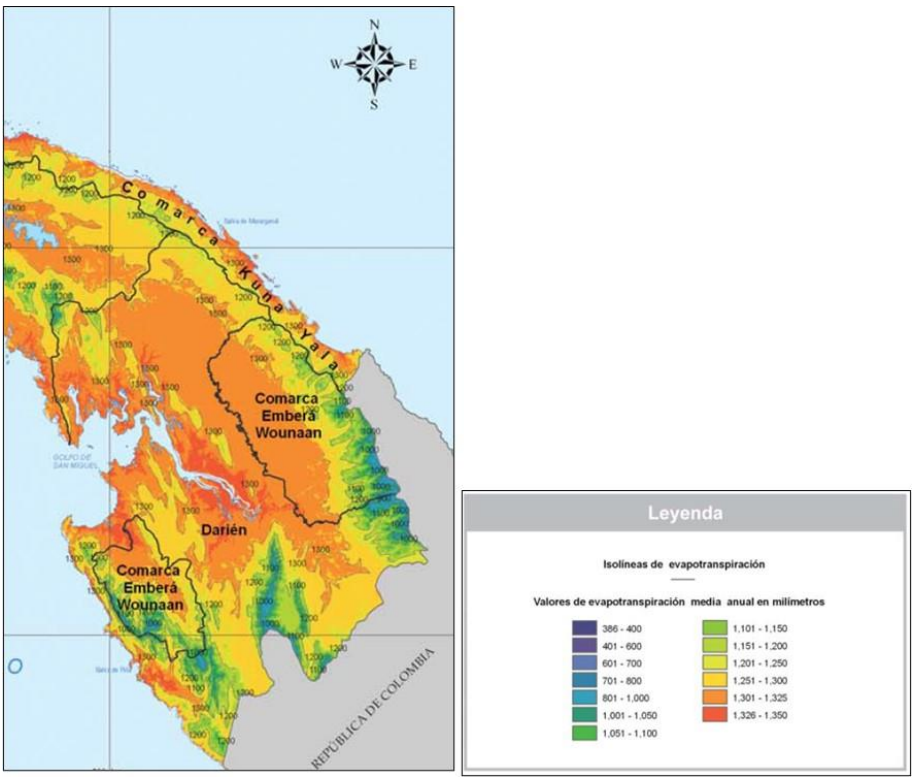
Figure 8. Average annual precipitation in the Project area and its surroundings.



Source: (National Government of Panama, 2010).

Finally, evapotranspiration exhibits a similar pattern according to the altitudinal gradient, being higher in the lower areas and decreasing with altitude. In the lowlands of the Sambú region, it is 1,350 mm per year, while in the higher areas of the Jingurudó mountains, it drops to 800 mm per year. In the Cémaco region, evapotranspiration in the lowlands is 1,325 mm per year, decreasing to 800 mm in the highlands of the Darién mountains.

Figure 9. Average annual evapotranspiration in the Project area.



Source: (National Government of Panama, 2010).

2.5.1.5 Biomes and ecosystems

The Cémaco and Sambú regions are in the ecoregion known as the Chocó-Darién humid forests. (National Government of Panama, 2010), which is characterized by high biological diversity and representativeness. This ecoregion has been designated as a high conservation priority at the national level and is one of the 25 global hotspots with a concentration of endemic species facing habitat loss. According to the same publication, the original extent of this ecoregion was 260,600 km², and by the time of the publication, only 24.2% retained original vegetation. It is home to 9,000 plant species, of which 2,250 are endemic, representing 0.8% of the total worldwide. Additionally, it supports 1,625 vertebrate species, with 418 being endemic, equivalent to 1.5% of the total worldwide. The breakdown of vertebrate species includes: 830 bird species, with 85 endemics; 235 mammal species, with 60 endemics; 210 reptile species, with 63 endemic; and 350 amphibian species, with 210 endemic (Myers, Mittermeier, Mittermeier, A.B. Da Fonseca, & Kent, 2000).

Additionally, according to (COONAPIP, 2009), in the Darién region and specifically in the Cémaco area, three main life zones are distinguished based on the Holdridge life zone map (Tosi, 1971). These zones correspond to tropical moist forest, very moist tropical forest, and premontane very moist forest. The first zone is characterized by annual rainfall exceeding 2,000 mm, where large species such as Guayacán (*Tabebuia chrysantha*), guarumo (*Cecropia peltata*), algodonero (*Cedrela odorota*), cuipo (*Cevellinesia plantafolia*), and maría (*Callophyllum brasiliense*) are established. The second zone, very moist tropical forest, is characterized by intense rainfall throughout the year, with precipitation in some communities exceeding 5,000 mm/year, and temperatures ranging between 20 and 25°C. Species found in this zone include espavé (*Anacardium excelsum*), guácimo (*Luehea seemani*), guavas (*Inga sp.*), fruta de mono colorado (*Annona reticulata*), and rabo de zorro (*Andropogon bicornis*).

Finally, the premontane very moist forest is characterized by maximum elevations not exceeding 200 meters above sea level, where temperatures range between 21.5 and 24°C. Its natural vegetation has been replaced by crops, with remnants of forest containing species such as Almendro (*Coumarouna panamenesis*), granadillo (*Platymiscium dimorphandrum*), guavas (*Inga sp.*), and higuerones (*Ficus sp.*) (COONAPIP, 2009).

2.5.1.5.1 Ecosystem types in protected areas

Additionally, the ecosystems present in the Protected Areas System are categorized, resulting in the tropical very moist forest according to the Holdridge classification having the largest area, accounting for 32.54% of presence in all protected areas. This is followed by premontane rainforest (30.09%), premontane very moist forest (28.26%), tropical moist forest (8.21%), and low montane rainforest (0.90%) (see **Table 7** and **Figure 10**). The cartographic base of the ecosystems is consolidated in the folder "*04_SIG\4_SHP\Holdridge_AP_V6.shp*" providing the supplied information.

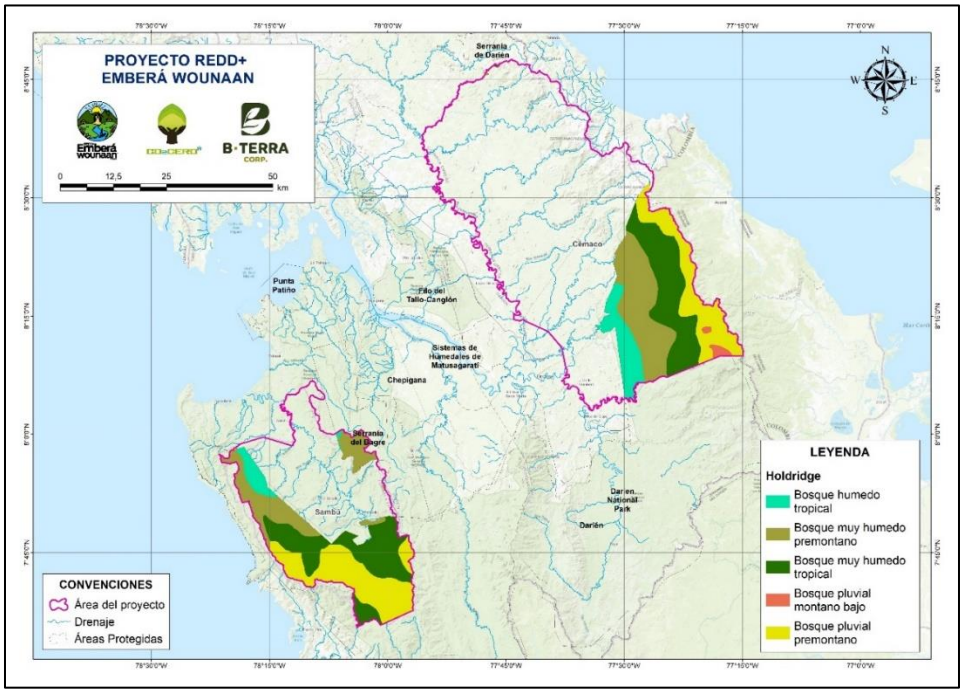
Table 7. Ecosystems presents in protected areas according to Holdridge.

Protected Area	Ecosystem according to Holdridge	Area (ha)	Area (%)
Darién	Tropical very moist forest	47,150.05	32.41%
	Premontane rainforest	43,724.13	30.05%

Protected Area	Ecosystem according to Holdridge	Area (ha)	Area (%)
	Premontane very moist forest	36,202.02	24.88%
	Tropical moist forest	11,693.38	8.04%
	Low montane rainforest	1,304.89	0.90%
Serranía de Darién	Tropical very moist forest	92,52	0.06%
	Premontane very moist forest	54,10	0.04%
Serranía del Bagre	Premontane very moist forest	4.853,07	3.34%
	Tropical moist forest	249.06	0.17%
	Tropical very moist forest	102.67	0.07%
	Premontane rainforest	55.68	0.04%
Total		145,481.57	100.00%

Source: (National Government of Panama, 2010).

Figure 10. Ecosystems in protected areas according to Holdridge.



Source: (National Government of Panama, 2010).

2.5.1.5.2 Mountains in protected areas

For the determination of important biodiversity sites within protected areas in the mountains, the definition of mountains from (FAO. 1998. Citado en Villota, 1991) is used, where it is defined as "a large natural elevation of land, of diverse origin, with more than 300 meters of relief between the base and the summit and in relation to the adjacent landscape, and whose slopes, whether regular, irregular, or complex, have an average slope greater than 30%".

Therefore, for the establishment of mountain landscapes within the protected areas present in the project area, a cartographic analysis was conducted, and areas with slopes greater than 30% were delimited, defining that 19,413.41 hectares belong to this landscape and to the important biodiversity sites, mainly found in Darién National Park (99.89%), as observed in **Table 8** and **Figure 11**. Within the folder "*04_SIG\4_SHP\montaña_AP_V4.shp*", the cartographic base of mountainous areas present in the project's protected areas is available.

Confirming the information with that described by (COONAPIP, 2009), it is identified that part of the territory of the Sambú District overlaps with Darién National Park and is constituted by the Jingurudó mountain range, Cerro Jingurudó (1,506), and in the Sapo mountain range, Cerro Sapo (1,145), mountains with an altitudinal gradient ranging from

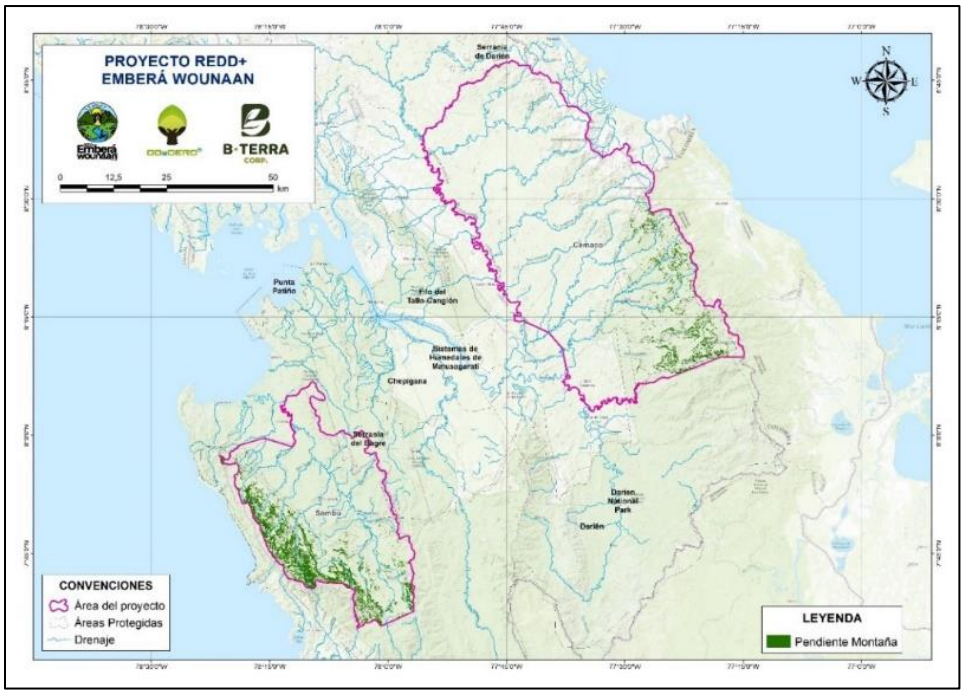
800 to 1,000 meters above sea level. Additionally, the area of the Cémaco District borders to the north and west with the Metetí district and the Darién Mountain range; to the south with Darién National Park; to the east with the Republic of Colombia and presents a relief composed of mountain ranges, hills, plains, hills, and coastal plains.

Table 8. Mountain landscape by protected area.

Protected area	Area (ha)	Area (%)
Darién	19,392.30	99,89 %
Darién Mountain	9.96	0,05 %
Bagre Mountain	11.16	0,06 %
Total	19,413.41	100,00 %

Source: CO2CERO S.A.S., 2023.

Figure 11. Mountain landscape within protected areas.



Source: CO2CERO S.A.S, 2023.

2.5.1.5.3 Agrological Capacity

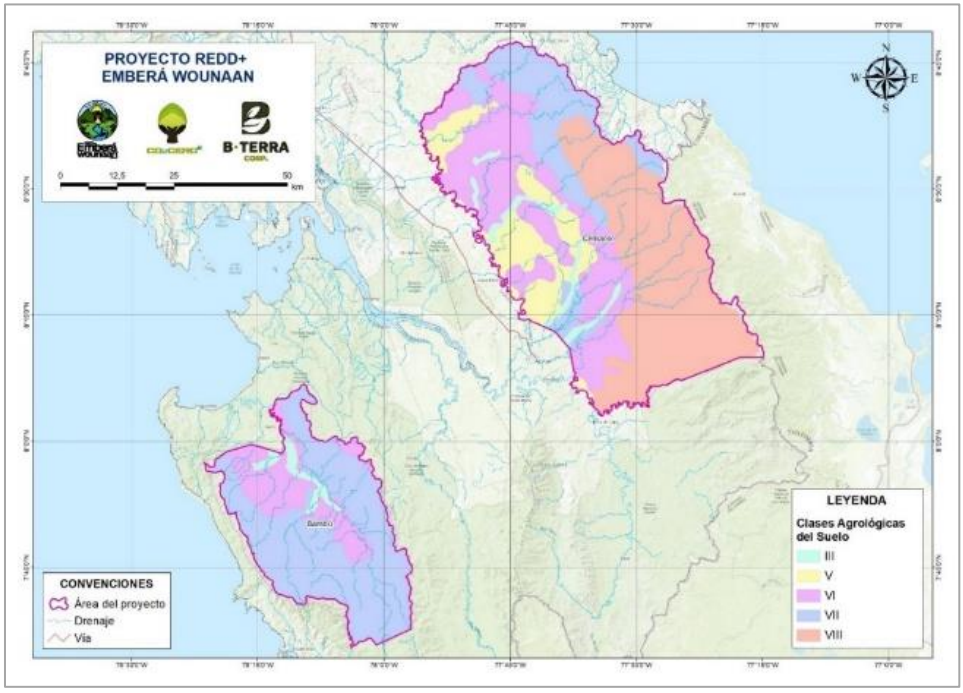
According to the information presented by the National Directorate of Agrarian Reform; Rural Land and Water Cadastre, May 1968 (CATAPAN Project), type I soils correspond to those with the greatest capacity, while type VIII soils represent those with the greatest limitations due to one or more adverse characteristics they possess. Therefore, it is concluded that within the project area, soils with some type of limitation are more prevalent, primarily falling within the higher categories (V, VI, and VIII), as observed in **Table 9** and **Figure 12**. The cartographic base of soil suitability by agrological class is in "*04_SIG\4_SHP\Clases_EW_V6_Diss.shp*"

Table 9. Agrological capacity in the Project area.

Type	Aptitude	Area (ha)	Area (%)
III	Arable, severe limitations in plant selection, requires special conservation, or both.	14,710.52	3.37%
VII	Non-arable, with very severe limitations suitable for forests, grasslands, reserve lands.	40,220.64	9.21%
VIII	Non-arable, with limitations preventing its use in commercial plant production.	119,278.66	27.32%
VI	Non-arable, with severe limitations for forests, grasslands, reserve lands.	144,256.17	33.04%
V	Non-arable, low risk of erosion, but with other limitations, suitable for forests and grasslands.	118,085.48	27.05%
Total		**436,551.48**	100.00%

Source: (National Government of Panama, 2010).

Figure 12. Agrological capacity in the Project area.



Source: CO2CERO S.A.S., 2023.

2.5.1.5.4 Land cover

When detailing the information for the districts of Cémaco and Sambú and based on the Forest Cover and Land Use map of the Republic of Panama from 2012, it is observed that out of the total area of 436,551.48 hectares, 399,565.77 hectares, equivalent to 91.5% of the extension, correspond to mature mixed broadleaf forests (**Table 10** and **Figure 13**). Within this cover, tropical humid forests and tropical montane forests are found, as previously described, according to the altitudinal gradient.

The second most important cover in terms of extension corresponds to secondary mixed broadleaf forests, i.e., forests that have undergone some type of anthropic intervention. They occupy an extension of 23,900.49 hectares, equivalent to 5.5% of the total extension. They mainly correspond to tropical humid forests located in the valleys of the main rivers present in the Comarcas and around human settlements. This is the case of the Sambú River, which crosses the middle of this district, and several rivers on the western slope of the Darién Mountain range in the Cémaco District.

The next most important cover is the scrubland and shrubby vegetation, covering 4,577.60 hectares, or 1.04% of the total area, and is located according to the same dynamics as the secondary mixed broadleaf forest cover. Considering all the covers that imply some agricultural or livestock activity by indigenous communities, they occupy a total extension

of 10,262.59 hectares, equivalent to 2.35% of the total extension. The cartographic base of the land covers identified within the project area is located within the folder[4].

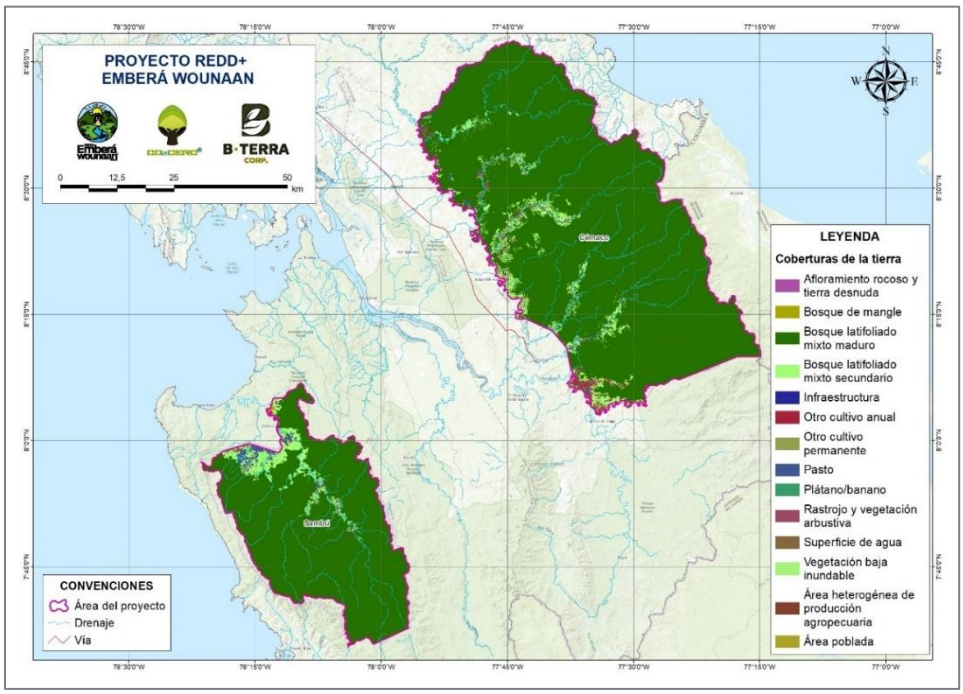
Table 10. Landcover identification in the Project area.

Landcover	Area (ha)	Area (%)
Mixed mature broadleaf forest	399,565.77	91.53 %
Secondary mixed broadleaf forest	23,900.49	5.48 %
Mangrove forest	212.20	0.05 %
Planted broadleaf forest	8.55	0.002 %
Brushwood and shrubby vegetation	4,577.60	1.05 %
Low floodable vegetation	152.36	0.04 %
Rock outcrop and bare soil	49.59	0.01 %
Beach and natural sandbank	1.20	0.000 %
Plantain/banana	138.82	0.03 %
Other permanent crop	125.67	0.03 %
Rice	2.13	0.000 %
Other annual crop	676.16	0.16 %
Heterogeneous agricultural production area	1,484.31	0.34 %
Pasture	3,055.95	0.70 %
Water Surface	2,300.08	0.53 %
Populated área	276.45	0.06 %
Infraestructure	24.16	0.006 %
Total	436,551.48	100.00 %

Source: CO2CERO S.A.S.

Figure 13. Landcover map (2021) for the Project area.

[4] See in: *04_SIG\4_SHP\Coberturas_REDDEmberaW_V1.shp*



Source: CO2CERO S.A.S., 2023.

2.5.2 Socioeconomic characterization

2.5.2.1 Social description

The Emberá and Wounaan are two culturally similar groups in terms of history and culture. They differ by linguistic group: the Emberá speak the *Emberá* language and the Wounaan speak *Woun*. These two groups share the same territory and inhabit tropical lowland forests from northern Ecuador to the Panama Canal. Historically, they predominantly lived in the Chocó Department in Colombia, which is why they are commonly known as the "Chocó." The same author describes how, for centuries, these indigenous groups have populated the rivers of Darién in a simple manner, with scattered houses rather than villages.

Historically, they had no political or social organization superior to the family level; each settlement acted as a self-sufficient economic unit, with the oldest father or man as the highest authority. In recent decades, this structure has changed, as they have grouped into villages and developed a political organization to obtain their own Comarca with semi-autonomous administration (Herlihy, Peter, 1987). In addition to the Emberá-Wounaan of Panamanian Darien, there are other Emberá or Chocoes groups in other geographical areas, such as the Emberá Catío located in northwestern Colombia and bordering Panama or the Emberá Chami who inhabit the Colombian Andes (Regidor & Gil Tébar, 2017).

2.5.2.2 Historic description

The historical description of the Emberá - Wounaan groups outlined below largely recapitulates a publication by geographer Peter Herlihy titled 'Changes in the Cultural Landscape of the Emberá and Wounaan (Chocoes) Indians of Darien, Panama' (1987). In this work, he summarizes the main results of his research and publications on this group (Herlihy, 1985).

Before the 18th century, the Darien region was the territory of the Cuna and Cuevas Indians, not the Chocoes (Herlihy, Peter, 1987). The same author suggests that Emberá Indians may have existed in the southeast of Darien in the upper Sambú since pre-Columbian times, but the entire Darien region was inhabited by the Cuna and Cuevas. Since the 17th century, the Spaniards, with the help of Chocoes Indians and Blacks, attempted to colonize the Darien region, managing to drive out the Cuna Indians to the headwaters of the Chucunaque and Tuira rivers. In 1789, the Spaniards abandoned their intentions to colonize the Darien, paving the way for the control and settlement of Emberá and Wounaan Indians (Herlihy, Peter, 1987). The same author mentions that in the 19th and 20th centuries, the Emberá - Wounaan population grew and occupied the major rivers of Darien by Embera - Wounaan. In 1960, families occupied the basins of the Chucunaque, Tuira, Balsas, Sambú, Jaqué, and Congo rivers. Although there were no population data available at that time (Herlihy, Peter, 1987) he estimates, based on his knowledge and perception, that there were 6,200 inhabitants in the Embera - Wounaan population in Darien.

Herlihy (1987) recapitulates from oral history and ethnological accounts that since colonial times, the social structure of the Emberá and Wounaan has been egalitarian, without tribal chiefs, chieftains, or elder structures. Certain religious beliefs and ceremonial activities are centered around the shamán or jaibaná. However, from the standpoint of political, economic, or personal relations, no individual has held a chief position. The head of the family or noko in the Emberá language has authority as a chief adviser and ultimate authority and is responsible for distributing domestic resources and resolving disputes. Occasionally, there is also a group of relatives led by the oldest and most respected man (Herlihy, Peter, 1987).

Continuing with his description, (Herlihy, Peter, 1987) described that the traditional landscape of the Emberá and Wounaan Indians consists of scattered houses along the riverbanks. Typically, each populated place is home to an extended family. There were no villages or large clusters of houses. Houses on stilts, with roofs made of palm leaves, are scattered along the banks, usually built on riverbanks or alluvial terraces. The population density varies from river to river, but houses are typically spaced apart, at least several

hundred meters; the forest and the bends of the river obstruct the view of the neighbor's house. The population is usually larger in places where the Indians have lived longer (Herlihy, Peter, 1987).

Regarding the traditional means of subsistence of the Emberá and Wounaan Indians, (Herlihy, Peter, 1987) relates it to the pattern of the traditional landscape of scattered houses. The populated environment has three land zones extending away from the river. The first zone, adjacent to the river, is narrow; it typically lies on the side of the best riverbank soils or alluvial terraces. It is approximately 50 to 75 meters wide, including the house, animal pens, banana and plantain crops, and fruit trees. The second zone consists of swamps and seasonal forest of variable extent, but usually less than a kilometer wide. This zone supports pigs and other domestic animals, away from the third zone of cultivable grains, while providing fodder for roaming pigs. This zone also serves as a natural resource repository. The third zone is the smallest but has significant grain and root production. In this zone, amidst a mixture of seasonal forest and secondary vegetation, called fallow, there are small fields planted with corn, rice, and yams (Herlihy, Peter, 1987) .

In Darién, indigenous populations have not been forced to relocate from their traditional lands as in other parts of Central America. The traditional organization of Emberá and Wounaan culture began to change in Darién during the 1960s. The Emberá and Wounaan Indians are concerned with their own relocation scheme, where dispersed populations following historical patterns are now forming villages to gain rights to their lands and political control of their culture. (Herlihy, Peter, 1987) mentioned that this movement to relocate the Emberá and Wounaan into villages was developed by the indigenous people themselves. An older generation had already gained some experience through gradual but persistent contacts with the Panamanian national economy. Parents realized that their children could not deal with strangers without speaking Spanish. In the 1950s, the first villages began to form around schools. A small number of villages were the result of missionary activities between 1954 and 1960, where the "villages" were nothing more than clusters of huts around "churches" with palm roofs. In 1983, of an estimated population of 11,140 Emberá and Wounaan indigenous people in Darién, approximately 75% lived within fifty-three villages along the rivers in Darién. Of these villages, thirty-seven were Emberá villages, twelve were Wounaan, and four had a mix of both languages(Herlihy, Peter, 1987).

The same author mentioned how the transition to village life has greatly changed the traditional spatial order of Emberá and Wounaan settlements. By the 1980s, villages ranged from 25 to 450 inhabitants. In all cases, the villages were confined to one side of the river. The growth of populations does not mean that isolated houses will be established along the riverbanks. Nowadays, houses are clustered in villages that expand laterally into

the surrounding forest. The three characteristic zones of traditional settlements can no longer be seen. Houses are situated in groups within large areas where natural vegetation has been cleared. In the center of the village is a school, a teacher's dormitory, and a communal house. Additionally, there is usually a store, a basketball court, and sometimes a health center. The native forest has been cleared to a distance of three to six kilometers depending on the size of the village. This area is covered with cultivated land and extensive fallow land. Subsistence has also changed. Typically, subsistence and commercial farming activities are located far from residential areas. Domestic gardens are no longer significant, and now many indigenous people cultivate fruit trees on farms far from the village. All agricultural activities, including burning, shifting cultivation, and banana and plantain stalks, are reasonably located within walking distance, where land is claimed and cultivated or left fallow.

Efforts to obtain legislative approval for a Comarca like the Emberá and Wounaan indigenous people of Darién developed slowly. In the government of Arístides Royo at the end of the 1970s, formal positions were created in which representatives would act as "ambassadors" between the "Panamanian nation." These individuals would serve as representatives in all social, economic, and cultural aspects and would be paid by the national government. While the acquisition of reserves and Comarcas had been discussed for a long time in the Emberá General Congresses, it had now become a dominant focus. These new representatives were tasked with drafting the "Draft Law" to create the Comarca Emberá Drua in Darién. The translation of Emberá Drua means "Embera Land."

Lastly, Herlihy concluded that the movement to organize Emberá and Wounaan culture began in the 1960s and spread rapidly. In less than two decades, a cultural landscape that had changed little since colonial times had been transformed. The changes produced in the 1960s and 1970s were positive. The Emberá and Wounaan Indians of Darién have developed a tribal organization. While new leaders worked to form a structure in a growing political system, they also learned to deal with the political and economic issues arising from the opening of the Pan-American Highway to Darién. Additionally, the Emberá and Wounaan Indians recognized the geographical boundaries of their Comarca, which are important in their confrontations with settlements of people coming from the western provinces and cities, who are forming villages along this highway. Even more importantly, the Emberá began to control their own cultural destinies. However, there were fewer desirable aspects regarding these cultural changes. The "village model" has changed the organization of subsistence and cultural values of land ownership and inheritance. Now, agricultural lands are considered commercial capital, complicating land tenure within the Comarca. The growth and concentration of the population, along with

the increased commercialization of subsistence, because of village life, have put more pressure on the ecology of the region.

2.5.2.3 Comarca conformation

The efforts undertaken in the late 1970s, which led to the drafting of the preliminary bill for the creation of the Emberá Drua Region, ultimately resulted in the promulgation of Law 22 on November 8, 1983. This law officially recognized the territories inhabited by the Emberá and Wounaan ethnic groups and granted them collective title through the figure of the "Emberá Wounaan Region."

In its first article, the law decrees the segregation of the districts of Chepigana and Pinogana in the Province of Darién to create the Emberá-Wounaan Region. The lands defined by the law, except for those already privately owned, became the property of the Region for the collective use of the Emberá and Wounaan indigenous groups, with the purpose of dedicating them to agricultural and industrial activities, as well as other programs promoting their integral development.

The law also prohibits the private appropriation or alienation of these lands by any means. Union Chocó was established as the capital of the Region and the seat of the Regional Government. Additionally, the Emberá Region, according to the new law, was divided into two Regional Districts: The Cémaco District, with its capital in the Community of Union Chocó; and the Sambú District, with its capital in Puerto Indio.

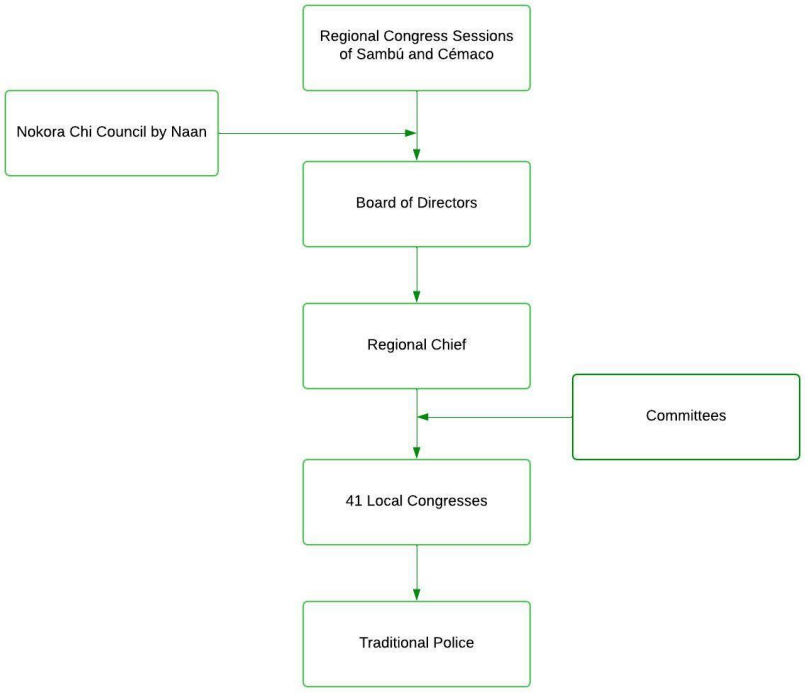
On April 9, 1999, Executive Decree No. 84 was drafted, published a week later, which incorporated the articles of Law No. 22 of 1983 and established new reforms. This new Decree recognized the right to indigenous autonomy and self-management for the Emberá-Wounaan people, in ongoing and harmonious collaboration with the government entities established in the Region (Regidor & Gil Tébar, 2017).

2.5.2.4 Political-administrative organization

Regarding political and administrative organization, Law No. 22 decrees the institution of the General Congress of the Comarca as the highest traditional decision-making and expression body of the Emberá people. It also establishes Regional Congresses and Local Congresses, in addition to the Nokora Council as a consulting body for the Congresses and the Chiefs of the Comarca. The position of General Chief was appointed as the first traditional authority of the Emberá people, with functions and powers established in the Organic Charter of the Comarca. In turn, in each Comarcal District, there will be a Regional Chief. All these traditional authorities are elected, according to the Law, every five years with the right to re-election.

The General Congress of the Comarca is the highest decision-making and expression body of the Emberá-Wounaan people, so it is the main body that decides on the plans, programs, and projects to be carried out in the Comarca. It meets every two years, on dates set by the board of directors and the general chief. Its decisions are communicated through resolutions (Congreso General Emberá-Wounaan, 2000). The regional congresses for both Cémaco and Sambú are composed of the congress sessions, the consultative body Noko Council, the Board of Directors, the regional chief, an administrative body, local congresses, committees, and the traditional police (Congreso General Emberá-Wounaan, 2000).

Figure 14. Organizational structure of the regions of the Comarca Emberá Wounaan.



Source: Compiled by CO2CERO S.A.S., 2022.

Finally, the Law 1983 establishes that the government and the Emberá Community will ensure the conservation and rational use of renewable natural resources, such as flora, fauna, and water. Additionally, they took into account the importance of education and culture in this community, with the implementation by law of a special program of bilingual education planned, organized, and executed in cooperation with indigenous authorities and educational entities of the State; and the guardianship of archaeological

sites and objects, historical documents, and any other valuable assets from the past of the Emberá people and their ancestors by the National Directorate of Historical Heritage of the National Institute of Culture along with indigenous authorities.

2.5.2.5 Demographic description

According to the latest population census of the Republic of Panama, in 2010, the total population in the Emberá Wounaan Region was 10,001 inhabitants. In 2000, it was 8,246, and in 1990, it was 7,970 inhabitants. The annual growth rates for the first period were 0.34 and 1.95 for the period between 2000 and 2010 (INEC, 2011). Considering that the surface area of the Emberá-Wounaan Region is 4,394 km², the population density increased from 1.9 inhabitants/km² in 2000 to 2.3 inhabitants/km² in 2010 (INEC, 2011). Of the total population living in the Comarcas in 2010, 54% were men and 46% were women (Davis E. , 2010). Similarly, in 2000, 94.3% identified themselves as members of the Embera – Wounaan people, which is 9,433 individuals. In 2010, 92.5%, equivalent to 7,630 individuals, recognized themselves as members of this ethnic group (INEC, 2011). This means that within the territories of the Comarca Embera Wounaan, most of the population belongs to this ethnic group.

Table 11. Population results from the latest censuses in Panama.

AREA, POPULATION, AND POPULATION DENSITY IN THE REPUBLIC, BY PROVINCE, INDIGENOUS REGION, DISTRICT, AND SUB-DISTRICT: CENSUSES FROM 1990 TO 2010							
Province, Indigenous Region, District, and Sub-District	Area (km²) (23)	Population			Density (inhabitants per km²)		
		1990	2000	2010	1990	2000	2010
COMARCA EMBERÁ (1)	**4.393,9**	**7.970**	**8.246**	**10.001**	**1.8**	**1.9**	**2.3**
Cémaco.....	**3.097,5**	**5.958**	**6.292**	**7.715**	**1.9**	**2.0**	**2.5**
Cirio Guainora (Cabecera)	434,8	1.428	2.015	2.197	3.3	4.6	5.1
Lajas Blancas.....	1.548,2	2.662	2.638	3.735	1.7	1.7	2.4
Manuel Ortega.....	1.114,6	1.858	1.639	1.783	1.7	1.5	1.6
Sambú.....	**1.296,4**	**2.012**	**1.954**	**2.286**	**1.6**	**1.5**	**1.8**
Río Sábalo.....	562,2	1.479	1.417	1.800	2.6	2.5	3.2
Jingurudó.....	734,2	533	537	486	0.7	0.7	0.7

Source: INEC, (consultation July 2022[5]).

[5]See in: https://www.inec.gob.pa/publicaciones/Default3.aspx?ID_PUBLICACION=360&ID_CATEGORIA=13&ID_SUBCATEGORIA=59

The crude mortality rate was 4.9 persons per 1,000 persons for the Republic of Panama in the year 2010. In the Comarca Emberá Wounaan, this rate was 29.1 inhabitants per 1,000 inhabitants: significantly higher than the national value. However, there is evidence of a decrease compared to the rate reported for the year 2000, which was 35.7 persons per 1000 inhabitants (INEC, 2011). In the case of infant mortality, in the Comarca Emberá Wounaan, the mortality rate was 5.9 persons per 1000 inhabitants, while the national value was 4.9 persons per 1000 inhabitants. Comparing this indicator with the one obtained in the year 2000 for the Comarca, there was a decrease in mortality, as it was 6.9 persons per 1000 inhabitants at that time(INEC, 2011).

Regarding life expectancy, the population of the Comarca Emberá Wounaan had a life expectancy of 68.77 years in 2010. This value is significantly lower than the value for the Republic of Panama, which was 76.74 years (INEC, 2011). Compared to the values from 2000, the life expectancy of the Comarca population increased by 3.06 years (INEC, 2011). Other noteworthy variables for the Comarca: the 2010 census identified that, on average, 5.1 people inhabit each household. The median age of the population is 17 years, with 44.64% of the population being under 15 years old, 50.07% of the population being between 15 and 64 years old, and the remaining 5.29% being over 65 years old. When analyzing the population by district, Cémaco had 7,715 inhabitants across its three districts and a population density of 2.5 inhabitants per km^2. In the case of Sambú, the population was 2,286 inhabitants with a population density of 1.8 inhabitants per km^2 (see **Table 11**).

3 Quantification of GHG emissions reduction

The quantification of reduced GHG emissions from deforestation and forest degradation for the Emberá Wounaan REDD+ Project is carried out using the BCR 0002 methodology from the BioCarbon Standard, version 3.1. The application of this methodology is based on matching forest cover identified within project boundaries with the variables and parameters required in the calculation methods. Similarly, the project addresses the biophysical and dynamic conditions of deforestation and forest degradation, characterized by their historical trend in the decade prior to the project's start date, based on patterns of agents, factors, and underlying causes caused by these phenomena within the territory.

3.1 Quantification methodology

The methodology used for quantifying avoided GHG emissions corresponds to the Quantification of GHG Emission Reductions for REDD+ Projects BCR 0002 from BioCarbon Standard, version 3.1.

3.1.1 Applicability conditions of the methodology

Below, the compliance with the applicability conditions defined for methodology BCR 0002 version 3.1 for Quantification of Greenhouse Gas Emissions Reduction in REDD+ projects is justified.

a) *The areas within the project's geographical boundaries correspond to the forest category (according to the national definitions of forest for the Clean Development Mechanism) at the start of the project activities and ten years before the project's start date.*

Panama's forest reference level defines a forest as "*Land extending over more than 0.5 hectares, with trees having an average height of over 5 meters and a canopy cover greater than 30%; or trees capable of reaching these thresholds in situ, provided the land has been designated for restoration, conservation, and/or forest management purposes. In the latter case, where abiotic conditions limit the trees from reaching 5 meters in situ, it will be enough for them to exceed 30% coverage. It does not include land predominantly used for agricultural or urban purposes*" (Ministry of Environment, 2018).

The REDD+ Emberá Wounaan project has evaluated, according to the previously indicated forest definition, the stocks in the section *3.6.1 Eligible areas within GHG project boundaries (AFOLU sector projects).* This ensures compliance with the definition and the corresponding coverage to be applicable within REDD+ type GHG mitigation initiatives.

b) *Identified causes of deforestation may include, among others, agricultural frontier expansion, mining, timber extraction, and infrastructure expansion.*

According to the analysis of deforestation factors (see *7. Causes and agents of deforestation and forest degradation*) conducted within the territory through social mapping, territorial diagnosis, and forest cover monitoring, it is possible to identify the direct causes of deforestation as timber harvesting for internal consumption, cultivation for subsistence, and illegal logging for the commercialization of fine woods. The recognized agents of mobility in and around the project area include road infrastructure (highways and roads), navigable rivers, and the establishment of infrastructure for community housing; corresponding to applicability condition b.

c) *Identified causes of forest degradation may include, among others, selective logging, firewood extraction, forest fires, grazing in forests, agricultural frontier expansion, and illicit crop cultivation.*

According to the analysis of degradation agents within the comarca, it is possible to determine selective logging for the acquisition of fine woods for commercialization, wood

extraction for firewood, and the establishment of family agricultural units (UPME, 2018)(See ***Error! Reference source not found. Error! Reference source not found.*** and ***Error! Reference source not found. Error! Reference source not found.***).

d) The reduction of deforestation or degradation is not expected to occur in the absence of the project.

The REDD+ activities designed for the initiative focus on protecting territorial boundaries as a mechanism for preserving natural capital, with the forest being the fundamental asset. Additionally, strategies such as sustainable forest management and the implementation of forest nurseries are considered, which are new elements for the territory. These strategies promote forest conservation and strengthen the community's capacity for the proper use and management of the forest. Within national initiatives such as the National Forest Restoration Strategy and the Alliance for the Million, specific areas of the Comarca Emberá Wounaan are not identified.

In addition, the Project has identified the baseline scenario through the analysis of barriers for probable land uses, finding that, as mentioned in section *Sub-step 2b. Elimination of land use scenarios that are prevented by the identified barriers*, an increased in agricultural activities and production. This has led to an increase in demand for agricultural products and has impacted forests through slash-and-burn agriculture and subsequent conversion to pasturelands (Arcia, J, 2017), this increase in agricultural activities and production is evident in the agricultural GDP, which recorded a 9% growth in the second quarter of 2021. Activities such as rice and corn cultivation increased by 5.2% and 7.7%, respectively, while the livestock sector also saw growth in cattle slaughter (16.2%), pork production (24.1%), poultry meat (19.4%), and milk production (6.5%) (INEC, 2021). Showing that, without the implementation of the REDD+ Emberá Wounaan project, deforestation and forest degradation will continue to increase.

e) It is possible that, in the areas within the project's boundaries, carbon reserves in soil organic matter, litter, and dead wood may decrease or remain stable.

The project objectives include designing activities to mitigate and prevent the increase of deforestation and forest degradation factors at the local level for a period of 30 years. This would lead to the creation of conserved forest systems with lower loss dynamics, as the disturbances that produce deadwood, litter, and soil organic carbon will show low intensity, ensuring their balance and, according to forest dynamics, their reduction, as indicated by Spies and others (1988) in Eggleston and others (2006).

f) The quantification of GHGs other than CO_2 should be included in the quantification of emissions caused by forest fires (if applicable) during the monitoring period.

The project conducts a spatial analysis of the presence of forest fires for the different years of the monitoring period within the project boundaries and the leakage area, according to

the information provided by (Tyukavina, et al., 2022)[6]. Based on this analysis, the results show 90.60 hectares affected by fires within the project area and 70.17 hectares in the leakage belt. The deductions for CO_2, CH_4, and N_2O emissions are detailed (see *1.5.2.3 Forest fires* in the Monitoring Report).

3.2 Project boundaries, sources and GHGs

Below, spatial and temporal boundaries related to the REDD+ Emberá Wounaan project are described.

3.2.1 Spatial limits of the project

The REDD+ Emberá Wounaan Project is in the Darién Province (Panama), encompassing 41 communities with approximately 10,000 beneficiaries and 436,551 hectares distributed across two sectors. The Cémaco Region includes three townships: Cirilo Guaynora, Manuel Ortega, and Lajas Blancas, accounting for 72% of the total area. The Sambú Region comprises two townships, Río Sabalo and Jingurudó, covering 28% of the total area. To verify the procedure defined for establishing the reference region, the project area, and the project's leakage belt, refer to the *3.6.1.1 Reference region* and *3.6.1.2 Leakage area*.

3.2.2 Carbon reservoirs and GHG sources

Within the REDD+ Emberá Wounaan project, changes in carbon stocks are considered for the following carbon reservoirs: aboveground biomass, belowground biomass, deadwood, litter, and soil organic carbon. **Table 12** presents the selected carbon reservoirs according to methodology BCR 0002 version 3.1, while **Table 13** presents the selected emission sources and GHGs for the current project.

Table 12. Selection of carbon reservoirs.

Source or reservoir	GHG	Included (Yes/No/Optional)	Justification
Aboveground biomass (Tree)	CO_2	Yes	The change in carbon content in this reservoir is significant, according to the IPCC.
	CH_4	No	
	N_2O	No	
Aboveground	CO_2	No	

[6] See in: *04_SIG/Informe Geoprocesamientos SIG REDD+Embera Wounaan_V6.docx*

Source or reservoir	GHG	Included (Yes/No/Optional)	Justification
biomass (Non tree)	CH_4	No	Not applicable, as the land's final use (after the change) does not involve establishing permanent crops.
	N_2O	No	
Belowground biomass	CO_2	Yes	The change in carbon content in this reservoir is significant according to the IPCC.
	CH_4	No	
	N_2O	No	
Deadwood and litter	CO_2	Yes	In the post-deforestation scenario, the carbon content due to dead wood and litter can increase, given the forest conservation dynamics.
	CH_4	No	
	N_2O	No	
Soil organic carbon	CO_2	Yes	The carbon stocks in this reservoir increase due to project activities.
	CH_4	No	
	N_2O	No	

Source: CO2CERO S.A.S, 2022.

Table 13. Emission sources and GHG selected.

GHG	Selection	Justification
CO_2	No	The CO_2 emissions resulting from the combustion of woody biomass are quantified as changes in carbon stocks.
CH_4	Yes	The emission of CH_4 is included in areas where fires are recorded during the monitoring period.
N_2O	Yes	The emission of N_2O is included in areas where fires are recorded during the monitoring period.

Source: CO2CERO S.A.S., 2022.

3.2.3 Time limits and analysis periods

3.2.3.1 Project start date

The project's start date, April 20, 2018[7], reflects the moment when the Emberá Wounaan communities, voluntarily and autonomously, managed their internal administration to initiate concrete actions aimed at reducing GHG emissions through the conservation of natural forests. This initiative originated from the communities themselves, demonstrating their commitment to protecting forest resources and preserving their cultural identity.

Support for this date is found in Administrative Resolution No. 07 issued by the Emberá Wounaan General Congress, which includes a series of specific measures for forest conservation. Among these measures[8], REDD+ projects are highlighted as a tool for conservation, particularly through strategies related to carbon dioxide capture.

In this context, Resolution No. 07 of April 20, 2018, also references the regulatory framework that established the Emberá Darién Territory. This territory was segregated from the Province of Darién, covering two geographic areas in the districts of Cémaco and Sambú, with the purpose of promoting the integral development and cultural identity of the Emberá and Wounaan people. It is important to note that the Emberá Wounaan Territory is subject, in terms of administration, to the provisions of the National Constitution, current laws, and the regulations adopted by the General Congress of the Territory, which are executed by municipal governments and state agencies operating within its jurisdiction[9].

The Act of Resolution No. 07 also underscores the active participation of the Emberá Wounaan General Congress in national REDD+ discussions, including its contribution to the development of the National REDD+ Plan and the National Indigenous Peoples REDD+ Plan, in collaboration with the Ministry of Environment. These actions were formalized through a resolution signed by the President of the General Congress, Edilberto Dorigama, and the General Cacique, Edilfonso Aji, emphasizing the intention to conserve the Territory's forests under a conservation and protection scheme related to carbon dioxide capture.

It is worth noting that, although the National Government promoted initiatives such as the "One Million Hectares Program" (Law 69 of October 30, 2017)[10], the Emberá Wounaan

[7] See in: *07_Fecha de inicio\ResAdm_07_2018.pdf*.
[8] See in: *07_Fecha de inicio\ResAdm_15_2018.pdf*.
[9] Law 22 of November 8, 1983, which established the Emberá Darién Territory.
[10] See in: *07_Fecha de inicio*

Territory chose not to join the program, highlighting the voluntary nature of its efforts. By staying outside this program, the communities did not receive benefits associated with Law 69 of 2017, reaffirming that their actions were taken independently and without external conditions. However, Law 69 of October 30, 2017, served as a guide for the communities in structuring their conservation strategies.

3.2.3.2 Quantification period of GHG emission reductions

The quantification of emission reduction from the project will be conducted from the start date of the initiative, corresponding to April 20, 2018, until April 19, 2048, within a 30-year accreditation period.

3.2.3.3 Monitoring periods

Triannual verifications are proposed to evaluate the emissions avoided by deforestation and forest degradation, with a maximum period of 5 years in accordance with the project's conditions. The procedures carried out to monitor the emission reductions from deforestation and degradation will consist of spatial analysis using GIS tools, where changes in forest cover will be validated to proceed with the quantification process defined by BioCarbon Standard. Additionally, every 10 years, the baseline scenario will be revalidated, and the areas will be monitored through geoprocessing.

3.3 Identification of the baseline scenario and additionality for AFOLU projects

Below is the analysis conducted to determine the additionality and identify the baseline scenario of the Emberá Wounaan REDD+ Project, following the methodology BCR 0002 Version 3.1 and the Biocarbon Guidelines "Baseline and Additionality. GHG Projects generate Verified Carbon Credits (VCC) that represent emissions reductions, avoidance, or removals that are additional. Version 1.2" dated September 27, 2023, generated by BioCarbon Standard.

3.3.1 Baseline scenario and Additionality

For determining the additionality of Emberá Wounaan REDD+ project, literal (c) stated in methodology BCR 0002 Version 3.1 was employed, focusing on Changes in carbon stocks within the Project boundaries, identifying the most likely land use at the beginning of the Project. To identify the baseline scenario, the following actions are applied:

a) Step 0. Preliminary screening base on the starting date of the Project activity
b) Step 1. Identification of alternative scenarios
c) Step 2. Barrier's analysis
d) Step 3. Common practice analysis

The application of this procedure is based on the principle that emission reductions generated do not correspond to reductions attributable to the implementation of actions required by law. Below, the content is developed for each of the mentioned steps, through evidence and support of the existence of different land uses and their correspondence with territorial reality.

Step 0. Preliminary screening base on the starting date of the Project activity

According to what was mentioned in the *Project start date*, the moment when the project starts generating emission reductions due to deforestation and degradation is April 20, 2018, given the implementation of activities for the conservation of natural ecosystems and forest cover.

Step 1. Identification of alternative scenarios

Below, the alternative land uses to the project are described, following the territorial context, through the analysis of trend land uses and the socio-economic dynamics currently configured.

Sub-step 1a. List of credible alternative land use scenarios that would have occurred on the land within the project boundary of the project activity.

Under this premise, the existing scenarios under the pre-project condition are considered, defining that these land uses would manifest with greater intensity over time within the territory. Similarly, the scenario in which the area consolidates conservation initiatives without being part of a REDD+ project is assumed.

- **Forest use**

The Emberá-Wounaan region has historically implemented activities related to selective logging for its own sustenance, infrastructure improvement, and in some cases, small-scale commercialization. However, in a scenario of massive exploitation, this could lead to increased rates of deforestation and forest degradation. This is related to the deforestation dynamics observed around the territorial boundaries, where excessive exploitation for commercialization to external actors has been noted. In other cases, the existence of permits and management plans has been evidenced, which in some places have regulated the use of wood. Nevertheless, due to lack of regulation and in accordance with observed deforestation trends, these management areas could expand and exceed the permitted quantities and sectors, primarily in the Cémaco sector.

Historically, the Emberá-Wounaan landscape shows housing infrastructure along the riverbanks, with extended families, which were built on stilts and with roofs made of palm leaves (Herlihy, Settlement and subsistence change among the chocó indians of the Darien

Providence, eastern Panamá, 1985). This demonstrates a utilization of the forest for subsistence related to basic housing infrastructure, where trees of resistant wood are selected from the forest, and palm leaves are used for roofing, which can have adverse effects on populations when not properly managed. Urban settlements also contribute to deforestation processes for material acquisition and territorial expansion, while also creating areas for subsistence crop cultivation (Herlihy, Settlement and subsistence change among the chocó indians of the Darien Providence, eastern Panamá, 1985).

- **Agricultural activities**

According to the information provided by the members of the board of directors and the community in general regarding deforestation events, one of them is the historical burning of forests for the establishment of subsistence crops. The livelihoods supported (Herlihy, Cambios en el paisaje cultural de los indios Emberá y Wounan (Chocoes) del Darién, Panamá, 1987) indicate that houses associated with riverbanks have houses, animal pens, plantain and banana crops, and fruit trees. In areas associated with marshlands and seasonal forests, they are associated with livestock activities for pig production, while the more distant zone has cultivable grains, fodder banks, and finally, in the fallow zone, it is common to find small fields of corn, rice, and yams. Subsistence activities have been evolving, and family gardens are no longer a favorable model for production. Cultivators now cultivate in areas far from urban centers, and in some cases, they plant fruit trees at a reasonable distance from their homes, which leads to a greater dispersion of deforestation and forest degradation events.

- **Cattle**

Furthermore, the occurrence of burnings for the expansion of cattle ranching frontier from the external zone towards the interior of the indigenous territory has been evidenced, as stated by (Requena, 2010). This phenomenon is evident in the border zone of the Panamanian Darién with the Indigenous Territory, within the Darién-Chocó ecoregion, where the main factors of land use change have been industrial timber extraction and cattle raising.

Regarding the development of this activity in areas similar to the project's location, according to (AED, 2004), there is a cattle ranching expansion in the sub-basins of Hules-Tinajones and Caño Quebrado, which are part of the Water Catchment Area of Lake Gatun and are located northwest of the La Chorrera District. It is established that more than 60% of the soils belong to categories V, VI, and VII, which are defined as non-arable zones with severe to very severe limitations for crop use and suitable for forests, pastures, and reserve areas, with an average temperature of 26°C and annual precipitation of 1,500-1,800 mm.

The soil is drastically transformed due to overutilization for cattle ranching, with a total of 178 cattle ranches covering an area of 9,875 hectares and a total of 7,872 head of cattle. 80% of these ranches are primarily dedicated to cattle ranching, with 60% focused on dual-purpose cattle and the remainder on cattle breeding and fattening. Additionally, 88% of the ranches employ an extensive model and 12% use a semi-intensive model.

- **Project activity without being registered as an AFOLU Project**

The implementation of conservation activities, productive improvement, and sustainable management can be carried out within the territories without the need for project registration; however, it will be subject to the contributions of the government regarding the Indigenous Territories, which are protected under the regulatory and normative framework of the provinces and the nation (see *Law 22 of 1983 - Art. 16*).

Likewise, it is the responsibility of the Indigenous Territories, through the corresponding bodies, to promote, plan, and execute projects for the integral development of the communities. It is the duty of the national government to provide technical and financial assistance to create productive mechanisms that favor the distribution and commercialization of the generated results. Among the sources of income that could favor investment in conservation and sustainable development are municipal revenues determined by the political constitution and laws of the republic (see *Law 22 of 1983 - Art. 17 and Art 18*).

Regarding the management of natural resources, the National Directorate of Renewable Natural Resources (DIRENA) of the Ministry of Agricultural Development and the community will promote actions for the conservation and rational management of natural resources such as flora, fauna, water, and soil. In cases of resource utilization, authorization must be obtained from the General and Regional Chiefs with prior information to the National Directorate of Natural Resources. In cases where there is exploitation of subsurface resources, an execution permit from the Executive Branch is mandatory, guaranteeing the participation of the community in the social and economic benefits derived from such activity (*Law 22 of 1893 Art. 20*).

According to the Political Constitution of the Republic of Panama, its *Chapter 7* on *Ecological Regime* determines (*Art. 118*) the state's responsibility to guarantee a healthy and pollution-free environment for the population, achieving a healthy and quality environment for the inhabitants. (*Art. 120*) It is the duty of the state to regulate, supervise, and implement measures to regulate the use and exploitation of fauna, forests, lands, and waters, avoiding their depletion. For this purpose, communities have approved studies with external entities for the monitoring and identification of the biotic factors that

comprise the area, some in partnership with the Fundación Panamá Canal de Vida and B-Terra (B TERRA; KAMCA FORESTAL, 2018), (Vega, Arroyo, & Potvin, 2019), (Fagua, Baggio, & Ramsey, 2019) & (Herlihy, Participatory Research Mapping of Indigenous Lands in Darién, Panama, 2003); finally, (*Art. 121.* The law shall regulate the use of non-renewable natural resources to prevent social, economic, and environmental harm.

Sub-step 1b. Consistency of land use alternatives with applicable laws and regulations.

Below are the described land use alternatives, where land uses that do not comply with applicable laws and regulations are identified.

Table 14. Consistency of land use alternatives with applicable regulations.

Laws and regulations	Description	Compliance
Use: Forest management		
Resolution N° AG-0613-2009	Which approves and adopts in all its parts the Methodological Guide for Developing General Forest Management Plans (PGMF) and Annual Operational Plans (AOP) in Tropical Forests, for the processing of requests for sustainable forest exploitation.	The activity is not governed by current regulations because its primary use in the project area is for subsistence and is carried out intensively, without limitations or restrictions on the amount of wood extracted. Regarding the communities' perception of established exploitation plans, there is no total clarity regarding the effective implementation of General Forest Management Plans (PGMF) within their territories. Currently, the initiative consolidates the community's perception and interest in applying these regulations regarding forest resource management.
Resolution N° DM 0201 of 24 november, 2022.	Provisionally suspends for one year the granting of special permits for subsistence forest exploitation and its modalities, as well as community permits and concessions in tropical forests for a term not exceeding one year. It is necessary to limit sustainable forest exploitations in Indigenous Territories to maintain a percentage of exploited area lower than 30% of the production forest area surface.	

Laws and regulations	Description	Compliance
Use: Agricultural activities		
Law 127 of 3 march, 2020	Imposes measures for the development of Family Agriculture in Panama, ordering strategies for this sector to achieve its full development.	Agricultural activities comply with the current regulatory framework, mainly under Law 127 of 2020, understanding subsistence agriculture and family farming practices as the primary activity of the Emberá Wounaan communities and their relationship with food security. Traditionally, community members teach their families from a young age how to utilize conucos (small plots of land) and cabuyas (traditional gardens), delineate their cultivation areas, and in some cases, form associations for the regional-scale commercialization of certain products. Currently, Panama is designing synergies between mitigation and adaptation measures of ecosystem services and the agricultural sector, which demonstrates management regarding the application of practices and risks in the face of climate vulnerability (CGIAR, 2014).
Law 17 of 2018	Rice is declared a national food security crop, being the main product of Panama's basic food basket. The state will adopt certain measures to support the production of this product.	
Law 18 of 2018	The regulatory framework for the special transportation of fuel for agricultural equipment or machinery is established, outlining the conditions that motor vehicles, or towing units must meet for this purpose.	
Use: Cattle		
Panama Livestock Development and Agricultural Health Program (1986)	Its objective is to increase the production and productivity of Panama's agricultural sector and consequently increase the supply to meet domestic demand, as well as to boost the export of agricultural and livestock products.	Although livestock farming severely affects aspects related to the environmental dimension in the project area, it does not violate what is described in the law, as there are programs to promote this activity, and policies aimed at increasing its productivity.

Laws and regulations	Description	Compliance
Law N° 352 (18 January, 2023)	Establishes the state's agri-food policy and dictates other provisions. Its main objectives are: • To contribute to the stability of the agricultural and rural sector, as well as of the indigenous and Afro-descendant population, as matters of national interest. • To promote the transformation of the agricultural sector to make it inclusive, efficient, sustainable, competitive, innovative, and entrepreneurial, guided by both the domestic and international markets, fostering the development of human capital, mainly in rural and indigenous populations. • To design an action plan in which the national agricultural producer is the protagonist of the country's food security and sovereignty. • To promote education, research, development, and local or indigenous innovation as a strategic driver to incorporate innovation into the agricultural sector.	Additionally, this activity is implemented at the community level to guarantee food security for some communities of the Emberá Wounaan Territory. Therefore, it is one of the recognized economic activities at the territorial level, and it contributes to deforestation, particularly in cases where it is carried out by external actors.
Use: Activity of the project without being registered as an AFOLU project.		
Law 22 of 1983 (Art. 16, 17 and 18).	This law creates the Emberá de Darién Territory, defines the integral development of the Territories, promotes	The Indigenous Territories are under regulatory protection, under which it is the state's duty to promote equity, integration, and development of indigenous

Laws and regulations	Description	Compliance
	comprehensive development projects, and sources of income.	communities, with the conservation of their way of life being one of them. Regarding the conservation of natural resources, it has been the responsibility of the Indigenous Territory to regulate the use and exploitation of its resources. This is reflected in internal mandates and orders that identify and condemn the indiscriminate use of renewable and non-renewable natural resources. At the same time, state entities have the responsibility to promote conservation actions and rational management within the territories. To achieve this, there must also be sources of income capable of favoring investment in conservation and sustainable development, such as municipal revenues.
Cabinet Decree 53 of 1971	Approval is granted regarding the protection and integration of indigenous populations.	
Use: Implementation of mitigation initiatives		
Law 37 of 1962 (Article 10, Article 26, and 27-5º).	The law defines the constitutional respect of indigenous communities in relation to other laws. It establishes reserve lands for indigenous tribes as exempt from being considered state lands subject to agrarian reforms.	Within the lines of climate change mitigation, the stabilization of greenhouse gas emissions is promoted, along with the implementation of development projects in various productive and non-productive sectors, and strategies for the development of projects contributing to sustainable development. Within this framework, REDD+ initiatives constitute the most favorable mechanisms for generating positive impacts on the atmosphere. This has driven the development of the National REDD+ Strategy as a link between communities, development, and mitigation to consolidate sustainable models favorable to the objectives of the UNFCCC.
Cabinet Decree 53 of 1971	It approves measures regarding the protection and integration of indigenous populations in accordance with ILO Convention 107. It promotes equality of rights and opportunities, the promotion of social, economic, and cultural	

Laws and regulations	Description	Compliance
	development, and national integration.	The implementation of a mitigation initiative includes the reduction of greenhouse gas emissions, which has been addressed in various regulatory instruments and national strategies such as climate change adaptation and the REDD+ strategy of the Panamanian government. In this regard, the initiatives provide a favorable scenario for communities when evaluated against the indicators of Contribution to the Sustainable Development Goals and socio-environmental safeguards, ensuring their participation, social development, and integration in accordance with ILO Convention 107. In the chapter *4 Compliance with applicable legislation,* the applicability and relevance of the project with national and international norms and regulations related to climate change, as well as indigenous social equity and inclusion, are evident.
Law 41 of 1998	Recognizes the right of the Indigenous Territories and indigenous peoples to the traditional sustainable use, management, and utilization of renewable natural resources, participating in comarcal advisory committees.	
Executive Decree 35 of 2007	This is a document approving the National Climate Change Policy, its principles, objectives, and lines of action.	
National Forest Development Plan (2008)	It establishes within the models of sustainable forest management, initiatives for emissions reduction from deforestation and degradation (REDD+).	
Law 69 of 2017	Incentive Program for Forest Cover and Conservation of Natural Forests.	
National REDD+ Strategy Panama (2022)	Voluntary strategy for contributing to the reduction of global carbon emissions from deforestation and forest degradation.	

Source: Compiled by CO2CERO S.A.S., 2023.

Step 2. Additionality analysis: Barrier analysis.

The demonstration of additionality of REDD+ Emberá Wounaan project is carried out through the analysis of barriers, evaluating which of the identified land use scenarios are not hindered by these barriers.

Sub-step 2a. Identification of barriers that would prevent the implementation of at least one alternative land use scenarios

Following the barrier analysis, it is determined whether the project and its activities can address those that prevent or limit its implementation and that also do not prevent the implementation of at least one land use alternative for establishing the baseline[11].

Sub-step 2b. Elimination of land use scenarios that are prevented by the identified barriers

The identified barriers do not prevent the implementation of agricultural and livestock activities regarding the availability of financing and the investment risk for short and medium-term activities. This is because there is access to financing through debt and credit facilities such as the BBVA Microfinance Foundation, Microserfin, (FMBBVA, 2020) and the Panama Agro Solidario Program. These institutions work closely with farmers and livestock breeders in the country (BDA, 2022).

Regarding social barriers, conflicts have arisen due to the expansion of agricultural and livestock frontiers in areas adjacent to the project area. However, these conflicts have been either resolved or mitigated, resulting in increased agricultural activities and production. This has led to an increase in demand for agricultural products and has impacted forests through slash-and-burn agriculture and subsequent conversion to pasturelands (Arcia, J, 2017), this increase in agricultural activities and production is evident in the agricultural GDP, which recorded a 9% growth in the second quarter of 2021. Activities such as rice and corn cultivation increased by 5.2% and 7.7%, respectively, while the livestock sector also saw growth in cattle slaughter (16.2%), pork production (24.1%), poultry meat (19.4%), and milk production (6.5%) (INEC, 2021).

In the implementation of REDD+ Emberá Wounaan project, six (6) sub-barriers that could hinder its development have been identified based on the project's context information. These barriers are primarily related to investment, including limited access to credit and

[11] See in: *02_Cobeneficios\1_Add_REDD+Emberá Wounaan_V1.xlsx*.

capital financing due to the high uncertainty associated with the project's long-term execution. Financial institutions view such investments as high-risk, leading to increased credit rates. Additionally, there are social barriers stemming from land use conflicts and the unconventional nature of the REDD+ project, being the first of its kind in the country and at the regional level, given its focus on conservation and sustainable resource management, which diverges from other proposed models in the territory.

Sub-step 2c. Determination of baseline scenario.

Within the list of selected land use scenarios, livestock and agricultural activities are included; however, the project activity not registered as an AFOLU project is removed from the probable scenarios because it does not overcome any of the three identified sub-barriers.

The determination of the baseline scenario is carried out through a coverage analysis for the year 2020 within the project area using the Forest Cover and Land Use map of the Republic of Panama for the year 2021. It was found that pasturelands have a higher coverage compared to agricultural crops (**Table 15**), with a difference of 2,113.17 hectares. Additionally, during the workshops to identify factors of deforestation and forest degradation, it was observed that this economic activity has increased throughout history within the Comarcas. Therefore, the baseline scenario for this project is livestock farming.

Table 15. Landcover present in Project area in 2020.

Landcover	Crops (ha)	Pasturelands (ha)	Difference(ha)
Area (ha)	942.78	3,055.95	2,113.17

Source: Landcover map and land use in Panamá, 2012.

Step 3. Common practice analysis

Within the analysis of common practice, the company ANCON is found, which established the Punta Patiño Private Nature Reserve in 1993, encompassing a private area of 30,000 hectares consisting of mature secondary forests and primary jungles. ANCON has established agreements with community organizations for the development of projects for sustainable production. The emergence of a social enterprise, Artesan Panamá, S.A., and the production of 100% natural virgin coconut oil were presented, the only Panamanian coconut oil brand with sanitary permission from the processing plant and product sanitary registration, currently for sale in stores in Panama. To generate the necessary income, there are partner programs, carbon footprint compensation, and donations to preserve the Patiño forests, with actions to protect the reserve, as significant resources must be invested

year after year, as the reserve has a budget of around $300,000 in recurring expenses and investments necessary for its conservation (ANCON, s.f).

The German cooperative The Generation Forest in Panama carries out actions focused on nature conservation, using money from the acquisition of shares by its 6,000 members. The company purchases cleared lands from farmers who suffer from reduced yields due to compaction by livestock and depletion from rice cultivation. In deforested areas, The Generation Forest plants a new forest aimed at mimicking natural jungle structure and biological diversity but also includes tree varieties whose wood can be sold later (Lüber, K, 2022).

The implementation of the National Forest Restoration Program has had a significant impact on the country's forests due to its focus on forest restoration, evident in the recovery of degraded lands and conservation of regrowth areas that have become young forests, sequestering greenhouse gases (MiAmbiente, 2020). This program is an initiative of the National Government, inviting active participation from civil society and government entities; it also has a network of nurseries nationwide, with the main goal of reforesting a total of 51,000 hectares. All restoration and reforestation actions by allied organizations will contribute to this goal, increasing the total hectares restored during this five-year period, through funding from international sources or national funds such as the Trust for Water, Wildlife, and Protected Areas.

Contrasting the Panamanian conservation initiatives described earlier with the registration of the REDD+ Emberá Wounaan project, it is found that the initiatives are constantly seeking funding from other actors or societies, posing a potential risk to the continuity of their activities. The implementation of the REDD+ project impacts primarily on investment barriers, as the communities generate monetary income from the sale of issued carbon certificates and the execution of activities associated with non-timber forest production, reforestation, and the design of sustainable economic alternatives and production chains. This reduces financial risks derived from the analysis of uncertainty and non-permanence. Additionally, barriers due to social conditions are overcome with the non-monetary income generated by the implementation of REDD+ activities, increasing employment opportunities, encouraging training of personnel in different strategic areas of knowledge, and fostering governance scenarios. Regarding barriers due to the lack of land tenure legislation and regulation, activities related to support and strengthening of land tenure security are established through the creation of consultation and decision-making spaces by authorities and members of the Emberá Wounaan

community, developing planning and community development tools, and identifying territorial boundaries and various strategies for their protection, among others[12].

3.4 Uncertainty management

To avoid overestimating reductions, parameters are adjusted in the calculation process. For example, extrapolated calculations are rounded down, meaning decimal figures are discounted and, therefore, fewer removals are estimated than those including decimals integrally. Additionally, the theoretical factors used are evaluated conservatively, so if two values exist for the same parameter, the more conservative one is used to estimate the parameter conservatively. Moreover, the databases used as input for the quantification of removals undergo a process to purge outliers, resulting in the elimination of extreme data, which translates to removing data that increase or overestimate reductions.

According to the methodological document of the AFOLU sector BCR0002 version 3.1, uncertainty management is based on the precision of the maps used to estimate activity data values and the application of discounts on emission factors, within the framework of the uncertainty definition established by (GOFC-GOLD, 2016).

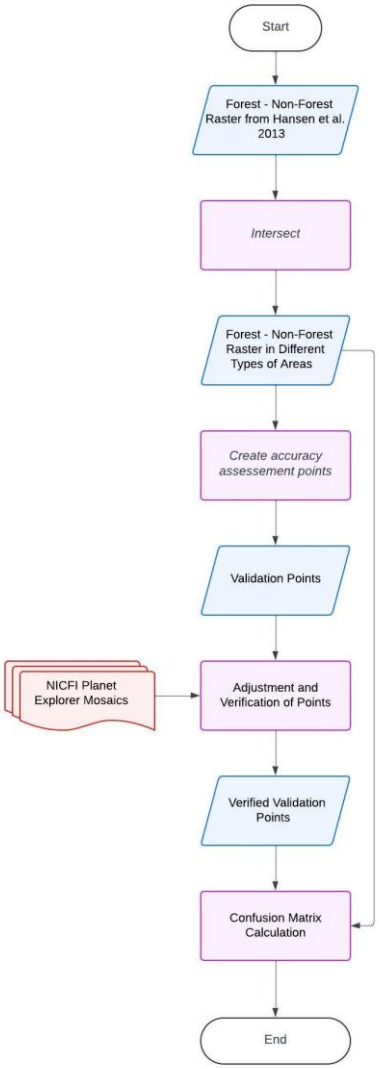
- **Activity data**

In Chapter 3. Data Accuracy of the Geoprocessing Report[13], the importance of ensuring that the estimates of avoided emissions are reliable is detailed according to the applicable methodology. According to the BCR0002 version 3.1 methodology, the accuracy of activity data must exceed 90%. To evaluate this accuracy, areas are classified as "forest" or "non-forest" using the maps generated by the model from (Hansen, et al., 2013), which is used to monitor deforestation.

The accuracy is evaluated through a confusion matrix, which allows for the comparison of the model's predictions with actual observations. This matrix quantifies the correct and incorrect classifications of the areas, providing an overall accuracy value that reflects the proportion of correct and incorrect classifications. For greater reliability, the validation points are proportionally distributed across the areas of interest (**Figure 15**).

Figure 15. Confusion Matrix Calculation Procedure and Accuracy Determination

[12] See in: *11_Anexos y complementarios\10_Anexo_DistribuciónBeneficios_V3.docx.*
[13] See in: *04_SIG\Informe Geoprocesamientos SIG REDD+ Embera Wounaan_V6.docx*



Source: (CO2CERO SAS, 2023)

Below is a summary (**Table 16**) of the accuracies obtained for the different areas and activity years in the project, covering the leakage area, project area, and reference region, with a value greater than 90% in all cases.

Table 16. Summary of accuracies in the project areas.

Year	Type of area		
	Leakage area	**Project area**	**Reference region**

2008	97.8	98.4	90.8
2013	95.4	N/A	90.1
2017	90.8	97.8	N/A
2018	92.0	97.0	90.8
2019	91.2	96.4	N/A
2020	91.8	96.2	N/A
2021	92.4	96.2	N/A
2022	92.8	96.0	N/A

Source: (CO2CERO SAS, 2023)

It is also worth highlighting that the model by (Hansen, et al., 2013) has been previously validated by the authors, reporting an overall accuracy of 99.5% in tropical areas based on the validation of 628 points.

- **Emission factor**

The guidelines establish that the evaluation of emission factors must be conducted. Below are the processes and equations used for the evaluation of uncertainty. The first step consists of determining the uncertainty for each reservoir as established in the methodological document BCR0002 v3.1. This is achieved with the following equation set out in Volume 1 Chapter 3 titled, "*Uncertainties," of the IPCC 2006 "Guidelines for National Greenhouse Gas Inventories*" (Paciornik, et al., 2006).

Equation 1. Uncertainty of the reservoir

$$U_n = \pm \left\{ \frac{t_{0.95}^{2C} * SE}{\mu} \right\}$$

Where:

U_n: Percentage of uncertainty associated with each parameter

$t_{0.95}^{2C}$: T-student value with 95% confidence and two-tailed analysis with degrees of freedom determined by the sample units -1

SE: Standard error of the mean for reservoir n

μ: Average value of reservoir n

Similarly, the standard error of the mean must be determined using the following variable.

Equation 2. Standard error of the mean

$$SE = \frac{\sigma}{\sqrt{n}}$$

Where:

SE: Standard error of the mean

σ: Standard deviation

n: Number of sample units

Subsequently, once the uncertainty values for each reservoir are obtained, they should be combined using the following equation.

Equation 3. Overall uncertainty of reservoirs

$$U_{total} = \frac{\sqrt{(U_1 * x_1)^2 + (U_2 * x_2)^2 \ldots (U_n * x_n)^2}}{I x_1 + x_1 \ldots + x_n I}$$

Where:

U_{total}: Percentage of uncertainty in the sum of the reservoirs

U_n: Percentage of uncertainty associated with each reservoir

x_n: Mean value of each reservoir

According to the results of the uncertainty[14] analysis, a result of 17.16% was obtained. Therefore, the lower confidence interval value was taken as established in the methodological document BCR0002 v3.1. The lower confidence interval was applied to the emission factor of each reservoir. This ensures the process of conservatism and the application of uncertainty management.

3.5 Leakage and non-permanence

The monitoring of areas experiencing deforestation and degradation during the reference period (2008 – 2018) was conducted, in accordance with the delineation of the leakage belt according to the REDD+ Emberá Wounaan project area. Subsequently, the avoided emissions are calculated in the Ex-Ante scenario for deforestation (*EfdefM*) and degradation (*EfdegM*), considering the deforestation and degradation rates respectively identified in the baseline scenario during the reference period and the forest cover of the project's starting year (2018), assuming a linear trend over the 30-year duration of the initiative.

3.6 Mitigation results

3.6.1 Eligible areas within GHG project boundaries (AFOLU sector projects)

According to methodology BCR 0002 version 3.1, eligible areas are those within the geographic boundaries of the project that correspond to the forest category according to the definition of forest by the MDL, which are identified under this structure at the start of project activities and ten (10) years before the project start date. According to the official definition of forest in Panama, within the National REDD+ Strategy Panama (MiAmbiente, 2022a) and Resolution No. DM-0067-2017 of February 16, 2017, which establishes a minimum area of 0.5 hectares to be classified as forest, the following are included:

a) Closed forest formations where there are trees of various strata and low vegetation covers a high proportion of the ground or open forest.
b) Young natural stands and all plantations that have not yet reached a crown density greater than the range of 10 to 30% or a height greater than the range of 2 to 5 meters.

[14] See in the sheet "Incertidumbre" of the document *03_Carbono\FE_EmberaWounaan_V4.xlsx*

c) Areas that typically comprise forest but temporarily lack forest stocks due to human intervention, such as harvesting activities or natural causes, but are expected to revert to forest.[15]

The main activity of the project is to reduce carbon emissions avoided by the conversion of forest-covered soils with high carbon content to non-forest soils, similarly, reducing effects from forest degradation. This project aims to reduce unplanned deforestation, which is eligible as a REDD+ activity. Deforestation of the forest at the project boundary occurs due to socioeconomic activities such as timber exploitation and soil transformation for other uses such as subsistence agriculture and selective timber harvesting for local infrastructure and markets.

The quantification of forest cover was carried out using the results of monitoring algorithms (Hansen, et al., 2013) that utilize Landsat[16] satellite images worldwide to determine Forest-Non- Forest status for each year. This monitoring is obtained through the Google Earth Engine catalog, ensuring the same source of information and guaranteeing credible forest change tracking over the years. This way, deforestation and degradation are quantified for the reference period 2008-2018, revealing the historical deforestation and degradation process, as well as its behavior during the implementation of the initiative.

Based on this information, the corresponding geoprocessing is used to calculate forest and non-forest areas, determining the stable forest areas within the project boundaries, which are identified as eligible areas.

Similarly, this process is used for monitoring periods of deforestation and historical degradation throughout the implementation of REDD+ project actions.

Table 17. Project eligible areas.

Class	Baseline scenario 2008[17]	Project scenario 2018[18]
Forest (ha)	431,472.98	426,170.32
Non forest (ha)	5,078.50	10,381.16
Total, general (ha)	436,551.48	436,551.48

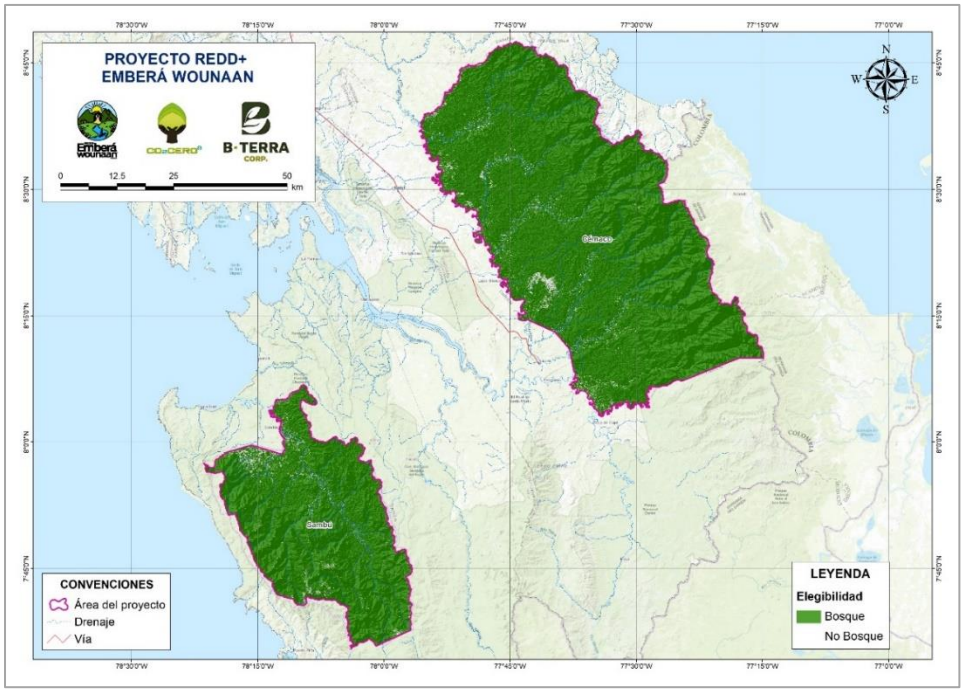
[15] *https://cdm.unfccc.int/Reference/Guidclarif/glos_CDM.pdf*
[16] The use of these images defines a working scale of 1:50,000, according to the specifications of the National Geographic Institute Tommy Guardia (IGNTG) of Panama.
[17] See in: *04_SIG\1_GDB\B_NB_Embera_V7.gdb*" con el nombre de *PA_Vector_treecover2008_3*
[18] See in; *04_SIG\4_SHP\Area_elegible_V4.shp*

Source: CO2CERO S.A.S., 2023.

Those areas that have transitioned from the forest category to non-forest will be referred to as deforested areas, those that change from non-forest to forest are regenerated areas, and those that remain in the non-forest category are non-forest areas; these categories are not considered eligible.

426,170.32 hectares of stable forest are identified between the start date (year 2018) and 10 years before the start date (2008) (**Table 17**), corresponding to the eligible areas of the project, as shown in **Figure 16**.

Figure 16. Map of eligible areas of the project.



Source: CO2CERO S.A.S., 2023.

3.6.1.1 Reference region

The delineation of the Reference Region is carried out following the criteria of methodology BCR 0002 version 3.1, as shown below:

a. The entire or part of the project area can be included:

The REDD+ Emberá Wounaan project includes within the delineation of the reference region 52,917.21 hectares of the project area, which corresponds to 12%, thereby fulfilling the first criterion.

REDD+ Emberá Wounaan project includes within the delineation of the reference region 52,917.21 hectares of the project area, which corresponds to 12% of the total. This is mainly due to the existence of restricted access areas due to the absence of infrastructure that allows mobility, at least during the time period in which the reference region is modeled and delimited. The **Figure 18** provides detailed evidence of how variables are susceptible to change over the years in territories affected by deforestation and forest degradation dynamics caused by agents mentioned in Chapter *7 Causes and agents of deforestation and forest degradation*.

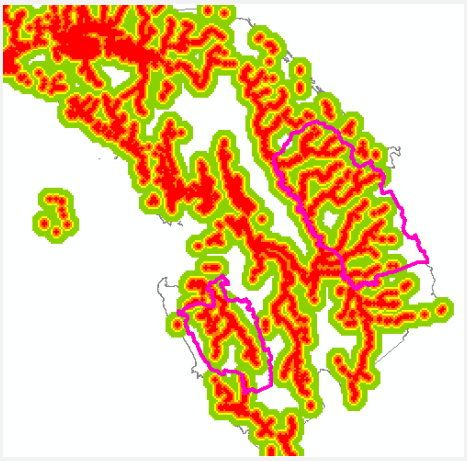
b. The agents and determinants of deforestation/degradation identified in the reference region can access the project area.

The reference region was defined based on a spatial multicriteria analysis of the main variables that allow the mobility of agents and the factors of deforestation and degradation, taking into account factors such as bodies of water and drainage, roads, infrastructure, districts, agricultural frontier expansion, and the non-forest edge, which due to their proximity and interaction with forests, generate greater susceptibility to deforestation. As shown in **Table 18**, an analysis of the agents was carried out using ArcMap 10.8 software through the implementation of mobility ranges in distance per class, in order to establish the presence of deforestation and degradation agents and their behavior within the study area.

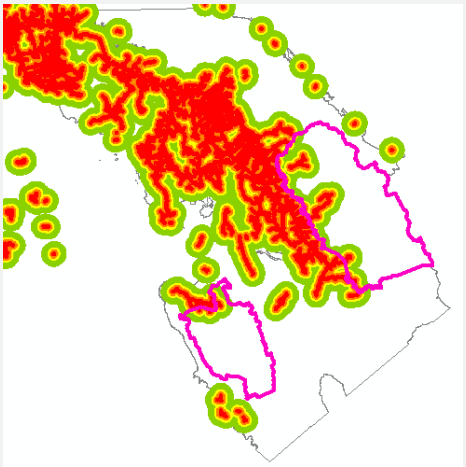
Table 18. Defined criteria for the analysis of mobility of deforestation agents to define the boundaries of the reference region.

Raster of probability of mobility of agents by navigable drains[19]	Raster of probability of mobility of agents by roads[19]

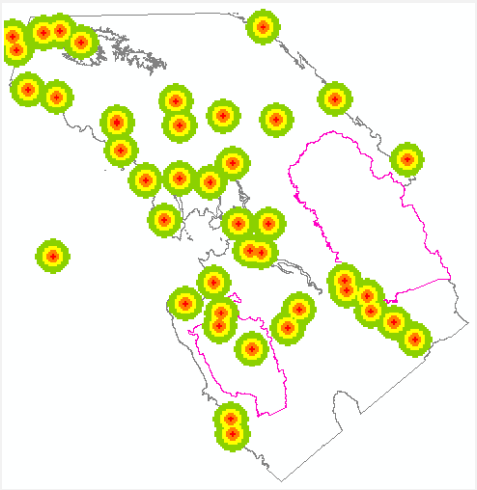
[19] The base cartography information used for this parameter was acquired through the National Geographic Institute "Tommy Guardia," which sells its cartographic products in CD format directly at its offices. The project made this purchase on May 17, 2022. The obtained layers are in vector format at a scale of 1:25,000, with national coverage, and were generated from radar orthoimages from the year 2011. It is important to note that these layers do not include metadata, which limits the availability of additional information to describe their technical characteristics in more detail. Likewise, it is emphasized that the most up-to-date information available was used.

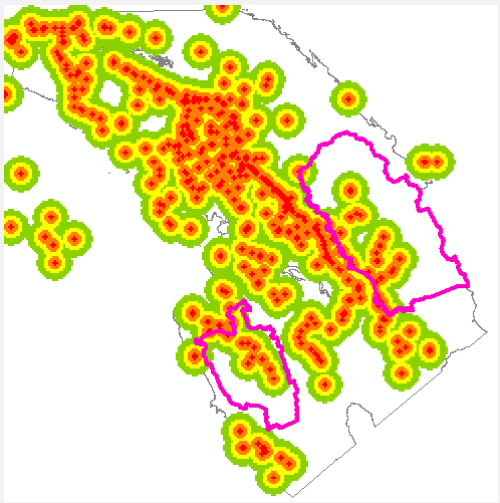


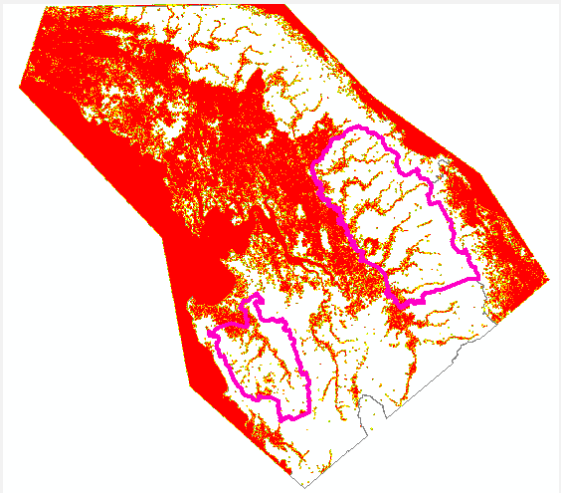
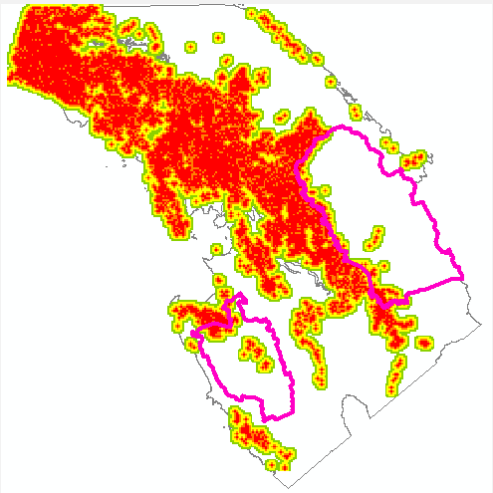
Raster of probability of mobility of agents by populated centers[19]



Raster of probability of mobility of agents by infraestructure[19]





Raster of probability of mobility of agents by non-forest limits[20]	Raster of probability of mobility of agents by expansion of agricultural frontier[21]
	

Source: CO2CERO S.A.S., 2023.

The importance values were established based on the information collected from the specific characteristics of the territory, such as interviews with key informants, social cartography, among others[22]. It is important to note that the same ranges were implemented for some agents considering the similarity in the dynamics of activities that exert pressure on forest cover, such as roads and rivers, which behave in a linear way, and their ranges are presented in meters per class (see **Table 19**).

Table 19. Assessment of key factors influencing the mobility of deforestation agents relevant to the delimitation of the reference region.

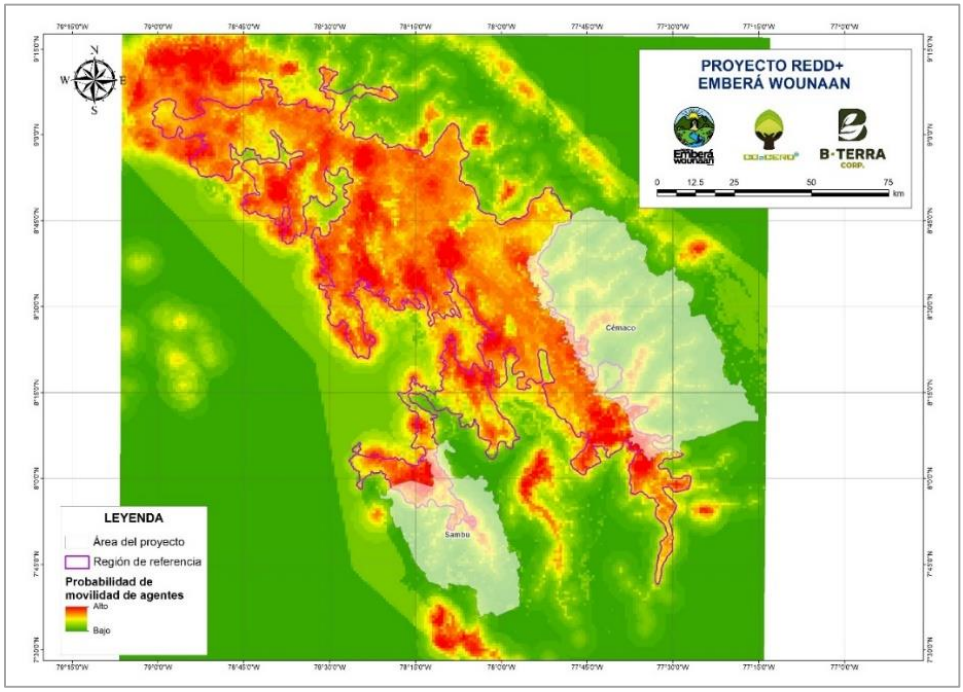
[20] The forest and non-forest data come from (Hansen, et al., 2013) which were download in June 20, 2023. Available at: 04_SIG/3_RASTER/TreeLoss-Embera2022.
[21] The data comes from the input titled "Forest Cover and Land Use. Republic of Panama. Year 2021 (1:25,000)": Available at: https://www.sinia.gob.pa/index.php/extensions/datos-abiertos-y-geoservicios
[22] The annex *Informe Geoprocesamientos SIG REDD+ Embera Wounaan_V6* (04_SIG) provides more details on the use of this information and the methodology for delimiting the reference region.

Relative weight assigned	Roads (m)	Rivers and water bodies (m)	Non-forest boundary (m)	Agricultural frontier	Townships (m)	Infraestructure (m)
0	> 6000	> 6000	> 400	> 4000	> 8000	> 8000
1	3000 – 6000	3000 – 6000	300 – 400	2000 – 3000	5000 – 8000	5000 - 8000
2	2000 – 3000	2000 – 3000	200 – 300	1000 – 2000	3000 – 5000	3000 - 5000
3	1000 – 2000	1000 – 2000	100 – 200	500 – 1000	1000 – 3000	1000 – 3000
4	1 – 1000	1 – 1000	1 – 100	1 – 500	1 – 1000	1 - 1000

Source: CO2CERO S.A.S., 2023.

Finally, the raster layers of deforestation and degradation agents were integrated, resulting in the map for the study area, highlighting the behavior of the agents. It should be noted that proximity to the variables increases the relative weight value, indicated by red coloring. As the tonality decreases, it tends toward green, indicating that distance is not significant for the factor (see **Figure 17**)

Figure 17. Map of probability of mobility of agents for defining the reference region.



Source: CO2CERO S.A.S., 2023.

To comply with paragraph (b), it is evident from **Figure 17** that the agents of deforestation and degradation are tending to affect the project area in terms of the proximity of the analyzed variables. The description above is supported through the development of a comparative analysis with the main causes and agents of deforestation present in the project area identified with secondary and primary information, described in Chapter 7. It is evident for the Sambú region that the major identified driver is the invasion of settlers into the comarcal lands since the 1990s to carry out livestock activity; this has led to an increase in families belonging to the comarcas engaging in the activity, starting from the 1970s with 3 families and increasing to 13 families by 2023. Another identified cause allowing agents to cross the community borders was the construction of the road between Puerto Indio and Rompido in 1995, which also caused the loss of primary forests. As a conclusion from the workshops held in the communities of Bayamón, Villa Keresia, Boca de Trampa, and Churuco settled on the rivers Sábalo, Tigre, and Sambú, it is obtained that deforestation is caused by agents external to the comarca because settlers invaded through the Sansagarra ravine area and illegally logged native forests mainly for developing livestock, agriculture, and commercial timber exploitation purposes[23].

Subsequently, the analysis was conducted for the Cémaco region, confirming that the agents of deforestation/degradation identified in the reference region can access the project area through activities that generate land use change, such as the emergence of livestock as a new factor within the territory. Despite being prohibited within the territory, livestock farming has begun to gain strength due to external pressure and increased income from the activity, and it is being implemented in areas of 1 to 3 hectares with 2 to 5 heads of cattle. Additionally, roads have been opened for timber exploitation, leading to river channel changes and erosion[24].

The above description is supported by the National REDD+ Strategy of Panama, which states that the primary cause of deforestation in the country is the expansion of agricultural frontier with increased crop cultivation and livestock farming, and to a lesser extent, but with significant impact, human settlements and infrastructure development (MiAmbiente, 2022). Additionally, it is complemented by secondary information linking colonists to forest logging for establishing slash-and-burn crops and later pastures, or for renting them out to generate economic income (Arcia, J, 2017).

[23] See in *11_Anexos y complementarios\2_Factores_DefDeg_EmberaWounaan\Analisis_DefDeg_Sambú. xlsx*
[24] See in *11_Anexos y complementarios\2_Factores_DefDeg_EmberaWounaan\Analisis_DefDeg_Cema.xlsx*

c. The project area is of interest to the identified agents.

The province of Darien is a region characterized by its lush variety of natural resources, including timber, minerals, and biodiversity, which make it highly potential for contributing to the country's development (Universidad de Panamá, 2022). Additionally, it is of interest to agents of deforestation and forest degradation, given the presence of valuable but protected species such as *Dalbergia retusa* and *Dalbergia darienensis* (cocobolo), *Swietenia macrophylla* (mahogany), balsam (*Myroxylon balsamum*), espavé (*Anacardium excelsum*), pinotea (*Podocarpus guatemalensis*), and others, which have been identified as existing outside the indigenous reserves of the Kunas and the Emberá-Wounaan (Bech, 2014). Furthermore, there is a lack of control and oversight mechanisms for natural resources within the Comarca Emberá, facilitating illegal logging and wildlife trafficking for commercialization to third parties (COONAPIP, 2009). As a result, roads continue to be opened to allow heavy machinery into the forest for logging, after which the timber is sold and the land is cleared for cattle ranching (Bilbao, 2019).

Based on this analysis, it is established that the agents of deforestation are related both in the reference region and in the project area, making the latter of interest to the identified agents of deforestation and degradation.

d. The land tenure and land use rights figures must be characterized in the reference region

According to the identified reference region, compliance is achieved with item (d) of methodology BCR 0002 V 3.1, which is based on determining that land ownership within it corresponds to collective ownership for the Comarca Kuna Wargandi, located in the Pinogana District in the Darién Province, granted through Law 34 of 2000. This is consistent with the land ownership structures present in the project area, corresponding to collective ownership granted to the Comarca Emberá Wounaan through Law 22 of 1983. Below are the three provinces present in the reference region.

Table 20. Land tenure in reference region.

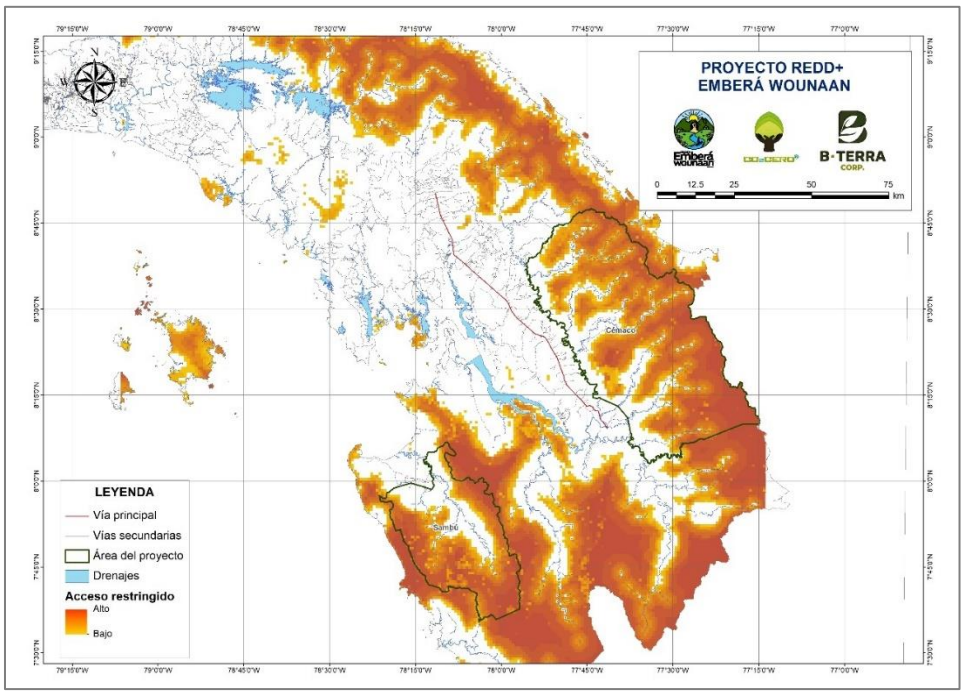
Province	Land tenure	Area (ha)
Darién	Law N° 22 of December 27, 1922	432,320.48
Panamá	Law N° 1 pf August 22, 1916	40,588.09
Total, general		**522,689.88**

Source: CO2CERO S.A.S., 2023.

e. Restricted access areas for deforestation and degradation agents and drivers are excluded.

To comply with this section, an analysis of restricted access areas defined as "physical space that prevents access by unauthorized third parties" (INEGI, 2015) is carried out. In the process of delineating the reference region described above, attention was focused on and spaces with a low probability of mobility of agents derived from populated centers, presence of roads and drainage where they could enter, identified within **Figure 18** through shades of red, were discarded.

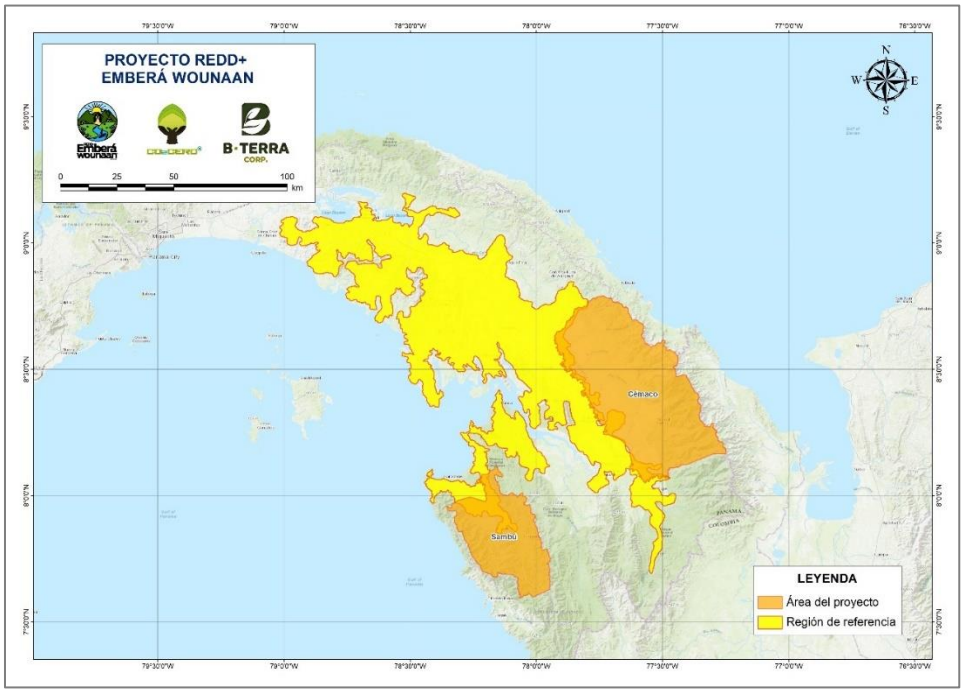
Figure 18. Map of restricted access areas for agents and drivers of deforestation and degradation.



Source: (CO2CERO SAS, 2023).

As a result of the analysis of these mentioned variables, the reference region of the project is obtained, which covers 721,842 hectares. **Figure 19** shows it in yellow.

Figure 19. Reference región map.



Source:CO2CERO SAS, 2023).

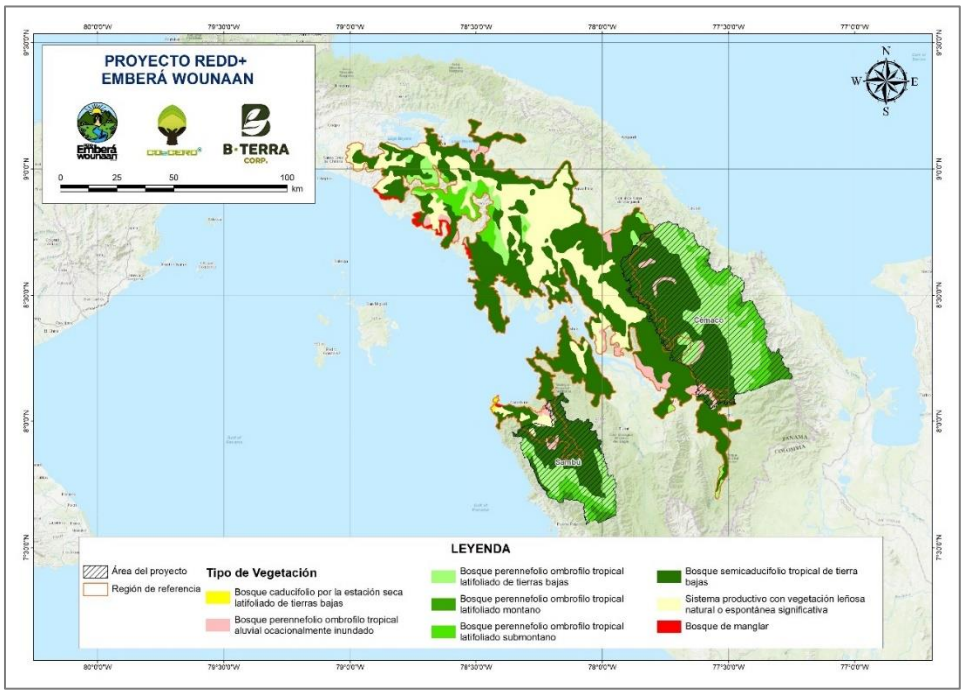
3.6.1.1.1 Reference región geographic information

Below, the geographic factors of the reference region are described.

Type of vegetation

Unlike the forest cover map, the vegetation map provides a more detailed consideration of the floristic composition of vegetation formations and their geographic location within altitude classes specifically designed for this purpose (National Government of Panama, 2010) . The most predominant type of vegetation is the tropical semi-deciduous lowland forest, which represents 60.82% of the reference region's surface area. Similarly, the project area includes 49.54% of this same type of vegetation.

Figure 20. Type of vegetation map.

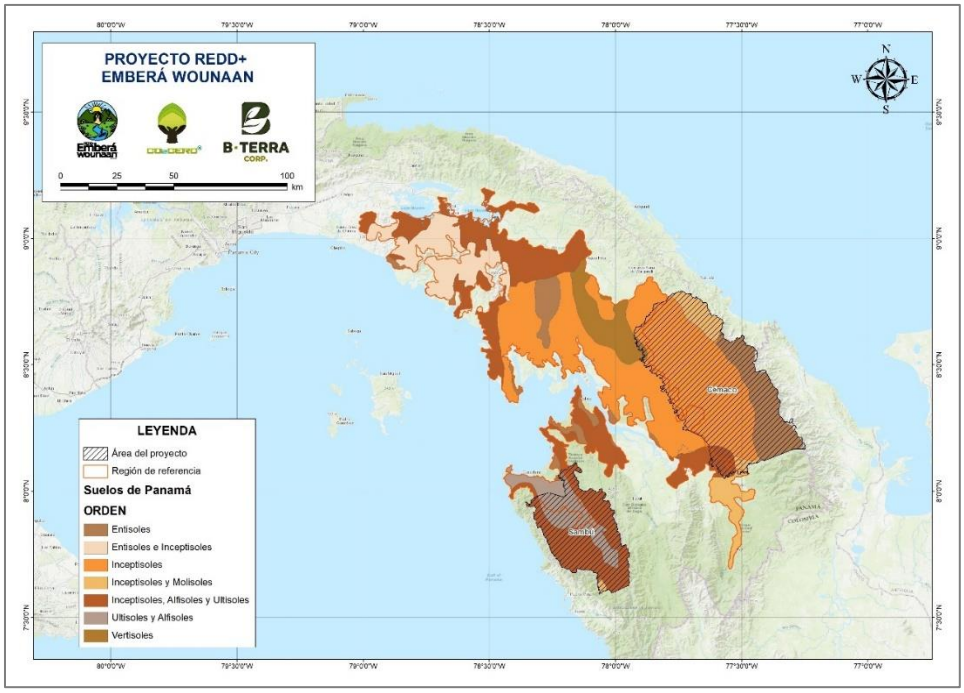


Source: (National Government of Panama, 2010).

Soils

In the reference region, the predominant soil order is Inceptisol, covering 39% of it. This type of soil is also the most representative in the project area, encompassing 45% of the total area (**Figure 21**).

Figure 21. Type of soils map.

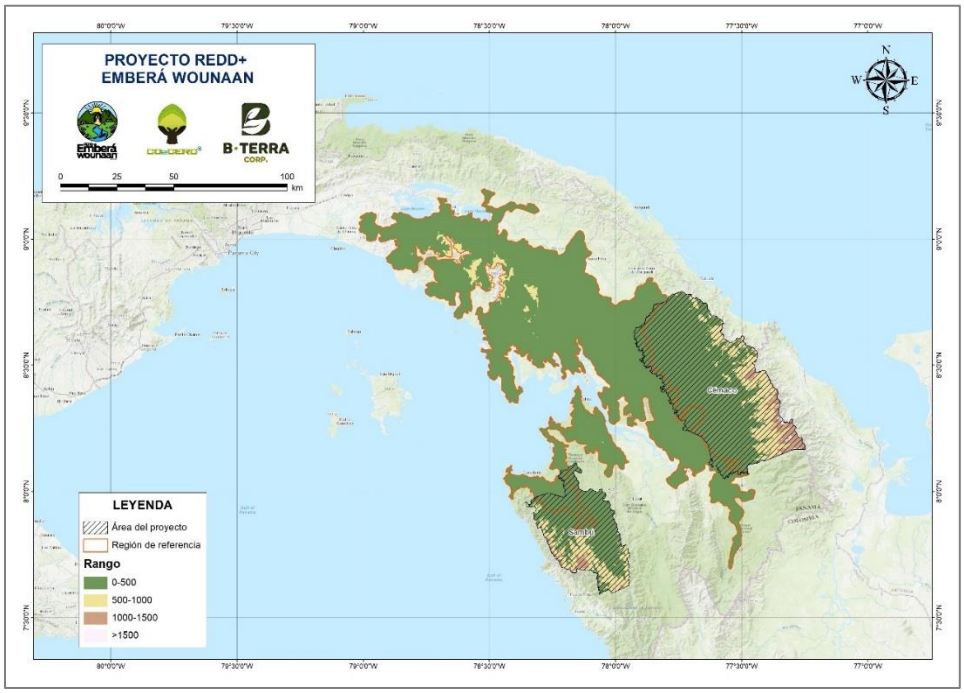


Source: (Panama Canal Authority, 2022)

Land elevation

Land elevation is determined using a Digital Elevation Model (DEM), which measures height in meters above sea level (masl). Elevation has been classified into 500-meter ranges. The results indicate that the range from 0 to 500 meters is the most representative, covering 97% of the reference region and 76% of the project area. This demonstrates that most of the areas are in low-altitude zones, commonly associated with coastal areas and areas near bodies of water (**Figure 22**).

Figure 22. Land elevation map by ranges.

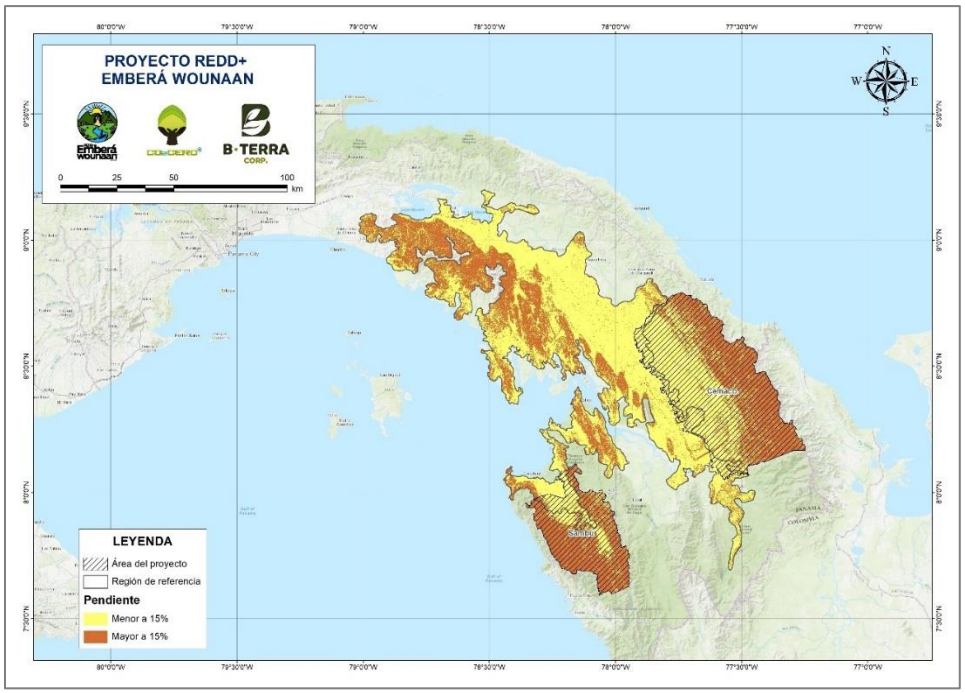


Source: (NASA Earthdata, s.f.)

Slope

In the **Figure 23** displays the results of the slope analysis for the reference region, expressed in percentage and divided into 2 classes, 'gentle' (slope <15%) to 'steep' (slope ≥15%). The predominant slopes in the reference region are in the range of less than 15%, characterizing the terrain as 'gently sloping'. However, the slope of the terrain in these areas can vary considerably. Due to the narrowness of the country and its narrow mountainous system, it is possible to find areas with steeper slopes near rivers and bodies of water, as is the case with the project area.

Figure 23. Slope map by percentage.



Source: (CO2CERO SAS, 2023).

To conclude the analysis of these geographic factors in the reference region and to highlight their similarity with the project area, as no criterion or variable analyzed exceeds a difference greater than (+/- 30%), this result is summarized in **Table 21**.

Table 21. Comparison of Geographic Factors in the Reference Region.

Criteria's	Variable	Reference region	Project Area	Comparison
Type of vegetation	Lowland broadleaf dry-season deciduous forest	0.13%	0.00%	0.13%
	Mangrove forest	0.97%	0.00%	0.97%
	Tropical alluvial evergreen rainforest occasionally flooded	3.93%	2.69%	1.24%
	Lowland broadleaf tropical evergreen rainforest	4.45%	31.29%	-26.84%
	Montane broadleaf tropical evergreen rainforest	3.65%	3.93%	-0.27%
	Submontane broadleaf tropical evergreen rainforest	0.00%	12.21%	-12.21%
	Lowland tropical semi-deciduous forest	60.82%	49.54%	11.28%

Criteria's	Variable	Reference region	Project Area	Comparison
	Productive system with significant natural or spontaneous woody vegetation	26.04%	0.35%	25.69%
Soil	Entisols	6%	16%	-10.16%
	Entisols and Inceptisols	13%	0%	12.69%
	Inceptisols	36%	45%	-8.92%
	Inceptisols and Mollisols	4%	6%	-2.51%
	Inceptisols, Alfisols, and Ultisols	29%	23%	6.79%
	Ultisols and Alfisols	4%	10%	-5.15%
	Vertisols	8%	1%	7.27%
Slope	Less than 15%	67.49%	46.27%	21.22%
	Greater than 15%	32.51%	53.73%	-21.22%
Elevation	0-500	97.72%	76.31%	21.41%
	500-1000	2.28%	18.68%	-16.40%
	1000-1500	0.00%	4.76%	-4.76%
	>1500	0	0.25%	-0.25%

Source: (CO2CERO SAS, 2023).

3.6.1.2 Leakage area

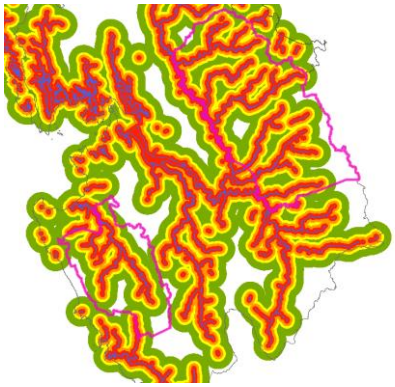
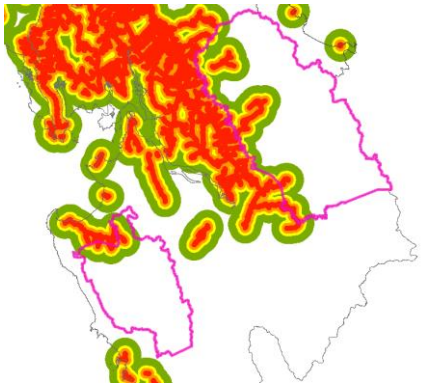
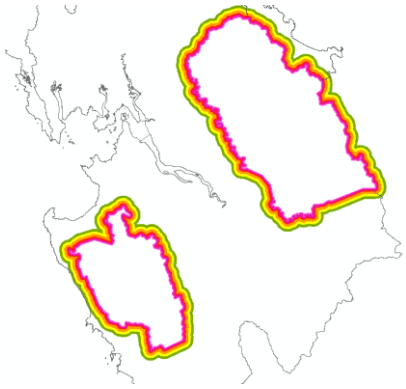
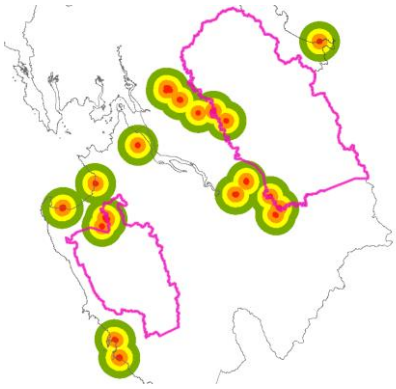
The leakage area or leakage belt is the area adjacent to the project boundaries in which displacement of deforestation and degradation activities occurs. It is delineated within forested areas near the mobility ranges of the deforestation and degradation actors defined in Chapter 7. ***Error! Reference source not found.***.

The identification of the leakage area of the project was established through the analysis of displacement of deforestation and degradation agents, associating access points to the forest due to their proximity to navigable rivers, which serve as the main means of transportation. Additionally, the analysis considered the Pan-American Highway, although it is not within the project boundary, as an important trigger for mobility agents, along with urban centers and the forest edge, which are more susceptible to deforestation or degradation. From the mobility analysis, it was identified that potential deforestation and degradation activities that define the leakage area are highly linked to the mentioned deforestation factors.

The factors of mobility analysis and their importance values were established based on evidence collected from the characteristics of the territory, identifying the mobility range in meters per class, relative weight, and subsequent spatial analysis for delineating the

leakage area through a multicriteria analysis using GIS software ArcMap 10.8, based on the determination of Euclidean distances of each mobility agent.

Table 22. Criteria defined for the analysis of mobility of deforestation agents to define the boundaries of the leakage area.

Raster of probability of mobility of agents by navigable drainages	Raster of probability of mobility of agents by roads.
	
Raster of probability of mobility of agents by project boundary	**Raster of probability of mobility of agents by population centers**
	

Source: (CO2CERO SAS, 2023)

The key factors for determining areas susceptible to deforestation and degradation due to agent mobility were based on a multicriteria analysis of proximity to navigable double-drainage systems such as rivers, urban centers, non-forest boundaries, and project boundaries outside the project area (see **Table 23**). Each factor was assigned a relative weight according to Euclidean distances of proximity, generating a raster (See **Figure 24**)

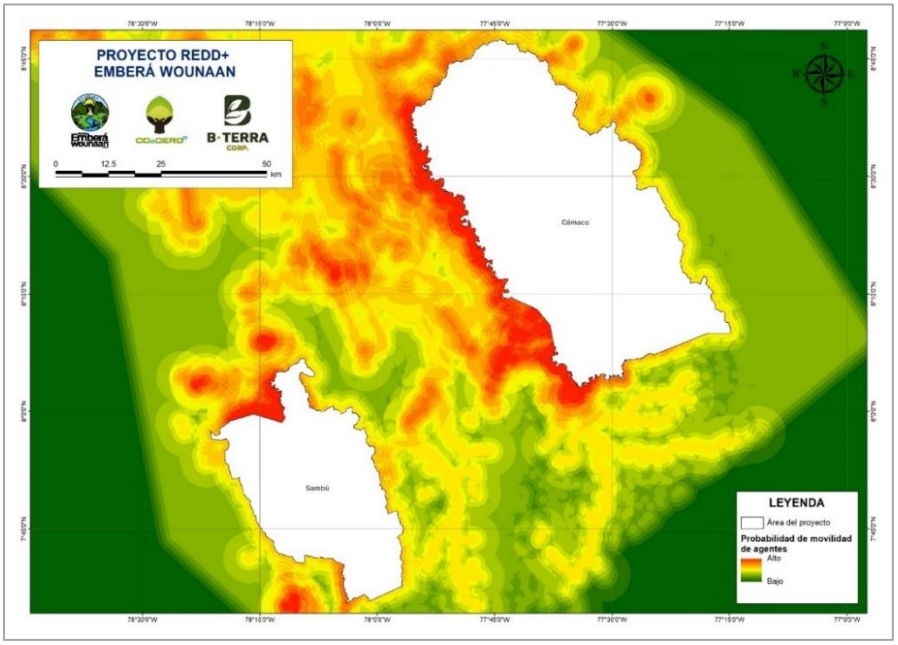
with corresponding classification values as shown in **Table 22**. Proximity to variables increases the relative weight value with a red coloration, while decreasing proximity tends towards green shading.

Table 23. Assessment of Key Factors for Deforestation Agent Mobility for Delimiting the Leakage Area.

Assigned relative weight	Roads (m)	Non-forest boundary (m)	Project boundary (m)	Navigable rivers (m)	Urban centers (m)
0	> 6000	> 4000	> 4000	> 6000	> 8000
1	3000 – 6000	3000 – 4000	3000 – 4000	3000 – 6000	5000 – 8000
2	2000 – 3000	2000 – 3000	2000 – 3000	2000 – 3000	3000 – 5000
3	1000 – 2000	1000 – 2000	1000 – 2000	1000 – 2000	1000 – 3000
4	1 – 1000	1 – 1000	1 – 1000	1 – 1000	1 - 1000

Source: (CO2CERO SAS, 2023).

Figure 24. Agent mobility probability map to define leak area.



Source: (CO2CERO SAS, 2023).

The result of this analysis is the definition of the leak area, which is 45,564.1 hectares.

3.6.1.3 Historical period of deforestation

The reference period evaluated to determine the historical deforestation behavior was from 2008 to 2018. Its results are presented in **Table 24**.

Table 24. Forest and non-forest areas for the reference period.

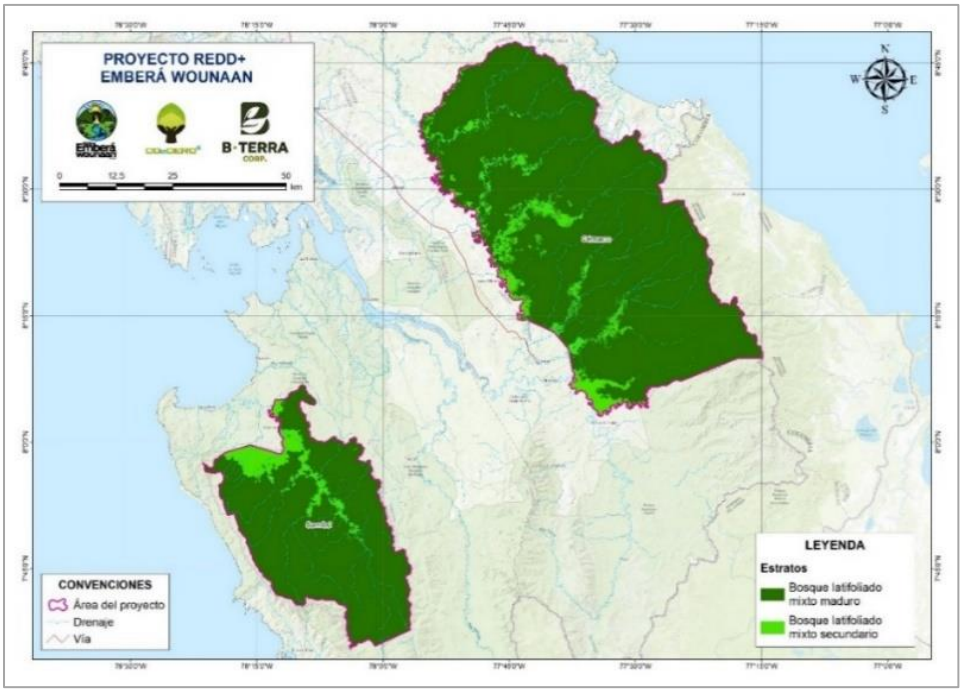
Class	2008	2018
Forest	552,095.48	483,003.63
Non-forest	169,746.90	238,838.76
Total	721,842.38	721,842.38

Source: (CO2CERO SAS, 2023).

3.6.2 Stratification (Projects in the AFOLU sector)

For the REDD+ Emberá Wounaan Project, stratification was performed based on the current land cover, which is found in the Land Cover and Land Use Map (2020) (National Environmental Information System, 2021) for the country of Panama. As a result of the analysis, two strata were defined. The first is the mature mixed broadleaf forest zone, which is predominantly found in the Project area. This is followed by the secondary mixed broadleaf forest zone, which also includes other natural covers present in smaller proportions (See **Figure 25**).

Figure 25. Map of the project strata



Source: (CO2CERO SAS, 2023)

3.6.3 GHG emissions reduction/removal in the baseline scenario

3.6.3.1 Leakage monitoring

The monitoring of areas that experienced deforestation and degradation during the reference period (2008–2018) was conducted according to the delineation of the leakage belt, in line with the REDD+ Emberá Wounaan project area. Subsequently, avoided emissions are calculated in the Ex-Ante scenario for deforestation (*EfdefM*) and degradation (*EfdegM*), considering the deforestation and degradation rates respectively identified in the baseline scenario during the reference period and the forest cover of the project's start year (2018), assuming a linear trend over the 30-year duration of the initiative.

3.6.3.2 Quantification of emission factor

To determine the current state of forest cover associated with the project, allowing for the determination of the emission factor for the baseline and the performance of REDD+ implementation activities, a methodological reconstruction of Panama's NREF (National Reference Emission Factor) was carried out to estimate the emission factor for the project, achieving a value consistent with IPCC principles. The emission factor for the deforestation activity is developed based on field sampling that allows for the compilation of data on forest structure and composition, litter carbon content, and soil organic carbon. For the degradation activity, these last two reservoirs (litter and soil organic carbon) are not considered for conservatism.

3.6.3.2.1 Selection of the number representative of plots.

The determination of the number of plots was based on identifying the required number of plots to meet the requirements with an error value less than 10%, with a 95% probability, using information from forest inventories conducted in Panama in the Darién forest area and in tropical moist forest ecosystems with the same classification.

It is evident that with the 8 plots inventoried within the project boundaries—two for the secondary mixed broadleaf forest stratum and six for the mature mixed broadleaf forest stratum, the sampling error requirement is met, achieving a sampling error of 9.79%[25].

[25] See in 03_*Carbono/FE_EmberaWounaan_V4*, Sheet "*error de muestreo*"

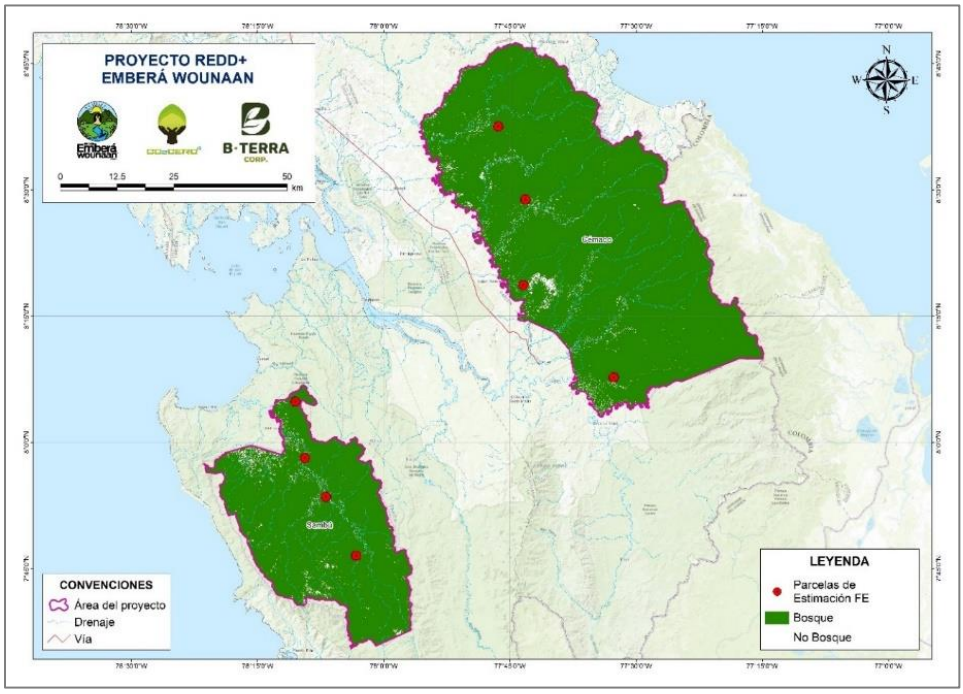
3.6.3.2.2 Sampling methodology

Eight sampling points (plots) were established over the project area for the measurement of different stages present in the delimited forest area (saplings and trees), litter, and soil organic carbon, consistent with the methodology proposed in the National Forest and Carbon Inventory of Panama 2015. The proposed design consists of a cluster formed by four (04) subplots with dimensions of 20 x 250 m arranged in a cross shape at 25 m equidistant from the central point (see **Figure 27**), covering an average area of 1.97 hectares[26].

The location of the plots was established in two stages. The first involved generating random points using ArcGIS® software, prioritizing proximity to water bodies to facilitate movement and data collection in areas that are difficult to access. The second stage considered community criteria, mainly focusing on factors related to public order. Finally, it was verified that the plots were within the forest area (see **Figure 26**), aligning with the proposal in the NREF under a simple random sampling design.

Figure 26. Map of the sampling plot locations.

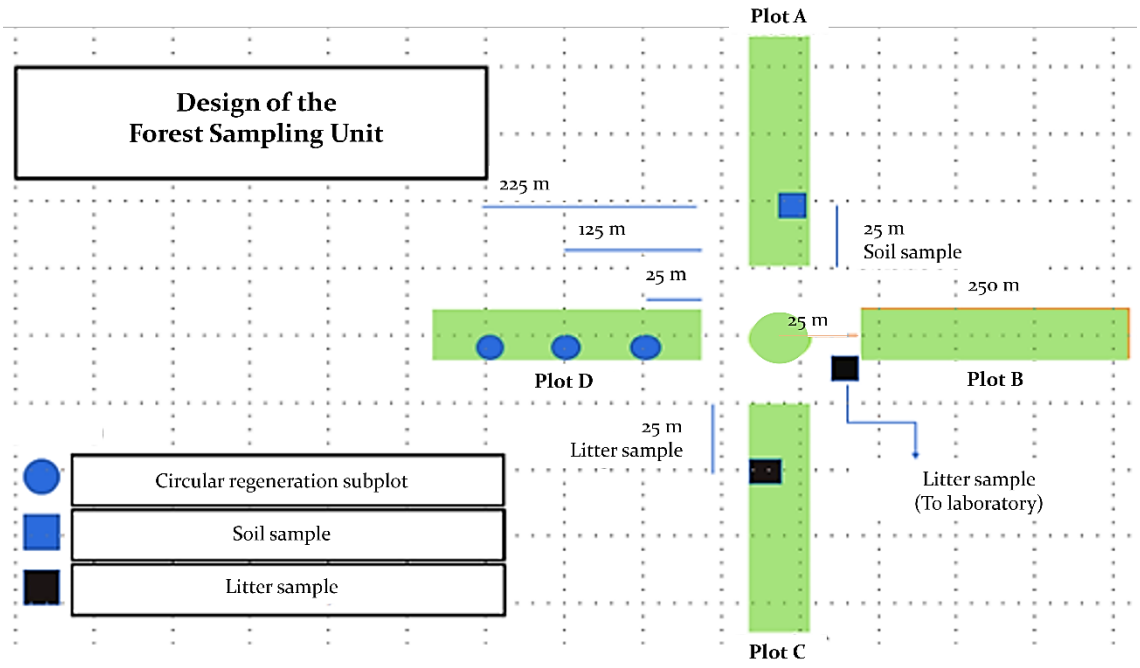
[26] See in *12_Reporte de monitoreo\01_Inventario forestal\Correccion de Pendiente\Anexo_Cálculo área efectiva_v2.pdf*



Source: (CO2CERO SAS, 2023)

At each sampling point, all species belonging to each forest cover were identified based on their respective scientific names and families. Subsequently, measurements were taken for the variables diameter at breast height (DBH) and total height of all tree and sapling individuals. For seedlings, the number of individuals present was counted.

Figure 27. Scheme of established field plots.



Source: (CO2CERO SAS, 2023)

Despite the project having effective areas smaller or larger than initially proposed (2 ha), the project fully complies with the stratified sampling formulas and the allowed sampling error (9.79%)[27] .

For individuals with a diameter at breast height (DBH) greater than 10 cm, all individuals present within each plot were initially identified. Subsequently, they were numbered and measured within each subplot area of 50 m^2 [28].

The other attributes necessary to determine the emission factor associated with the forest covers present in the project are described below:

1. ***Basic wood density:*** The Global Wood Density Database was used to provide each identified species with a corresponding value for this attribute. To determine the

[27] See in *12_Reporte de monitoreo\01_Inventario forestal\Correccion de Pendiente\Anexo_Cálculo área efectiva_v2.pdf*
[28] See in *12_Reporte de monitoreo \01_Inventario forestal\Informe_IF_REDD_EW_v3.pdf*.

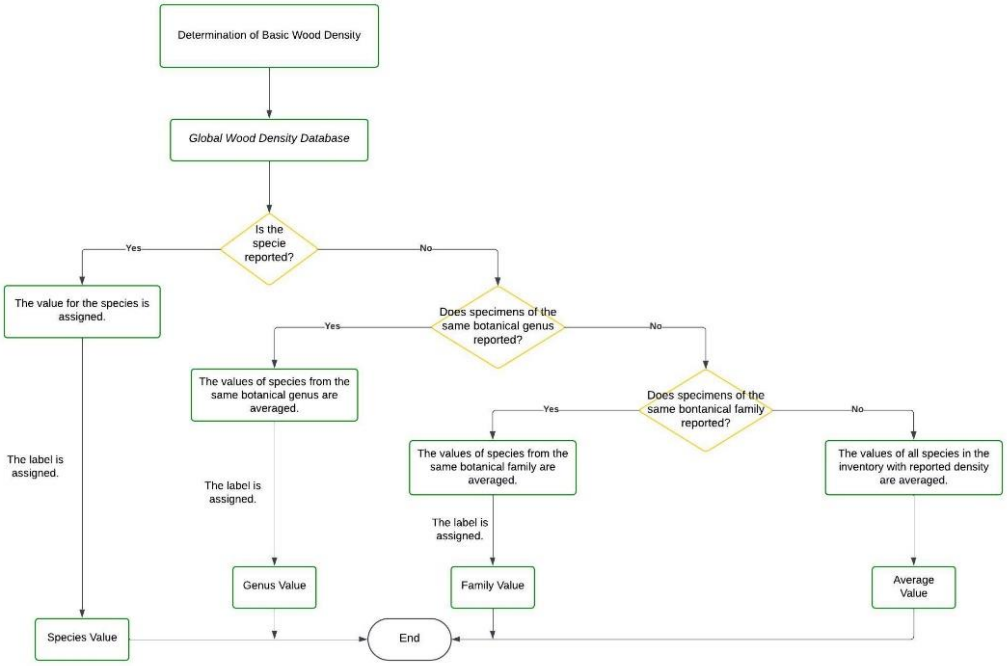
basic wood density of each of the species reported in the forest inventory, the following steps were carried out sequentially:

a) If the exact species identified in the forest inventory is reported within the wood density database, the corresponding basic density is assigned, and it is labeled as "Species Value" in the sheet called BA-Densities"[29]
b) If the exact species is not reported within the wood density database, all species with the same botanical genus are selected, and the average of the densities reported in the database is calculated. Additionally, it is labeled as "Genus Value".
c) If there are no records of the same botanical genus as the species in question, all species with the same botanical family are selected, and the average of the densities reported in the database is calculated. Additionally, it is labeled as "Family Value".
d) Finally, if there are no records of the same botanical family within the wood density database, the average of the basic densities of all species in the project's forest inventory that meet any of the steps described above (a to c) is calculated. Additionally, it is labeled as "Average Value".

It is important to note that step d is also used for individuals recorded in the project's forest inventory as indeterminate. By using the average value, the data dispersion of the density is not altered. In **Figure 28**, the flowchart with the procedure described above is presented.

Figure 28. Procedure for determining the basic wood density.

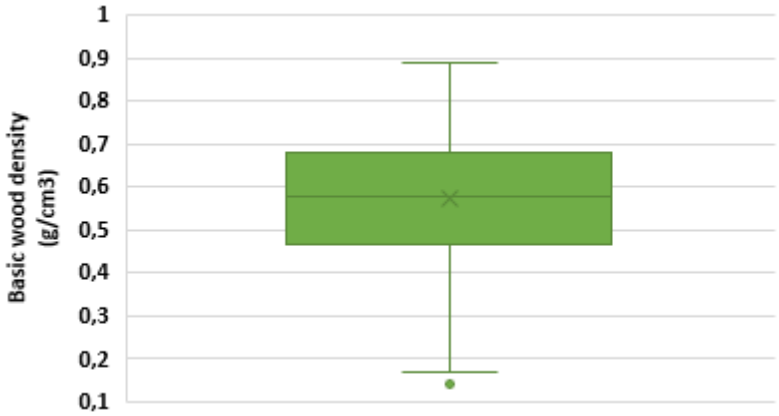
[29] See in *3_Carbono\FE_EmberaWounaan_V4.xlsx*.



Source: (CO2CERO SAS, 2023)

Below is the deviation obtained from the densities of each of the species recorded in the inventory (See **Figure 29**).

Figure 29. Boxplot of wood densities.



Source: CO2CERO S.A.S., 2023.

2. Application of the formulas determined by NRF for the year 2022 and INFyC for the calculation of Aboveground Biomass (AGB), Belowground Biomass (BGB), Soil

Organic Carbon over 20 years (SOC20years-i), and finally the corresponding Emission Factor. For soil organic carbon (SOC20years-i) and litter (HJ), field monitoring was conducted consistent with the data collection methodology determined by NRF and INFyC. In the case of SOC, variables associated with soil organic matter in the 0-30 cm horizon are determined based on a specific soil sample. For litter, a litter sample will be collected for processing.

3.6.3.2.3 Quantification of the emission factor

In the file *03_Carbono\FE_EmberaWounaan_V4.xlsx,* you can find the results for the emission factor obtained from the project, which is determined according to the types of ground covers identified within the project boundary, ensuring strata with similar dynamics. Each of the formulas and procedures used followed the guidelines of the (Ministry of Environment Panama, 2015)

3.6.3.2.3.1 Deforestation

To define emission factors for deforestation, the following carbon reservoirs are used: aboveground biomass, belowground biomass, dead wood, litter, and soil organic carbon.

Emission factor of carbon in total biomass

The estimation of the carbon emission factor in total biomass is carried out using **Equation 4**

Equation 4. Carbon dioxide equivalent contained in total biomass.

$$CO2eq = CCB \times \frac{44}{12}$$

Source: Taken from (BioCarbon Standard, 2021).

Where:

$CO2eq$	Equivalent carbon dioxide contained in total biomass; $tCO_2e\ ha^{-1}$
TB	Total biomass; $t\ ha^{-1}$
FC	Carbon fraction of dry matter (0,47)

According to the BCR 0002 methodology version 3.1 of the BioCarbon Standard, total biomass (TB) is estimated from the sum of aboveground biomass (AB) and belowground biomass (BS). The carbon content of total biomass (CBF) is the product of TB and the carbon fraction of dry matter (FC). Therefore, the carbon dioxide equivalent content in total biomass (CBFeq) is the product of the carbon content of total biomass (CBF) and the constant of the molecular ratio between carbon (C) and carbon dioxide (CO_2).

Emission factor of carbon in soil

To estimate the carbon emission factor in the soil, a gross emission is assumed where the soil carbon content (COS) is emitted following the deforestation event, over 20 years in equal proportions, according to **Error! Reference source not found.**.

Equation 5. Equivalent carbon dioxide in soils

$$SOCeq = \frac{SOC}{20} \times \frac{44}{12}$$

Source: Taken from (BioCarbon Standard, 2021)

Where

$COSeq$ Equivalent carbon dioxide content in soils; $tCO_2e\ ha^{-1}$

SOC Origanic carbon in soils; $tC\ ha^{-1}$

Total, carbon emission factor

According to the BCR 0002 methodology version 3.1 of the BioCarbon Standard, the total carbon emission factor includes the emission of carbon dioxide equivalent per hectare deforested, including the biomass and soil carbon compartments as shown in **Equation 6.** Total equivalent Carbon dioxide..

Equation 6. Total equivalent Carbon dioxide.

$$CTeq = CBTeq + COSeq + CHJeq + CMMeq$$

Source: Taken from (BioCarbon Standard, 2021)

Where:

$CTeq$	Total, equivalent carbon dioxide; $tCO_2e\ ha^{-1}$
$CBFeq$	Equivalent carbon dioxide content in total biomass; $tCO_2e\ ha^{-1}$
$C0Seq$	Equivalent carbon dioxide content in soils; $tCO_2e\ ha^{-1}$
$CHJeq$	Equivalent carbon dioxide content in litter; $tCO_2e\ ha^{-1}$
$CMMeq$	Equivalent carbon dioxide content in litter; $tCO_2e\ ha^{-1}$

3.6.3.2.3.2 Forest Degradation

The estimation of emission factors is carried out based on locally obtained and calculated results[30] for the strata established in the project area: Mature Mixed Broadleaf Forest and Secondary Mixed Broadleaf Forest. From this, the information reported by (Armenteras & González, 2016) is taken into account, where, using tropical humid forests as a reference, a carbon reduction percentage of 15% (from the middle quartile) is established for perforated areas and 74% for patches (critical quartile) (see **Table 25**). Finally, for the determination of differences in primary degradation, a 26% reduction is established (transition from core to patch), and for secondary degradation, a 30% difference is established (transition from core to perforated, that is, 85% remaining less 26% from perforated to patch) (see **Table 26**).

Table 25. Aboveground biomass by fragmentation class.

Stratum	Fragmentation class	Average biomass per class ($tC\ ha^{-1}$)
Mature Mixed Broadleaf Forest	Core	353,58
	Perforation	301,94
	Patch	90,81
Secondary Mixed Broadleaf Forest	Core	207,96
	Perforation	177,59
	Patch	53,41

[30] See in *03_Carbono/FE_EmberaWounaan_V4*

Source: (CO2CERO SAS, 2023).

Table 26. Difference in aboveground biomass by type of fragmentation.

Stratum	ID Transition	Fragmentation class transition	Mean difference of aboveground biomass (tC ha^{-1})
Mature Mixed Broadleaf Forest	1	Core – patch	262,77
	2	Drilled– patch	211,13
Secondary Mixed Broadleaf Forest	1	Core – patch	154,55
	2	Drilled- patch	124,18

Source:CO2CERO SAS, 2023).

To calculate the total biomass, the aboveground and belowground biomass are summed, stratifying the forest area by ecological zone to determine the total biomass per fragmentation class transition **Error! Reference source not found.**.

Equation 7. Total biomass transition difference.

$$DBTi = DBA \times (1 + R)$$

Source: Taken from (BioCarbon Standard, 2021).

Where

$DBTi$ Total transition biomass difference i; t ha^{-1}

DBA Average transition i aboveground biomass difference i (tC ha^{-1})

R Subterranean/aboveground biomass ratio; (ton d. m.)$^{-1}$

i Type of degradation; 1-primary degradation, 2-secondary degradation

For the content in the total biomass, it is the product of the total biomass and its carbon fraction, as shown in the **Error! Reference source not found.**.

Equation 8. Difference in carbon content in the total biomass.

$$DCBTi = DBTi \times FC$$

Source: Taken from (BioCarbon Standard, 2021)

Where:

$DCBTi$ Difference in carbon content in total biomass; tC ha^{-1}

$DBTi$ Total biomass difference; t ha^{-1}

FC Carbon fraction; 0,47

i Type of degradation; 1-primary degradation, 2-secondary degradation

The equivalent carbon dioxide contained in the DBT is the product of DCBT and the constant of the molecular ratio between carbon (C) and carbon dioxide (CO_2), according to the following **Error! Reference source not found.**.

Equation 9. Equivalent Carbon dioxide in the DTB.

$$DBT_{co2eq} = DCBT \times \frac{44}{12}$$

Source: Taken from (BioCarbon Standard, 2021).

Where:

$CTeq$ Total, equivalent carbon dioxide; tCO_{2e} ha^{-1}

$CBFeq$ Equivalent carbon dioxide content in total biomass; tCO_2e ha^{-1}

$SOCeq$ Equivalent carbon dioxide content in soils; tCO_{2e} ha^{-1}

3.6.3.3 Activity data

Below is a description of the method used to obtain the activity data for REDD+ Emberá Wounaan Project.

3.6.3.3.1 Deforestation

Below is the activity data determined for the deforestation identified at the project boundary and complementary areas.

3.6.3.3.1.1 Estimation of the deforestation rate from the historical average

The data on change in forest cover area (CSB) obtained for this quantification come from the approximation made through historical averages, for which an analysis of coverage change was conducted between the project start date and ten years prior to it, obtaining the gross deforestation of the area. This is defined under the premise that on the first date, the area had forest cover and for the second period, it is already devoid of it.

To mitigate effects from areas without information, Landsat images from reliable platforms are used, ensuring that the source remains consistent and providing credible monitoring of forest changes over time. The historical period used in this project is 2008 – 2018, which ensured the availability of eligible and suitable areas for analysis.

3.6.3.3.1.2 Annual historical deforestation in the reference region

To estimate the annual change in forest-covered area in the reference region, data from the final and initial years of the reference period were used, along with the forest areas identified in each of these periods. This provides the value representing the projected forest loss in the baseline scenario[31].

Annual Historical Deforestation in the Reference Region

$$CSB_{year} = \left(\frac{1}{t_2 - t_1}\right) x\ (A_1 - A_2)$$

Donde:

$CSB_{año}$ = Annual change in forest cover in the reference region; ha

t_2 = Final year of the reference period; year

t_1 = Initial year of the reference period; year

A_1 = Forest area in the reference region at the initial time; ha

A_2 = Forest area in the reference region at the final time; ha

[31] See in *3_Carbono\Carbono_Deforestacion_REDDEmberaWounaan_V10.xlsx*

3.6.3.3.1.3 Annual projected deforestation in the scenario with REDD+ project

Regarding the projected annual deforestation within the REDD+ project scenario, the annual change in forest cover area in the scenario without the project is considered, along with the expected reduction in deforestation due to the implementation of REDD+ activities. For the present analysis, a value of 70% is used.

3.6.3.3.1.4 Annual historical deforestation in the leakage area

For annual deforestation within the leakage area, as well as in the reference region, data from the final and initial periods, along with the forest areas for each of them, are used.

3.6.3.3.1.5 Annual projected deforestation in the leakage area in the scenario with project

Based on the change in forest area within the leakage area, in the scenario without the project and a value of 10% corresponding to the increase in emissions in the leakage area due to the implementation of REDD+ activities (value suggested by methodology BCR 0002 V 3.1), the annual change in forest area in the leakage area is determined in the project scenario.

3.6.3.3.2 Forest degradation

The reduction of emissions due to forest degradation refers, according to (MiAmbiente, 2022a), to the decrease in greenhouse gas (GHG) emissions and absorptions resulting from the decline of a mature, secondary, or any type of natural forest into shrub vegetation or scrubland. Based on this, the estimation of this activity is carried out through measurable variables in areas where the extent, canopy cover, and minimum height remain above the forest definition thresholds[32].

To define the activity data of forest degradation, the REDD+ Emberá Wounaan project makes use of a methodology that allows determining changes in aboveground biomass present in different forest cover classes assigned through a fragmentation analysis. Below, the methodology and associated results are described in relation to the steps outlined in methodology BCR0002 V3.1:

a) Natural forest cover layers used:

[32] See in 04_*SIG\ Informe Geoprocesamientos SIG REDD+ Embera Wounaan_V6*.

i) year of the start of the reference period,

The natural forest cover layer from the year 2008 is used.

ii) year of the end of the reference period,

The natural forest cover layer from the year 2018 is used.

iii) intermediate year between the start and end of the reference period.

The natural forest cover layer from the year 2013 is used.

b) Forest fragmentation for each layer used:

The Morphological Spatial Pattern Analysis (MSPA) tool suggested by the BCR0002 v3.1 methodology in its latest version (Soille & Vogt, 2022) is used. This tool employs the morphological segmentation of binary patterns (Soille & Vogt, 2009), which provides an effective method for characterizing spatial patterns with an emphasis on the connections between their parts, measured at different scales of analysis.

MSPA consists of a series of mathematical morphological operators specifically designed to describe the geometry and connectivity of the components of an image. This methodology, based solely on geometric concepts, is applicable to any scale and type of digital image, regardless of the field of application. In a binary image, the foreground area is segmented into seven distinct MSPA classes: Core, Islet, Perforation, Edge, Loop, Bridge, and Branch. MSPA segmentation generates 23 mutually exclusive feature classes that, when combined, exactly match the original foreground area[33].

The distinct MSPA classes that can be obtained as outputs are described below, according to (Soille & Vogt, 2022):

i. **Core:** Core pixels are those that belong to the connected components of the forest in an image and are situated at a considerable distance from their edges. They are identified by considering all the forest pixels whose Euclidean distance transformation exceeds a threshold determined by the input size parameter (defined by the methodology as 100 m).

[33] *https://forest.jrc.ec.europa.eu/en/activities/lpa/mspa/*

ii. **Boundaries:** Boundaries are defined as those forest pixels that separate the core pixels from the background pixels. They are divided into two categories:
    a. Perforations: defined as the internal boundary pixels.
    b. Edges: defined as the external boundary pixels.

iii. **Islets:** Islets, also called patches, are defined as those connected components of forest pixels that do not contain any core pixel.

iv. **Connectors:** Connectors link the core-connected components. They are subdivided into two classes:
    a. Bridges: Also referred to as corridors, these are connector pixels that link two or more individual core-connected components.
    b. Loops: Also known as shortcuts, these are connector pixels that originate from the same core-connected component.

v. **Branches:** Pixels that do not belong to any of the previously defined categories are termed branch pixels.

vi. **Background classes:** The connected components of the background pixels in the input image are divided into three classes depending on their embedding relationship with the forest pixel classes:
    a. Background: refers to the connected components of background pixels in the input image that are connected to the edge of the image. This means they are background pixels that can be reached from the edge of the image by following a connected path of background pixels (i.e., without crossing any forest pixels).
    b. Border-opening: refers to the connected components of background pixels that cannot be reached from the edge of the image without crossing one or more forest pixels but can be reached without crossing any core pixel.
    c. Core-opening: refers to the connected components of background pixels that cannot be reached from the edge of the image without crossing at least one core pixel. They are always associated with a perforation.

c) Fragmentation classes:

Based on the information provided earlier, the categories Core, Perforations, and Islets (patches) are selected. The results of the areas by fragmentation class for each evaluated year are presented in **Table 27**, for the baseline.

Table 27. Fragmentation classes in the baseline scenario.

	Class	Area (ha)

Spatial boundaries		Year 1 (2008)	Year 2 (2013)	Year 3 (2018)
Reference region	Core	333,274.36	264,264.85	192,472.72
	Perforated	356.10	1,069.97	1,358.22
	Patch	23,918.14	30,222.40	39,125.29
	Total	**358.048,60**	**295,551.22**	**232,956.23**
Leakage area	Core	24,096.52	19,132.22	12,887.90
	Perforated	217.66	115.75	98.74
	Patch	1,518.25	2,025.51	3,019.15
	Total	**25,832.43**	**21,273.48**	**16,005.90**

Source: (CO2CERO SAS, 2023).

d) Precision analysis to reduce the uncertainty of forest degradation estimates[34].
e) Transitions between fragmentation classes:
   i. primary degradation: core to patch, and
   ii. secondary degradation: perforated to patch.

Considering the selected MSPA classes and the coverages of the mentioned years, a transition analysis is performed according to the type of degradation for the baseline scenario (**Table 28**).

Table 28. Fragmentation class transitions in the baseline scenario.

		MMBF (ha)	SMBF (ha)
Spatial Boundaries	Year class 2008 / Year class 2018	Patch	Patch
Reference Region	Core	2,741.65	11,419.76
	Perforated	0.00	0.00
	Total, general	**2,741.65**	**11,419.76**
Leakage Area	Core	353.16	1,355.59
	Perforated	0.00	0.00
	Total, general	**353.16**	**1,355.59**

Source: (CO2CERO SAS, 2023).

[34] See in 04_*SIG\ Informe Geoprocesamientos SIG REDD+ Embera Wounaan_V6*

3.6.3.3.2.1 Annual historical forest degradation in the project area in the baseline scenario

The estimation of the annual historical degradation in the project area in the baseline scenario is carried out by considering the primary and secondary degradation of the reference region. For primary degradation, the start and end years of the reference period are identified, considering the defined area for the reference region in the core class at the start year (2008) and its transition to a patch by the end year of the reference period (2018). Additionally, for secondary degradation, the area in the reference region in the perforated class at the start year and its transition to a patch by the end year of the reference period are taken into account[35].

3.6.3.3.2.2 Annual historical forest degradation in the leakage area in the baseline scenario

For the historical annual degradation in the leakage area in the baseline scenario, primary degradation is considered, which is calculated using the values obtained in the leakage area in the core class in the starting year and the transition area to patch in the final year of the period. Additionally, for the estimation of annual secondary degradation, the values from the leakage area in the perforated class in the starting year and its transition to patch in the final year of the period are used.

3.6.3.3.2.3 Annual projected forest degradation in the project area in the REDD+ project scenario

For the projection of degradation in the project area in the with-project scenario, the historical annual degradation is used with a projection of the reduction in primary degradation due to the implementation of REDD activities in the Mature Mixed Broadleaf Forest (BLMM) cover of 100% and in the Secondary Mixed Broadleaf Forest (BLMS) cover of 100%.

3.6.3.3.2.4 Annual projected forest degradation in the leakage area in the REDD+ project scenario

It is obtained from the forest degradation patterns given in the leakage area in the without-project scenario and a value of 10% corresponding to the increase in emissions in the

[35] See in *03_Carbono\Carbono_Degradacion_REDDEmberaWounaan_V9.xlsx*.

leakage area due to the implementation of REDD+ activities (a value suggested by the BCR0002 V3.1 methodology).

3.6.3.4 Historical period results

Below are the results for the historical period according to the activities evaluated for the project.

3.6.3.4.1 Deforestation

Based on the emission factor obtained for the project, the baseline emissions were calculated, resulting in a total of 74,327,561 tCO2e for the entire project area over the years. (see **Table 29**).

Table 29. Emissions of baseline scenario.

Year	EAlb (tCO_2e)		Total
	MMBF	SMBF	
2018	276,504	1,454,412	1,730,916
2019	395,780	2,081,805	2,477,585
2020	395,780	2,081,805	2,477,585
2021	395,780	2,081,805	2,477,585
2022	395,780	2,081,805	2,477,585
2023	395,780	2,081,805	2,477,585
2024	395,780	2,081,805	2,477,585
2025	395,780	2,081,805	2,477,585
2026	395,780	2,081,805	2,477,585
2027	395,780	2,081,805	2,477,585
2028	395,780	2,081,805	2,477,585
2029	395,780	2,081,805	2,477,585
2030	395,780	2,081,805	2,477,585
2031	395,780	2,081,805	2,477,585
2032	395,780	2,081,805	2,477,585
2033	395,780	2,081,805	2,477,585
2034	395,780	2,081,805	2,477,585
2035	395,780	2,081,805	2,477,585
2036	395,780	2,081,805	2,477,585
2037	395,780	2,081,805	2,477,585
2038	395,780	2,081,805	2,477,585
2039	395,780	2,081,805	2,477,585
2040	395,780	2,081,805	2,477,585
2041	395,780	2,081,805	2,477,585
2042	395,780	2,081,805	2,477,585

Year	EAlb (tCO_2e)		Total
	MMBF	SMBF	
2043	395,780	2,081,805	2,477,585
2044	395,780	2,081,805	2,477,585
2045	395,780	2,081,805	2,477,585
2046	395,780	2,081,805	2,477,585
2047	395,780	2,081,805	2,477,585
2048	119,276	627,393	746,670
TOTAL	**11,873,397**	**62,454,164**	**74,327,561**

Source:CO2CERO SAS, 2023).

Where:

- EAlb (tCO_2e): CO_2e emissions from deforestation in the baseline scenario.
- MMBF: Mature mixed broadleaf forest
- SMBF: Secondary mixed broadleaf forest

3.6.3.4.2 Forest degradation

From the emission factor obtained for the project, the baseline was calculated, resulting in a total of 12,849,465 tCO2e emissions for all years within the project area (see **Table 30**).

Table 30. Emissions due to degradation in the baseline scenario.

Year	EAlbdeg (tCO2e) MMBF	EAlbdeg (tCO2e) SMBF	EAlbdeg (tCO2e)
	Annual	Annual	Annual
2018	86,738	212,496	299,234
2019	124,155	304,161	428,316
2020	124,155	304,161	428,316
2021	124,155	304,161	428,316
2022	124,155	304,161	428,316
2023	124,155	304,161	428,316
2024	124,155	304,161	428,316
2025	124,155	304,161	428,316
2026	124,155	304,161	428,316
2027	124,155	304,161	428,316
2028	124,155	304,161	428,316
2029	124,155	304,161	428,316

Year	EAlbdeg (tCO2e) MMBF Annual	EAlbdeg (tCO2e) SMBF Annual	EAlbdeg (tCO2e) Annual
2030	124,155	304,161	428,316
2031	124,155	304,161	428,316
2032	124,155	304,161	428,316
2033	124,155	304,161	428,316
2034	124,155	304,161	428,316
2035	124,155	304,161	428,316
2036	124,155	304,161	428,316
2037	124,155	304,161	428,316
2038	124,155	304,161	428,316
2039	124,155	304,161	428,316
2040	124,155	304,161	428,316
2041	124,155	304,161	428,316
2042	124,155	304,161	428,316
2043	124,155	304,161	428,316
2044	124,155	304,161	428,316
2045	124,155	304,161	428,316
2046	124,155	304,161	428,316
2047	124,155	304,161	428,316
2048	37,416	91,665	129,081
TOTAL	**3,724,639**	**9,124,827**	**12,849,465**

Source:CO2CERO SAS, 2023).

Where:

- EAlbdeg (tCO_2e) MMBF: CO_2e emissions from degradation in Mature Mixed Broadleaf Forest in the baseline scenario
- EAlbdeg (tCO_2e) SMBF: CO_2e emissions from degradation in Secondary Mixed Broadleaf Forest in the baseline scenario
- EAlbdeg (tCO_2e): Total CO_2e emissions from degradation in the baseline scenario.

3.6.4 GHG emissions reduction/removal in the project scenario

Below are the results of GHG emissions obtained from deforestation and forest degradation for the REDD+ Emberá Wounaan project. It should be noted that the risk of non-permanence (buffer) value corresponds to that determined by the BioCarbon Standard, where a fraction of 20% of the total credits generated by the project has been standardized.

3.6.4.1 Emissions avoided ex-ante

The reduction in emissions generated by the project is estimated in the Ex-Ante scenario, which would occur once the project is implemented over a period of 30 years, involving activities to reduce deforestation and forest degradation.

3.6.4.1.1 Deforestation

For the estimation of Ex-Ante emission reduction generated by deforestation, a projection of the decrease due to project activities was made, according to the determination of deforested area from 2018 to 2022 and the historical period (2008-2018), both for the project area and the Potential Leakage Area as follows:

- The percentage projection of the reduction in deforestation due to the implementation of REDD+ activities was carried out based on the comparison between the historical deforestation rate of the baseline and the deforestation rate of the initial monitoring period (2018-2022). Subtracting and converting each of the rates to a percentage allows to demonstrate the percentage effectiveness of the project activities implementation.
- On the other hand, for the projection of leaks in the project area, the value suggested by methodology BCR 0002 version 3.1 (10%) is used.

3.6.4.1.2 Forest degradation

For the estimation of Ex-Ante emissions reduction due to degradation, a projection of the decrease by the project activities was made, according to the determination of the transition area for each type of degradation from 2018 to 2022, both for the project area and the Leakage Area[36].

The percentage projection of the degradation decreases due to the implementation of REDD+ activities in the eligible area generated by the project commitment in the Ex-Ante scenario is evaluated through the percentage decrease of the annual degraded area evidenced from the analysis conducted between 2018 and 2022 (monitoring period), with respect to the annual degraded area of the baseline period (2008-2018). This will allow us to demonstrate the reduction of the degraded area brought about by the project, compared to what was generated in the baseline period. It should be noted that since these

[36] See in: 03_*Carbono\Carbono_Degradacion_REDDEmberaWounaan_V9*

are emissions, this result should be subtracted from a value of 100%, as it represents a percentage increase in emissions, not a decrease.

In this way, the Ex-Ante emissions reduction of the project due to degradation activities was obtained, taking into account the net emissions generated by the project estimated by the project implementation[37].

3.6.4.1.3 Reductions (avoidance, displacement or destruction) of net GHG emissions

In the calculation workbook *3_Carbono\Carbono_Total_EmberaWounaan_V11.xlsx*, 'Ex ante' sheet presents the results of net GHG emission reductions in the ex-ante scenario for the entire project, aggregating the behavior of deforestation and degradation activities, where:

- *Ealb:* CO_2e emissions from deforestation and forest degradation in the baseline scenario.
- *EAf:* CO_2e emissions from deforestation and forest degradation in the leakage belt.
- *RE Totales:* Total reduction of CO_2e emissions from deforestation and forest degradation.
- *Buffer:* Buffer non-permanece risk for the emission reduction scenario from deforestation and forest degradation.
- *RE Netas:* Net reduction of CO_2e emissions from deforestation and forest degradation.

Considering the selected pools in the project (Deforestation and Degradation), as explained earlier, a total of 56,947,881 tCO_2e net is obtained for the entire project area for all years, with an average annual net emission of 1,837,028 tCO_2e[38].

Table 31. Summary of ex - ante emissions.

Year	GHG emission reductions in the baseline scenario (tCO_2e)	GHG emission reductions in the project scenario (tCO_2e)	GHG emissions attributable to leakages (tCO_2e)	Estimated Net GHG Reduction (tCO_2e)
2018	2,030,150	158,442	213,979	**1,326,184**

[37] 03_*Carbono\Carbono_Total_REDDEmberaWounaan_V11*
[38] See in 03_*Carbono\Carbono_Total_REDDEmberaWounaan_V11*

Year	GHG emission reductions in the baseline scenario (tCO_2e)	GHG emission reductions in the project scenario (tCO_2e)	GHG emissions attributable to leakages (tCO_2e)	Estimated Net GHG Reduction (tCO_2e)
2019	2,905,901	226,789	306,283	**1,898,263**
2020	2,905,901	226,789	306,283	**1,898,263**
2021	2,905,901	226,789	306,283	**1,898,263**
2022	2,905,901	226,789	306,283	**1,898,263**
2023	2,905,901	226,789	306,283	**1,898,263**
2024	2,905,901	226,789	306,283	**1,898,263**
2025	2,905,901	226,789	306,283	**1,898,263**
2026	2,905,901	226,789	306,283	**1,898,263**
2027	2,905,901	226,789	306,283	**1,898,263**
2028	2,905,901	226,789	306,283	**1,898,263**
2029	2,905,901	226,789	306,283	**1,898,263**
2030	2,905,901	226,789	306,283	**1,898,263**
2031	2,905,901	226,789	306,283	**1,898,263**
2032	2,905,901	226,789	306,283	**1,898,263**
2033	2,905,901	226,789	306,283	**1,898,263**
2034	2,905,901	226,789	306,283	**1,898,263**
2035	2,905,901	226,789	306,283	**1,898,263**
2036	2,905,901	226,789	306,283	**1,898,263**
2037	2,905,901	226,789	306,283	**1,898,263**
2038	2,905,901	226,789	306,283	**1,898,263**
2039	2,905,901	226,789	306,283	**1,898,263**
2040	2,905,901	226,789	306,283	**1,898,263**
2041	2,905,901	226,789	306,283	**1,898,263**

Year	GHG emission reductions in the baseline scenario (tCO_2e)	GHG emission reductions in the project scenario (tCO_2e)	GHG emissions attributable to leakages (tCO_2e)	Estimated Net GHG Reduction (tCO_2e)
2042	2,905,901	226,789	306,283	**1,898,263**
2043	2,905,901	226,789	306,283	**1,898,263**
2044	2,905,901	226,789	306,283	**1,898,263**
2045	2,905,901	226,789	306,283	**1,898,263**
2046	2,905,901	226,789	306,283	**1,898,263**
2047	2,905,901	226,789	306,283	**1,898,263**
2048	875,751	68,347	92,305	**572,079**
Total	**87,177,026**	**6,803,676**	**9,188,498**	**56,947,881**

Source: CO2CERO S.A.S., 2023.

3.6.4.2 Avoided emissions ex-post.

Based on the monitored data year by year and the quantification of forest changes in the project area, the avoided emissions due to deforestation are calculated for the years of project activity. These can be found in the Monitoring Report section[39].

Taking into account the selected project activities (Deforestation and Forest Degradation), which were explained earlier, the total avoided emissions during the project implementation period to date are obtained, considering the reduction due to the risk of non-permanence (buffer).

4 Compliance with applicable legislation

In order to comply with the legislation regarding the collective rights of indigenous peoples in Panama, particularly in the management and use of their lands, the REDD+

[39] See in: *12_Reporte de monitoreo\02_Reporte de monitoreo\ReporteMonitoreo_REDD+ Emberá Wounaan_V14.docx"\1.5.3 Total GHG emission reductions*

Emberá Wounaan project adheres to a series of Indigenous norms and jurisprudence[40]. These are articulated with the design, implementation, and execution of REDD+ activities determined by the comarca (indigenous territory), respecting their rights, autonomy, customs, and cultures.

Similarly, initiatives to reduce emissions from deforestation and forest degradation within Panamanian territory are related to a normative context involving Executive Decree No. 84 of 1999, Executive Decree No. 35 of February 26, 2007, Law 22 of 1983, and Law 41 of 1998, which proposes a reference level for emissions from deforestation of natural forests. Additionally, the entire regulatory framework associated with the greenhouse gas mitigation initiative is presented. In addition, the management system document[41] is presented, which allows the monitoring of each of the legal requirements presented below.

4.1 Regulatory Framework Related to the Rights of the Emberá Wounaan Indigenous Peoples

Below, mention is made of the regulatory framework that regulates the rights of the Emberá Wounaan indigenous peoples in Panama, providing a description of its foundation and how it is articulated in the different stages of the project, especially in the REDD+ activities see **Table 32**.

Table 32. Legal Framework for the Rights of the Emberá Wounaan Indigenous Peoples.

Legislation	Year	Regulatory framework	Description
Constitution of Panama	1972	Article 5	The law may create other political divisions subject to special regimes, meaning that special laws will apply in indigenous territories and national laws will apply subsidiarily.
		Article 88	Indigenous languages will be the subject of special study, conservation, and dissemination, and the State will promote bilingual literacy programs in indigenous communities.

[40] See in: *09_Legislación\2_MatrizLegalDerechosFundamentales_REDD+EmberaWounaan_V2.xlsx*

[41] *See in: 13_Gestión de información\PC-P11 Procedimiento Gestión Información REDD.pdf*

Legislation	Year	Regulatory framework	Description
		Article 90	The State recognizes and respects the ethnic identity of national indigenous communities, will carry out programs aimed at developing the material, social, and spiritual values of each of their cultures, and will create an institution for the study, conservation, dissemination of these cultures and their languages, as well as for the promotion of the integral development of these human groups.
		Article 104	The State will develop education and promotion programs for indigenous groups, as they possess their own cultural patterns, in order to achieve their active participation in civic functions.
Law N° 34 Education	1995	Article 10	Education for indigenous communities is based on their right to preserve, develop, and respect their identity and cultural heritage.
Ley N° 17 Salud- Medicina tradicional	2016	Article 1	This law establishes a special regime to protect and promote respect for the knowledge of traditional indigenous medicine and to create mechanisms for the protection of traditional knowledge through the special system of collective intellectual property. It also guarantees the full and effective participation of indigenous congresses, councils, or traditional authorities at their different levels.
Law N° 42 Family, women and adolescence	1997	Article 13	The National Directorate of Social Promotion and Community Action is the technical body for planning, promotion, and execution through which the Ministry organizes, directs, develops, coordinates, executes, and monitors policies, programs, and standards related to social welfare and community action.
		Article 14	To plan, develop, and execute programs and projects for the prevention, guidance, care, and protection of indigenous groups, peasants, and other ethnicities.
Law No. 27 Protection, Promotion, and	1997	Article 10	In order to preserve national traditions and cultures, it prohibits the importation of products or goods that imitate Panamanian indigenous and traditional pieces or garments such as molas and naguas.

Legislation	Year	Regulatory framework	Description
Development of Handicrafts		Article 17	It covers handicrafts as an industrial expression; therefore, it includes the handicrafts produced by these peoples.
Law No. 35 Board of Fairs of the Indigenous Peoples of the Republic of Panama	2000	Article 2	Trust of Indigenous Peoples' Fairs of the Republic of Panama, its purpose is to organize and carry out national and international agroforestry, handicraft, cultural, educational, touristic, maritime, traditional medicine, and general trade fairs and exhibitions, in order to highlight the cultural and national richness of Panama's indigenous peoples.
Law No. 3 Commission of Indigenous Affairs	1995	Article 64	Its functions include studying, proposing draft laws, and issuing opinions to create or modify indigenous territories.
Decree No. 1 National Council for Indigenous Development	2000	Article 2 item 1	One of its objectives is to promote effective actions to support indigenous peoples and their development. In the Executive Decree that creates this Council, the first consideration states "that the Panamanian State is of a multi-ethnic, pluricultural, and multilingual nature"; therefore, the existence of indigenous peoples is recognized.
		Article 7	Promote, coordinate, supervise, and evaluate policies, plans, programs, and projects with a gender perspective for the development of indigenous peoples, respecting their ethnic and cultural identity, and their forms of organization.
Law No. 27 Fund for the Development of Indigenous Peoples of Latin America and the Caribbean	1993	Article 1	The purpose of the Fund for the Development of Indigenous Peoples of Latin America and the Caribbean, hereinafter referred to as the "Indigenous Fund," is to establish a mechanism aimed at supporting the self-development processes of indigenous peoples, communities, and organizations in Latin America and the Caribbean, hereinafter referred to as "Indigenous Peoples.
Universal Declaration of Human Rights	2015	Article 27	Every person has the right to freely participate in the cultural life of the community, to enjoy the arts, and to participate in scientific progress and the benefits derived from it.

Legislation	Year	Regulatory framework	Description
Convention 169 ILO on Indigenous and Tribal Peoples	2014	Article 1	It corresponds to tribal peoples in independent countries, whose social, cultural, and economic conditions distinguish them from other sectors of the national community, and who are governed wholly or partly by their own customs or traditions or by special legislation.
		Article 2 item 2-c	To assist the members of the indigenous peoples concerned in eliminating socio-economic differences that may exist between indigenous members and other members of the national community in a manner compatible with their aspirations and ways of life, as outlined in Convention No. 169 concerning Indigenous and Tribal Peoples in Independent Countries.
		Article 4 item 1	Special measures shall be taken as may be necessary to safeguard the persons, institutions, property, labour, cultures, and environment of the peoples concerned.
		Article 5	Measures shall be taken with the participation and cooperation of the peoples concerned to address the difficulties experienced by these peoples in facing new conditions of life and work.
		Article 6	Consultations shall be carried out with the peoples concerned, through appropriate procedures and particularly through their representative institutions, whenever legislative or administrative measures may affect them directly.
		Article 7	The peoples concerned shall have the right to determine their own priorities about the development process, insofar as it affects their lives, beliefs, institutions, and spiritual well-being, as well as the lands they occupy or use in any way, and to control, to the extent possible, their own economic, social, and cultural development.
		Article 23	Crafts, rural and community industries, and traditional activities related to the subsistence economy of the peoples concerned, such as hunting, fishing, trapping, and gathering, shall be recognized as important factors in maintaining their culture and self-sufficiency and in their economic development.

Source: Compiled by CO2CERO S.A.S., 2023

With the above, we highlight the importance of generating co-benefits for the social well-being of indigenous communities and the preservation of their culture and customs, emphasizing that they are ethnic groups with fundamental value for both society and the

nation. Additionally, these are peoples who, from their ancestral essence, still preserve the feelings and care for their natural surroundings.

4.2 Law and land use

In Panama, the rights of indigenous communities to collective land ownership are recognized in the 1972 Constitution, established in Article 127, declaring the State as the guarantor of indigenous communities in the reservation of their lands and their collective ownership for the achievement of their economic and social well-being. Thus, the law will regulate the procedures to be followed to achieve this purpose and the corresponding demarcations within which private land appropriation is prohibited. Additionally, there are laws that support the provisions of Article 127 of the constitution, as follows:

- **Law 37 of 1962 of the National Assembly of Panama:** Establishes reserve lands for indigenous tribes exempt from being considered as state lands subject to agrarian reforms, they cannot be transferred in property, as they will fulfill a social function, ensuring that the benefits of technical assistance always reach indigenous communities.
- **Cabinet Decree 53 of 1971 of the Provisional Government Board:** Approves provisions related to the protection and integration of indigenous populations, establishing in its article 11, "the recognition of collective property rights, in favor of members of the indigenous population".
- **Law 41 of 1998 of the General Legislative Assembly of the Republic of Panama**: In its article 21 - numeral 2, and article 63, recognizing the right of Comarcas and indigenous peoples regarding the use, management, and sustainable traditional exploitation of renewable natural resources, located within the Comarcas and indigenous reserves created by law.
- **Law 72 of 2008:** through which the National Assembly establishes the special procedure for the adjudication of collective land ownership of indigenous peoples outside the comarcas, corresponding to article 127 of the Political Constitution of Panama. This title of collective property aims to guarantee the economic, social, and cultural well-being of the people who inhabit the indigenous community.
- **Executive Decree No. 223 of 2010 of the Ministry of Agricultural Development:** Establishes the special procedure for the adjudication of collective land ownership of indigenous peoples that are not within the Comarcas; stating that to recognize such an area as traditionally occupied by indigenous peoples, it must present the "certification issued by the Comptroller General of the nation of the population census of the community, the certification of the national

indigenous policy direction of the ministry of government and justice, accrediting the existence of the community". These requirements were met to obtain the titling, demonstrating through the law of assignment the existence of legal representation.

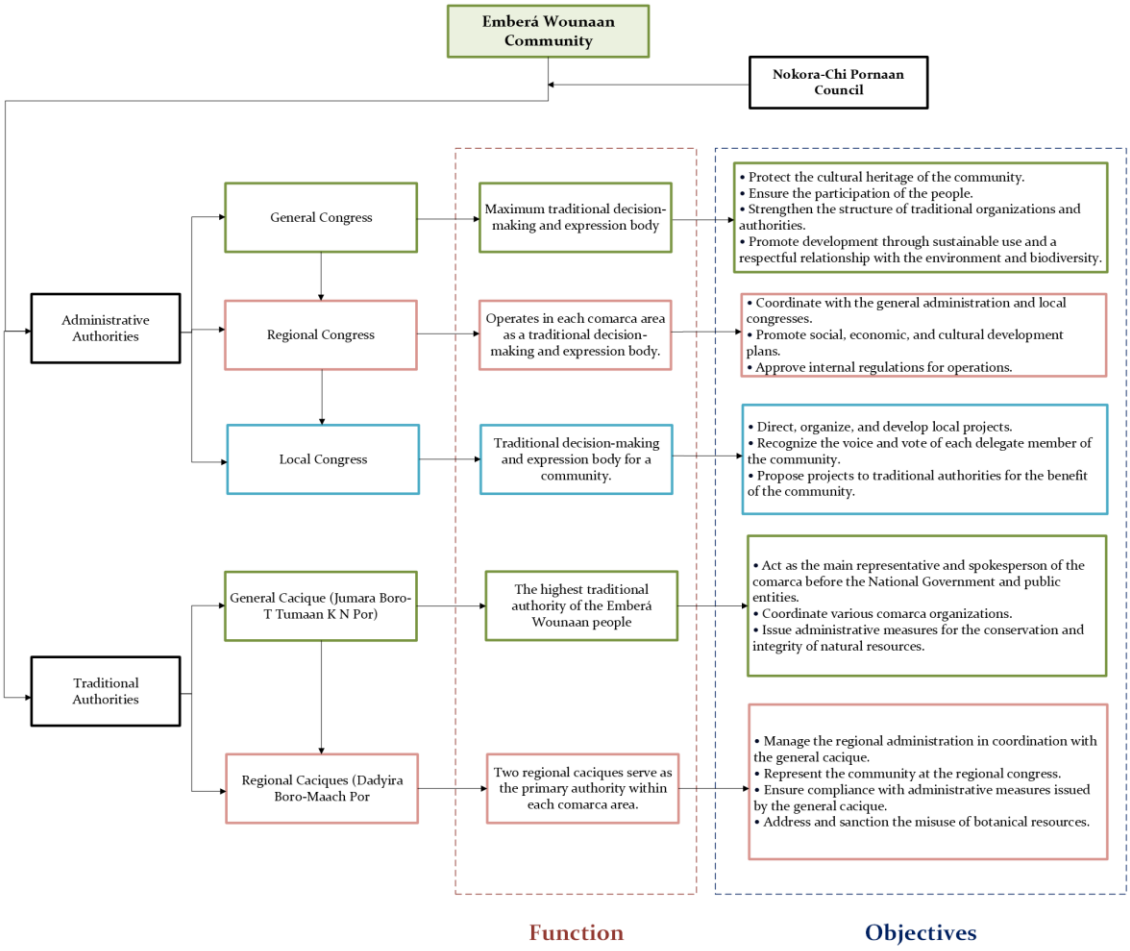
The Emberá Wounaan General Congress will serve as the highest traditional decision-making body and expression of the Comarca. Similarly, the regional and local congresses will have a board of directors, comprised of a president, vice president, secretary, assistant secretary, and treasurer, who will lead the development of plans, programs, and projects at their respective scales. Meanwhile, the Nokora-Chi Por Naan council will serve as a consultative body, where the general chief, regional chief, and presidents of the general, regional, and local congresses will submit plans, programs, and projects for consideration.

Regarding land ownership by the Comarca Emberá Wounaan, it was established and regulated by Law 22 of 1983 of the National Assembly of Corregimientos Representatives. This law recognizes the right to heritage and indigenous autonomy for the collective use of Emberá and Wounaan indigenous groups, for their integral development, prohibiting private appropriation. Similarly, Article 19 assigns responsibility to the community for the conservation and rational use of natural resources, such as flora, forest cover, soil, fauna, and water, aligning with the objectives of the REDD+ project.

The right to collective property of the Comarca Emberá Wounaan is ratified through Executive Decree No. 84 of 1999 of the Ministry of Government and Justice, by which the administrative charter of the Comarca Emberá Wounaan of Darién is adopted, recognizing the right to indigenous autonomy and self-management of the Emberá Wounaan people, in harmony and collaboration with governmental entities. Within its content, the following aspects are defined:

- **Title III** concerning the government and administration of the Comarca: The administration of the Comarca Emberá Wounaan will be exercised by traditional and governmental authorities and bodies, establishing the administrative organization of the Comarca (See **Figure 30**).

Figure 30. Administrative and Traditional Organization of the Comarca Emberá Wounaan.



Source: Adapted by CO2CERO S.A.S., 2023.

- **Title VI**, regarding the land regime:
  - Article 83: The land within the Comarca constitutes the community's heritage for the collective use of indigenous groups, with the purpose of dedicating it to integral development activities and sustainable resource use. Therefore, private appropriation or alienation of such lands is prohibited.
  - Article 84: Inhabitants within the administrative jurisdiction area of the Comarca shall have the right to land.
  - Article 85: Depending on the case, it will recognize forms of land use such as family use, communal use, collective use, forest use, biocultural subsistence, and land for reforestation.

- **Title VI,** regarding the land regime:

- Article 83: The lands within the Comarca constitute the community's heritage for the collective use of indigenous groups, aimed at dedicating them to integral development activities and sustainable resource use. Therefore, private appropriation or alienation of such lands is prohibited.
- Article 84: Inhabitants within the administrative jurisdiction area of the Comarca shall have the right to land.
- Article 85: Depending on the case, it will recognize forms of land use such as family use, communal use, collective use, forest utilization, biocultural subsistence, and lands for reforestation.

- **Title VII,** regarding the economy: The general congress of the Comarca Emberá Wounaan will establish the finance department, which will be responsible for conducting and controlling accounting operations, ensuring the development of effective and efficient financial self-management.
  - Article 94: Revenues are considered Comarcal if they originate from activities and management of land use and rights, applicable in the case of implementing the GHG mitigation project type REDD+. The Comarca will carry out effective and efficient financial self-management of resources through control and administration instruments consistent with territorial reality.
- **Title VII,** regarding the economy: The general congress of the Comarca Emberá Wounaan will establish the finance department, which will be responsible for conducting and controlling accounting operations, ensuring the development of effective and efficient financial self-management.
  - Article 94: Revenues are considered Comarcal if they originate from activities and management of land use and rights, applicable in the case of implementing the GHG mitigation project type REDD+. The Comarca will carry out effective and efficient financial self-management of resources through control and administration instruments consistent with territorial reality.
- **Title VIII,** regarding natural resources and the environment, establishes the following:
  - Article 95: The natural resources existing within the Comarca Emberá Wounaan are recognized as a collective heritage of the community, in which the general congress of the Comarca will work hand in hand with the National Environmental Authority (ANAM), defining policies for the protection, conservation, use, exploitation, and sustainable utilization of natural resources and the environment, managed by the Natural Resources and Environment Directorate.
  - Article 96: The Directorate of Natural Resources and Environment, in coordination with local congresses, will oversee and promote the protection

and sustainable management of natural resources, with the aim of not allowing exploitation or use without authorized consent.

- Article 97: The part of the Darién National Park located within the Comarca will be jointly administered by Traditional Authorities and the National Environmental Authority, prioritizing the benefit of the Emberá Wounaan indigenous people.
- Article 98: Rational use activities of natural resources will be carried out when the interested community requests the opinion of the Regional Cacique through the local congress, which will be supported by the Natural Resources Directorate of the general congress to provide an opinion on the feasibility of the project, which will then be submitted to the General Cacique.

In this way, the right to collective property establishes a mechanism to protect cultural identity, promote economic and social development as an ethnic group, recognizing a high degree of autonomous policy in decisions that affect them. This allows us to confirm that the Comarca Emberá Wounaan has the necessary regulatory framework to obtain land titling, demonstrating through law the allocation and existence of legal representation, of a legitimate community and a territory that promotes its development.

4.3 REDD+ in national context

The United Nations Framework Convention on Climate Change (UNFCCC) recognized during the Conference of the Parties (COP 13) held in Bali in 2007, the reduction of emissions from deforestation and forest degradation as a valid mechanism for mitigating the effects of climate change. This mechanism is applied in conjunction with the conservation, sustainable management, and enhancement of forest carbon stocks in developing countries.

Panama has been involved in efforts to reduce the effects of climate change through forest conservation and restoration, considering international commitments, where REDD+ represents an opportunity for improving and strengthening natural resource management. Among its strategies is the National Forest Restoration Program 2021 - 2025, whose objective is the structuring and leadership of processes for watershed restoration, recovery of degraded soils, and achieving carbon neutrality by 2050, favoring its Nationally Determined Contributions to the UNFCCC (MiAmbiente, 2022).

At the national level, the National Strategy for Reducing Emissions from Deforestation and Forest Degradation represents the transformation and commitment of the Ministry of Environment to act on forest resource management and its associated components, consolidating the country's capacity to conserve and increase forest resources, protecting

them from latent threats, while supporting farmers and indigenous peoples in the management and use of the resources with which they coexist (MiAmbiente, 2022).

Through the National Forest Development Plan issued in 2008 by the National Environmental Authority, it is established that within the models of sustainable forest management, initiatives for reducing emissions from deforestation and degradation (REDD+) are involved as an important tool to include forest management in the fight against climate change. In this regard, the communities involved will obtain income through the sustainable management of forests as an opportunity cost compared to negative activities on the same.

The national climate change policy provides the principle whereby the commitment to implement adaptation and mitigation actions to counteract the adverse effects of climate change is recognized, taking into account areas of poverty, with the conservation and recovery of natural resources, and the preservation of ecosystems. Thus, within its objective 3, it aims to promote actions related to climate change mitigation in a manner compatible with sustainable economic and social development established in the Kyoto Protocol, under the promotion of implementing development projects in the forest production sector, supported by the Clean Development Mechanism (CDM), including a REDD+ type climate change mitigation project.

Meanwhile, Panama's National Climate Change Mitigation Strategy, developed by the Ministry of Environment, is based on four pillars:

i) Emission reduction through changes in land use and forestry;
ii) Emission reduction through deforestation and degradation;
iii) Cleaner production;
iv) Energy.

For the land use change and forestry sector (*Pillar i*), afforestation and reforestation are proposed as mitigation options, while a REDD+ project is established to address actions for emission reduction through deforestation and degradation (*Pillar ii*).

Since 2015, Panama has been part of the UN-REDD+ system, an international alliance aimed at establishing and strengthening the development of national and subnational programs and projects for emission reduction through deforestation and forest degradation. These initiatives are based on the analysis of each nation's specific context, including their carbon reservoir potential, favorable regulatory and legislative scenarios, and social opportunities.

In the consolidated text of Law 41 of 1998, which includes amendments approved by Law 18 of 2003, Law 44 of 2006, Law 65 of 2010, and Law 8 of 2018 of the National Assembly, the value of environmental management and organized work for sustainable resource utilization is recognized. The law acknowledges the right to receive credits as a result of traditional forest use and customs, provided that responsible care of natural resources is maintained during their execution. Meanwhile, in Executive Decree 20 of 2019, which approves the National Forest Strategy 2018-2050 of the Ministry of Environment within the framework of REDD+ and the participation of the indigenous peoples' structure of Panama, twelve points were established that are addressed by this mechanism. It declares a strategy aimed at achieving positive economic, environmental, and social outcomes at the local level.

4.4 Laws and decrees

In **Table 33**, some regulatory instruments related to the REDD+ Emberá Wounaan project, as well as greenhouse gas (GHG) mitigation initiatives within the territory[42].

Table 33. Laws and decrees related to REDD+ Emberá Wounaan project.

Legislation	Year	Entity	Description
Law 18	1952	National Assembly of Panama	Creating as a governmental dependency a Secretariat of Indigenous Affairs of the Republic, which will handle matters as ordered by law and those directly related to the indigenous administration of the national territory.
Constitution of Panamá	1972	National Assembly of Panama	An instrument created for national strengthening, guaranteeing freedom, democracy, and institutional stability, coupled with the promotion of social justice, general well-being, and regional integration.
Executive decree No. 84	1972	Ministry of Agriculture and Livestock	Declaring the Upper Darien a protective forest, in which the exploitation of forest resources, hunting of animals, agriculture, and livestock are restricted. Dedicated to the

[42] See in: 09_Legislación9_*Legislación ambiental\1_MatrizLegalAmbiental_REDD+EmberaWounaan_V2.xlsx*

Legislation	Year	Entity	Description
			protection and sustainable use of natural resources in permitted areas.
Executive decree No. 21	1980	Ministry of Agricultural Development	Establishes the Darien National Park, where logging, burning, land allocation, and activities that destroy natural resources are prohibited. In 1981, the United Nations Educational, Scientific and Cultural Organization (UNESCO) declared it part of the World Biosphere Reserve.
Law 1	1994	National Environmental Authority	This legislation establishes forestry regulations in the Republic of Panama and enacts other provisions to protect, conserve, enhance, increase, educate, research, manage, and rationally exploit the forest resources of the Republic. It sets minimum requirements for sustainable forest management and harvesting natural forests in the required regions will require authorization through a contract with the environmental authority.
Resolution J.D. No. 01-95	1995	INRENARE	This resolution creates the biological corridor of the Bagre mountain range as a tool to ensure the conservation of representative samples of the ecosystems, fauna, and flora of the Darien. It acknowledges the traditional lifestyles of local communities.
Law 41	1998	Legislative Assembly	Establishes ANAM as the authority promoting the environmental management of the national territory. In its article 66, it creates the National System of Protected Areas (SINAP) through Law 41 of July 1, 1998 "ANAM," which is later corroborated by the creation of the Ministry of Environment in Law No. 8 of March 25, 2015.
Resolution JD-05-98	1998	Ministry of Agricultural Development	To establish the minimum requirements in forest management plans, where the environmental authority may establish a mechanism that encourages and promotes the management of natural forests, with the aim of capturing and sequestering carbon dioxide (CO_2)

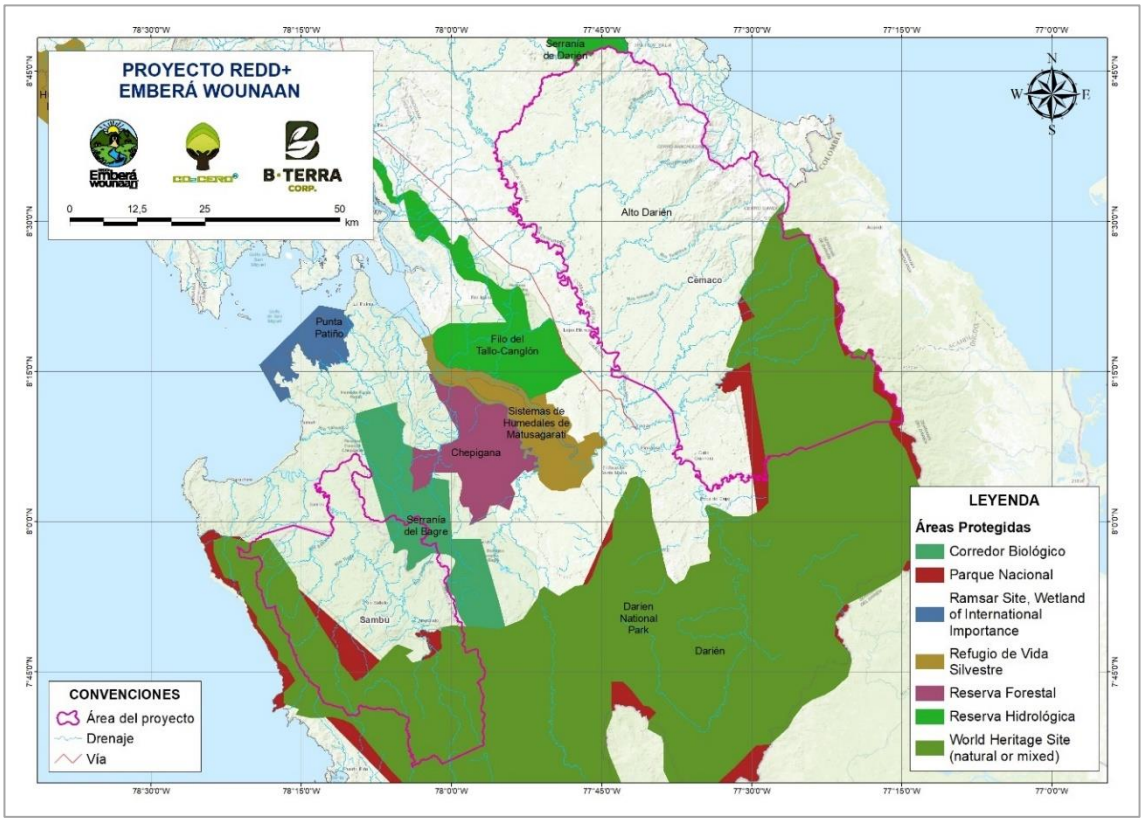
Legislation	Year	Entity	Description
			and contributing positively to the national balance and global emissions of greenhouse gases. For this purpose, a promotion, monitoring, and control office will be established.
Executive Decree No. 84	1999	Ministry of Government and Justice	By which the administrative organic charter of the Comarca Emberá Wounaan of Darién is adopted.
Law 20	2000	National Assembly of Panama	Establishes as its purpose the protection of the collective rights of intellectual property and traditional knowledge of indigenous peoples. Customs, traditions, beliefs, spirituality, worldview, and any other form of their cultural heritage shall be objectives of protection. From a standpoint where there are no industrial commercialization activities, such that the benefits perceived by the community from the commercialization of carbon certificates establish activities for the protection of traditional knowledge.
Executive Decree No. 2	2003	Ministry of Economy and Finance	By which the basic principles and guidelines of Panama's Forest Policy are approved, establishing mechanisms for the promotion, encouragement, and incentive in the social and market valuation of goods and services generated through socio-economic valuation and inclusion in the national watersheds for their review and design of economic incentives.
Resolution AG No. 0358	2007	ANAM	By which Resolution A.G. No. 0334 of 2004 is amended, through which a protected area is declared under the category of the Serranía del Darién hydrological reserve, with the purpose of adequately protecting the sources of rivers and stopping the expansion of the agricultural frontier.
Law 8	2015	National Assembly	Creates the Ministry of the Environment as the governing body in matters of protection, conservation, preservation, and sustainable utilization of natural resources. In its Chapter II, it establishes the state's relationship for

Legislation	Year	Entity	Description
			climate change mitigation, conducting a national inventory of greenhouse gas emissions and absorptions, and establishing mechanisms to promote the transition to a low-carbon economy.
Executive Decree No. 393	2015	Ministry of Foreign Affairs	Adopts the Sustainable Development Goals (SDGs) as part of a nationally binding process involving all societal levels.
Executive Decree No. 59	2016	Ministry of Environment	Allows and regulates co-management in the protected areas system, in those areas overlapping with indigenous Comarcas. This is corroborated in Law No. 72 of 2008, which establishes the relationship between the national environmental authority and indigenous authorities for the execution of sustainable natural resource management plans.
Executive Decree No. 34	2019	Ministry of Environment	By means of which the National Climate Change Strategy 2050 is approved.
Executive Decree No. 100	2020	Ministry of Environment	The Reduce Your Footprint National Program is created for the management and monitoring of low-carbon economic and social development in the Republic of Panama.
Executive Decree No. 137	2021	Ministry of Environment	The National Forest Restoration Program 2021-2025 is created, promoting the low-carbon economic and social development strategy, increasing ambition regarding NDCs for 2050.
Executive Decree No. 142	2021	Ministry of Environment	By means of which the national Carbon Market of Panama is established progressively and gradually.
Executive Decree No. 10	2022	Ministry of Environment	Which adopts the National Climate Action Plan and dictates other provisions.

Source: Compiled by CO2CERO S.A.S., 2022.

Regarding the overlap of project boundaries with protected areas or the national protected areas system (Darién National Park, Serranía del Bagre Reserve, and World Heritage Site), it is ensured through the Political Constitution of Panama, Law 22 of 1983, Law 1 of 1994, and ILO Convention 107, that the implementation of carbon projects is not limited by the existence of protection figures, provided that the well-being of the community prevails[43]. See in (**Figure 31**).

Figure 31. Protected areas in Project area.



Source: CO2CERO S.A.S., 2023.

[43] *See in: 10_Tenencia de la tierra\Consulta_TraslapesAP_2022.pdf*

5 Carbon ownership and rights

Below is a description of the party assuming responsibility for the carbon credits generated by the initiative.

5.1 Project holder

Below, are the proponents of REDD+ Emberá Wounaan project.

Individual or organization	**Comarca Emberá Wounaan**
Contact person	*Cacique Leonides Cunampia* [44]
Job position	*President of the General Congress of the Comarca Emberá Wounaan*
Address	*Bal Harbou Plaza, Local 23 Second floor, Panama City*
Phone number	*+507 6900-7584*
Email	*NA*

The Comarca Emberá Wounaan owns the territory where the initiative is implemented, thus serving as the proponent of the initiative and owner of the reduced greenhouse gas emissions generated within the project boundary. **Table 34** and **Table 35** present the communities comprising the Cémaco district, with a total of 29 communities, and the Sambú district, with 12 communities.

Table 34. Communities in the Cémaco District.

[44] It is important to highlight that the contact cell phone of the current Cacique Leonides Cunampia is a temporary contact information considering that it is a position subject to changes according to the governance structures of the Comarca Emberá Wounaan.

N.º	Community	N.º	Community	N.º	Community
Township Cirilo Guaynora		**Township Manuel Ortega**		**Township Lajas Blancas**	
1	Capetí	5	Barranquillita	16	Canán
2	El Puente	6	La Esperanza	17	Sinaí
3	Unión Choco	7	La Pulida	18	Maach Pobor
4	Vista Alegre	8	Punta Grande	19	Alto Playón
		9	Nuevo Belén	20	Peña Bijagual
		10	El Común	21	El Salto
		11	Naranjal	22	Baja purú
		12	Corozal	23	Lajas Blancas
		13	Villa Nueva	24	Tortuga
		14	Boca Tigre	25	Dosake Purú
		15	Nazareth	26	Nuevo Vigía
				27	Villa Caleta
				28	Marraganti
				29	Bajo Chiquito

Source: Compiled by CO2CERO S.A.S., 2022.

Table 35. Communities in the Sambu district.

N.º	Community
Township Rio Sábalo	
1	Puerto Indio
2	Bayamón
3	La Chunga
4	Boca Trampa
5	Villa Kerecia
6	Dai-Puru
Township Jingurudo	

N.º	Community
7	Pavarandó
8	Boca Wina
9	Jingurudo
10	Churuco
11	Condoto
12	Borobichi

Source: Compiled by CO2CERO S.A.S., 2022.

5.2 Other project participants

Additionally, some external roles have been involved in supporting the implementation of the GHG mitigation initiative; however, they do not have ownership or control over the GHG reductions obtained, these correspond to B Terra Corp. and CO2CERO S.A.S.

Table 36. Contact information of the managing partner.

Individual or organization	**B-Terra Corp**
TIN[45]	155631614-2-2016 DV 57
Contact person	Omar Fricentese
Job position	Project Coordinator
Address	Road to Brazil Commercial Center, Mall Of 522, 5th Floor. Panama City, Panama.
Phone number	+507 213-0000
Email	*info@b-terra.com*

Source: Compiled by CO2CERO S.A.S., 2022.

[45] Taxpayer Identification Number (Registro Único de Contribuyentes - RUC). This is defined according to Resolution 201-1946 of July 11, 2007, as the unique number that will serve to identify the taxpayer before the Tax Administration.

Table 37. Contact information of the technical partner.

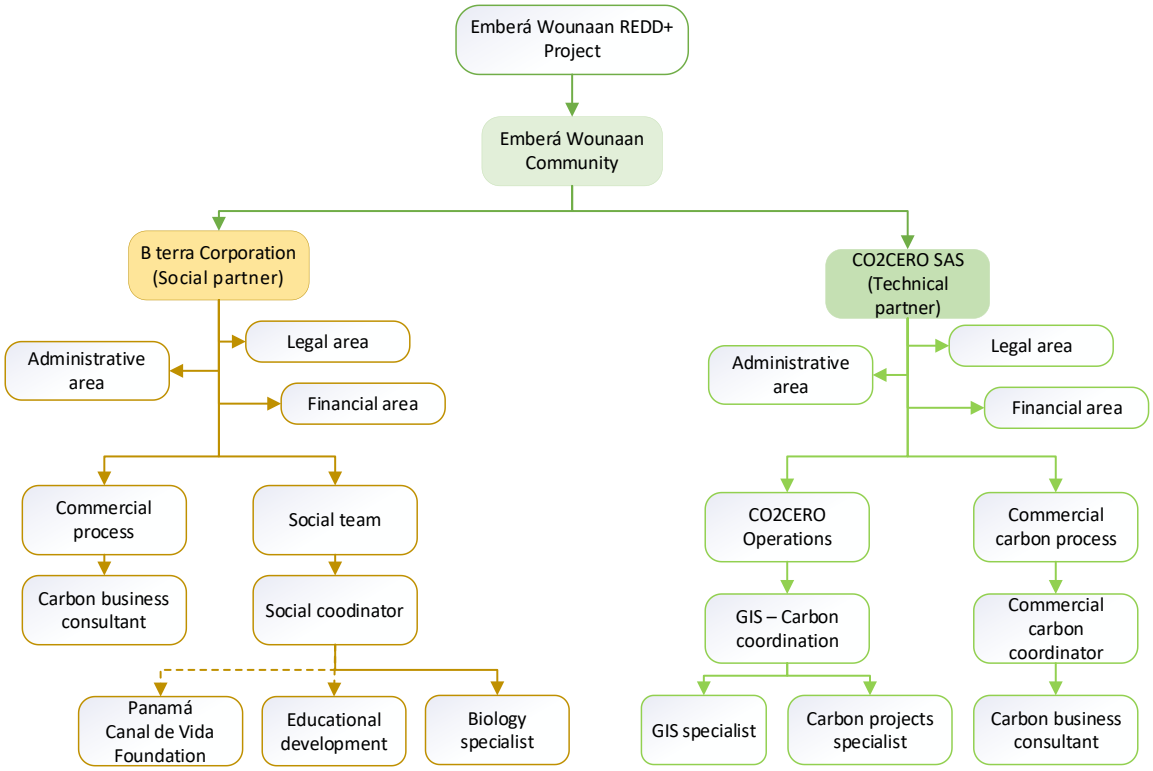
Individual or organization	**CO2CERO S.A.S.**
TIN[46]	901245493-8
Contact person	Jose Luis Rivera Micán
Job position	General director
Address	Cra 45a# 104b-16 Bogotá D.C. (Colombia).
Phone number	+601 6047279
Email	*info@co2cero.co*

Source: Compiled by CO2CERO S.A.S., 2022.

In **Figure 32**, the organizational structure of the REDD+ Emberá Wounaan project is presented, confirming that the Comarca Emberá Wounaan is the proponent and owner of the project, while its social and technical managing associates are B Terra Corp. and CO2CERO S.A.S. respectively. The social managing associate establishes direct links, communication channels, and mechanisms for community participation necessary for the consolidation of the project. Similarly, it ensures the flow of oral and written information among the various stakeholders, always adhering to the process of free, prior, and informed consent. The technical associate is responsible for designing and structuring the project document, quantifying the reduced emissions of GHGs, and certifying them through procedures issued by certification programs, conformity assessment bodies, and market dynamics.

Figure 32. Organizational structure of REDD+ Emberá Wounaan Project.

[46] Tax Identification Number (Número de Identificación Tributaria - NIT). This is defined according to Article 555-1 of the Tax Statute for taxes administered by the DIAN, as the number by which, for tax purposes, the DIAN identifies taxpayers, liable parties, withholding agents, and declarants.



Source: CO2CERO S.A.S., 2022.

On the other hand, the role of each of the actors involved in the REDD+ activities of the Emberá Wounaan project is expanded as follows:

Community: It comprises general, regional, and local comarcal authorities, as well as individual community members, who will have defined roles within the various activities according to the project design that is implemented. To ensure proper management and administration of information from monitoring and control actions, the community is guided through the required processes, as well as the materials and equipment necessary for carrying out monitoring activities. The monitoring of forest coverages is highlighted, which is fundamental for recognizing the reduction of deforestation and forest degradation. As part of the process of recognition and care of this resource, the region will implement surveillance within its territorial limits and will be the main supervisor of its state and conservation; its results will be a fundamental input to ensure the accuracy of the satellite information obtained within the project boundaries in terms of forest and non-forest areas.

- Managing Partner: This entity is the liaison with the communities of the comarca and will accompany the monitoring and control processes in the execution and

performance of the proposed REDD+ activities, ensuring their implementation by the community and fully meeting the objectives set for each of them. Additionally, it supports capacity-building processes, education, and design of territorial planning strategies (five-year plans, life plan adjustments, etc.), or may provide them when its knowledge allows. It serves as the connecting entity between the monitored information about the various REDD+ activities and the technical partner for the project monitoring report.

- Technical Partner: An organization responsible for generating data and information from digital sources such as cartography, spatial processing, software, and quantification of reduced GHG emissions. Monitoring in carbon reservoirs for determining the trend of deforestation and forest degradation falls under its responsibility. It will produce all relevant inputs to integrate a monitoring report, quantify reduced GHG emissions, and reveal forest dynamics in different verification periods. Within REDD+ activities mainly associated with quantification, it is responsible for monitoring forest coverages and generating early warnings within project boundaries.

5.3 Agreements related to carbon rights

Below **Table 38,** describes the compliance elements related to carbon rights according to the Biocarbon Standard guidelines, the Memorandum of Understanding dated December 14, 2021, and the partnership contract dated March 15, 2022, between the management associate B-Terra Corp and the authorities of the Comarca Emberá Wounaan, as well as supplementary documents.

Table 38. Compliance with respect to carbon rights.

Requirement	Contend
Signatories of the agreement	
Considerations of the partnership agreement	President of the Emberá Wounaan General Congress
	General Cacique of Comarca Emberá Wounaan
	Legal representative of B Terra Corp.
Purpose of the agreement	
Second clause of the partnership agreement	Generation and obtaining of natural, civil, commercial, and industrial fruits from the development of the social object of the parties in the territory of the associate through the initiation of a REDD+ project.
Clauses 3 and 9 of the memorandums of understanding	Achieve the development of a REDD+ project in mutual collaboration within the Cémaco and Sambú area.

Requirement	Contend
	Coverage of main pillars such as health, food, education, infrastructure, and maintenance.
Date of the agreement	
Twenty-fifth clause of the partnership agreement	March 15, 2022
Name of the mitigation initiative	
Verbal agreement between the board of directors and representatives of the Comarca	REDD+ Emberá Wounaan
Period for quantifying GHG emission reductions	
Third clause of the partnership agreement	Term of thirty (30) years.
Responsibilities, obligations, and rights of the parties	
Clauses 5 and 6 of the memorandum of understanding	Responsibility to protect information between the parties.
	Channeling of financing and maintenance costs through B Terra Corp.
	Economic distribution after expenses (56% Territory – 44% B Terra Corp.).
	Formalization of agreements through an exclusivity document and special power of representation.
Fourth, fifth, sixth, seventh, eighth, tenth, twelfth, and thirteenth clauses of the partnership agreement	Financing and execution of activities for the validation, verification, and issuance of carbon credits by the partner.
	Project socialization by the parties.
	Obligations of the managing partner B Terra Corp. for the development of the partnership agreement.
	Obligations of the associate or Emberá Wounaan Territory for the development of the partnership agreement.
	Profits, form and means of payment, participation for facilitation and management for the issuance and commercialization of carbon credits.
	Exclusivity in the management of issuance and commercialization of credits.
	Property rights over carbon credits and the project.
	Administration and allocation of monetary resources obtained by the partner from the project.
	Monitoring and control.

Source: (CO2CERO SAS, 2023)

Through contractual agreements, the proponent of the initiative and the managing partners determine their responsibilities and rights within it. In the "*01_Acuerdos\01_Acuerdo comunidad*" folder, the memorandum of understanding established between the managing partner B Terra Corp and the authorities of the Comarca Emberá Wounaan (President of the General Congress of the Comarca and the General Cacique of the Comarca) on December 14, 2021, is presented. The agreement outlines the signatory parties, the experience in the work to be performed, recognition of funding sources, and defines a participation in the commercialization of reduced GHG emissions. After deducting project expenses, it stipulates a 56% share for the 41 communities of the Comarca and a 44% share for the managing and technical partners during the 30-year project lifecycle, ensuring that most benefits are allocated to the community.

As a backup, an exclusivity agreement was consolidated on the same date (December 14, 2021), designating B Terra Corp. as the entity responsible for environmental activities, including REDD+ projects, owned by the Comarca Emberá Wounaan with support from the mentioned managing partner, for the contracting of services and financing.

The decision to include the project within the Emberá Wounaan territory is made through community-level decision-making processes, where each local congress, following a socialization process by the development team and ensuring the right to free, prior, and informed consent of each community, deliberates based on a local resolution in favor of the REDD+ project.[47]

Additionally, it is determined that resource management will be regulated by a fiduciary figure, ensuring transparency in the process of receiving, disbursing, and managing monetary benefits, without intervention from project development actors. The management is jointly carried out between the managing partner (B Terra Corp.) and the general congress of the Comarca, ensuring improvement in five pillars: health, food, education, health, and infrastructure.

In the partnership agreement established between the parties, namely the General Cacique of the Comarca Emberá Wounaan and the managing partner B Terra Corp., on March 15, 2022, it is considered that the Comarca owns the land and therefore the project.

[47] *See in: 01_Acuerdos/01_Acuerdo comunidad*

Its design and structuring are based on the uses, traditions, and customs of the indigenous people[48]. Furthermore, the contract defines its purpose, a duration of thirty (30) years, the obligations of the parties in the implementation of a REDD+ initiative, profits, payment methods, exclusivity, value in the commercialization of carbon credits, property rights, tax obligations, and confidentiality, among others.

These processes lead to the Emberá Wounaan REDD+ project design involving different community actors who play a fundamental role in decision-making, resource management, and information transfer within the territory[49].

5.4 Land tenure

The land tenure of the Emberá Wounaan Region is regulated by Law 22 of November 1983, created with Official Gazette 19976 of January 17, 1984. This law defines:

- Article 2: The lands delimited in this law, excluding private areas, are the heritage of the Emberá Region for the collective use of the Emberá and Wounaan indigenous groups. Their purpose is agricultural and industrial use, along with the development of other comprehensive activities. Private appropriation and alienation are prohibited in this case.
- Article 6: The distribution, use, and usufruct of collective and individual lands of the region shall be regulated in its Organic Charter.
- Article 7: The management of the Emberá Region is subject to the National Constitution, its laws, and the provisions approved by the General Congress of the Region, which will be developed by the municipal governments and state agencies regulating it.
- Article 9: The Emberá Region has two districts divided into two townships. Its political structure, direction, and functioning are subject to the special regulations contained in this law. In aspects not covered by this law, the relevant laws of the Republic shall apply.

The regulatory framework related to land ownership by the communities of the Emberá Wounaan Territory is presented in the "*10_Tenencia de la tierra*" folder.

[48] ***See in***: *01_Acuerdos\Acuerdo comunidad\Contrato_B Terra_Emberá.pdf and 01_Acuerdos\01_Acuerdo comunidad\Nota aclaratoria_Cláusula 7.*

[49] *See in 03_Actividades REDD+/SoporteActividades/1.1 Transaparencia y participación, 2.1 Planeación y prospectiva. y 11_Anexos y complementarios/1_Asistencia).*

6 Climate change adaptation

The Intergovernmental Panel on Climate Change defines climate change adaptation as "the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities."

In the territory of Panama, climate change adaptation is governed by Executive Decree No. 34 of 2019, which approves the National Climate Change Strategy 2050. This strategy is based on the principles of ensuring a healthy environment, free of pollution, with natural resources such as air, water, and adequate food to meet the requirements of an ideal human life. Among the objectives of the law is the protection, conservation, and enhancement of existing forest resources in the country, while promoting their rational and sustainable management and use, encouraging and implementing forestry projects to mitigate climate change. The objectives of the National Climate Change Strategy 2050 include those related to the sector involving the REDD+ project, specifically Forests (See **Table 39**), whose contribution is reflected in the REDD+ activities under the investment line "Enhancement of carbon reservoirs," and will be measured by their performance in each verification period, along with the achievement of their stated goal[50].

Table 39. Objective of Panama's National Climate Change Strategy 2050, corresponding to the project's activities.

Objective	Project contribution	Indicator
1. Ensure the protection and restoration of riparian zones, water recharge areas, protected areas, buffer zones, and biological corridors.	Establishment of Emberá Wounaan forest nursery.	Activities carried out for the establishment of the forest nursery. Number of people involved in activities related to the establishment of the forest nursery. Status of progress of the Emberá Wounaan forest nursery.

[50] See in: *02_Cobeneficios\3_Actividades REDD+/ActividadesREDD+_Emberá Wounaan_V4.*

Objective	Project contribution	Indicator
	4.2.2 Forest restoration	Hectares restored annually. Number of people involved in forest restoration activities, disaggregated by gender and age.
	4.2.3 Restoration of the original forest	Hectares reforested annually. Number of people involved in reforestation activities, disaggregated by gender and age.

Source: Compiled by CO2CERO S.A.S., 2023.

Law 1 of 1994 defines forest carbon capture as an environmental service. Accordingly, mechanisms will be established to attract financial and economic resources, with the REDD+ Mechanism being one such alternative. In this context, the current project promotes the manifestation of this mechanism as a contribution to mitigating climate change. It entails activities aimed at adapting populations to the resulting changes, fostering resilience, and continuously improving their quality of life.

According to the effects on the objectives for the AFOLU sector of the National Climate Change Strategy 2050, outlined in Section 2.3 Long-Term Mitigation Actions, Table 2 Mitigation Measures by Sector and Their Possible Effects, it is possible to identify some contributions that the REDD+ Emberá Wounaan project generates with its activities to reduce them (see **Table 40**), these are measured based on the performance indicators established for each one, given that the Strategy does not propose specific indicators to measure the contribution, allowing the adoption of those proposed by the project.

Table 40. Relationship of REDD+ activities with the national climate change strategy.

Effect	REDD+ activities contribution
Diversification of income sources and access to markets	• Technical support in sustainable family production models. • Design of sustainable economic alternatives and production chains. • Training in good production practices • Improvement of tools and work materials. • Institutionalization of good practices for economic development and well-being.

Effect	REDD+ activities contribution
Additional income for sustainable landscape management	• Support in the certification and commercialization of reduced GHG emissions. • Training in REDD+ and socio-environmental safeguards. • Establishment of the Emberá Wounaan forest nursery.
Innovative financing mechanisms for sustainable resource management	• Training in Sustainable Forest Management (SFM). • Non-timber forest product production.
Increase in cultural and recreational habitats through forest management	• Design of strategies for the conservation of indigenous ancestral knowledge. • Identification of territorial boundaries.
Reduction in burning practices	• Territorial boundary protection strategies. • Technical support in sustainable family production models. • Training in good production practices • Institutionalization of good practices for economic development and well-being.
Equitable participation in benefit distribution	• Guidance in defining governance structures and living well frameworks. • Establishment of consultation and decision-making spaces for authorities and community members of the Emberá Wounaan. • Training in good leadership practices.
Conservation and management of ecosystems	• Strategies for protecting territorial boundaries. • Training in REDD+ and socio-environmental safeguards. • Training in Sustainable Forest Management (SFM). • Forest restoration. • Reforestation.
Access to participation mechanisms and decision-making	• Guidance in defining governance structures and well-being. • Creation of spaces for consultation and decision-making by authorities and members of the Emberá Wounaan community. • Training in good leadership practices.
Application of existing policies for sustainable resource management	• Training in project management, finance, and resource administration. • Training in REDD+ and socio-environmental safeguards.

Source: CO2CERO S.A.S., 2022

Considering the REDD+ strategy designed for Panama, it is also possible to identify common points with other strategies in the country and with the activities designed within the initiative. In this way, the project engages with the following enabling conditions:

1. Implementation of an operational institutional framework: Through the generation of analysis and identification of common factors between international, national, and local policies and project actions, the project's management units and climate change mitigation initiative management at the national level play a necessary role in carrying out actions under a regulated context. Operational actions specific to the REDD+ context is consolidated, pursuing the objectives of reducing deforestation and degradation, increasing carbon reservoirs, and promoting sustainable forest management, all aimed at meeting the international framework.
2. Allocation of funds: Currently, the project involves some investments in the territory that favor conservation and sustainable forest management activities, thus aligning with the government's restoration and planting goals. In this sense, the project has also socialized mechanisms for the equitable distribution of the benefits it generates, emphasizing the importance of contributing sustainably to community development. Therefore, the project's results are strictly associated with reducing deforestation and forest degradation.
3. Climate change adaptation: The project analyzes, as part of its action axis, activities that contribute to reducing the effects of climate change and the adaptation mechanisms that the country has designed to achieve this. Similarly, the project's objectives are entirely focused on contributing to this goal, understanding REDD+ initiatives as a sustainable way to promote the sustainable development of indigenous communities and extend their positive externalities to other sectors aiming to mitigate climate change as well.
4. Promotion of the national Carbon market: The REDD+ Emberá Wounaan project aims to be a pioneer in generating carbon credits within indigenous territories. Therefore, it identifies the requirements and necessary variables in its execution to contribute to the consolidation of a carbon market, recognizing in the successes of this initiative the phases that Panama must apply to establish itself in this sector.
5. Regulation on carbon ownership: By legitimizing indigenous communities and respecting their land ownership, the project has ensured that the avoided GHG emissions belong to the Comarca Emberá Wounaan, aligning with the authority granted to them constitutionally and by law, while complying with the socio-environmental safeguards determined by the international framework.

The REDD+ Emberá Wounaan project has promoted the implementation of restoration processes involving the communities of Capetí, Unión Choco, and Nazareth. This has been achieved by strengthening capacities related to the establishment of forest nurseries, with material sourced from forest management activities such as recruitment, seed collection, and acquisition of seedlings in situ. This approach enhances the communities' adaptation to climate change, increases carbon reservoirs, improves the provision of ecosystem services, and promotes sustainable forest resource management. Additionally, educational components related to REDD+ initiatives, social and environmental safeguards, sustainable forest management, and vegetation cover monitoring have been included. These components aim to integrate technical elements at the territorial level to support the initiative's objectives, convincing the community of the current realities in their territory and the growing global demand for careful management over time.

Ensuring sustainable economic activities is a fundamental factor during the project, understanding agriculture as the direct means of family support and, as a scenario for productive improvement, increased food availability, and strengthening of technical and operational capacities related to land work. This leads to a sustainable and resilient model adapted to climate change and respectful of the communities' traditions. Additionally, through the institutionalization of knowledge associated with agricultural management, combined forest systems, and harvesting strategies, knowledge is established in the scenario permanently, leading to self-management processes based on agriculture.

Additionally, since 2012, activities have been implemented to strengthen culture and traditional knowledge, creating opportunities for community participation and cohesion. This has opened doors to communication and transparency among stakeholders, making decision-making processes more effective. In this same vein, spaces for defending territorial boundaries have been encouraged, establishing roles for forest and community guards. This approach aims to enhance the communities' sense of ownership over natural resources and reduce the impacts of external agents who do not adhere to the rules associated with natural resource management.

Table 41. Alignment of REDD+ activities of Emberá Wounaan project with the guidelines of the national REDD+ strategy.

REDD+ Activities	A. Promotion and implementation of sustainable forest management initiatives	B. Promotion of productive activities and livelihoods	C. Design and implementation of actions in indigenous territories	D. Implementation of facilitating actions
1.1.1 Guidance in defining governance structures and well-being				d11
1.1.2 Training in project management, finance, and resource administration			c9	
1.2.1 Creation of spaces for consultation and decision-making				d10
1.2.2 Training in good leadership practices			c9	
2.1.1 Development of community planning and development tools				d11
2.1.2 Design of strategies for the conservation of indigenous ancestral knowledge			c9	
2.1.3 Assessment of the provision and availability of basic services				d10
2.2.1 Identification of territorial boundaries			c9	
2.2.2 Strategies for the protection of territorial boundaries			c9	
3.1.1 Technical support in sustainable family production models		b6		
3.1.2 Design of sustainable economic		b7		

REDD+ Activities	A. Promotion and implementation of sustainable forest management initiatives	B. Promotion of productive activities and livelihoods	C. Design and implementation of actions in indigenous territories	D. Implementation of facilitating actions
alternatives and production chains				
3.2.1 Training in good production practices		b6		
3.2.2 Improvement of tools and work materials			c9	
3.2.3 Institutionalization of good practices in economic development and well-being		b6		
4.1.1 Training in REDD+ and socio-environmental safeguards				d10
4.1.2 Monitoring of vegetation and biodiversity				d10
4.1.3 Training in Sustainable Forest Management (SFM)	a3			
4.2.1 Creation of the Emberá Wounaan forest nursery	a3			
4.2.2 Forest restoration	a2			
4.2.3 Reforestation	a1			
4.3.1 non-timber forest production		b7		

Source: CO2CERO S.A.S., 2023.

With this relationship, it is possible to identify that the axes under which the REDD+ activities of the project have been designed align with the guidelines and their components, within which it is possible to differentiate the following, which in turn are

linked in Table 41. Alignment of REDD+ activities of Emberá Wounaan project with the guidelines of the national REDD+ strategy.**Table 41**:

a1. Restoration of lands with forestry vocation and agricultural use.

a2. Commercial reforestation.

a3. Conservation and sustainable management of natural forests.

b6. Organic agriculture.

b7. Biocommerce.

c9. Participation and contribution of indigenous peoples.

d10. Facilitating actions that promote and encourage the participation and involvement of all relevant actors.

d11. Establishing a conducive framework for the implementation of direct interventions aimed at modifying, creating, or implementing appropriate regulatory frameworks to ensure that direct interventions are effective and efficient.

NOTE: This Project Document (PD) shall be completed following the instructions included. However, it is important to highlight that these instructions are complementary to the BCR STANDARD, and the Methodology applied by the project holder, in which more information on each section can be found.

REDD+ EMBERÁ WOUNAAN

PART 2

Document prepared by B-Terra Corp and CO2CERO S.A.S. according to the methodology BCR 0002 version 3.1.

Name of the project	*REDD+ Emberá Wounaan*
Project holder	*Comarca Emberá Wounaan*
Project holder's contact information	*Cacique Leonides Cunampia*[1] *Cellphone: +507 6900-7584* *Office Address in Comarca Emberá Wounaan: Plaza Bal Harbour, Local 23 Upper Floor, Panama City.*
Project participants	*41 communities of the Comarca Emberá Wounaan,* *B-Terra Corp and CO2CERO S.A.S.*
Version	*14*

[1] It is important to highlight that the contact cellphone number of the current Cacique, Leonides Cunampia, is a temporary contact detail, considering that this is a position subject to change in accordance with the governance structures of the Comarca Emberá Wounaan.

Date	*20/01/2025*
Project type	*REDD+*
Grouped project	*N/A*
Applied Methodology	*This project has been developed based on the BioCarbon Registry. 2023. BCR STANDARD. From differentiated responsibility to common responsibility. Version 3.2. September 23, 2023* *Quantification of GHG emissions in REDD+ projects BCR0002 version 3.1.*
Project location (City, Region, Country)	*Darién Province in eastern Panama, Capital: Unión Chocó*
Starting date	20/04/2018
Quantification period of GHG emissions reduction	(20/04/2018 to 31/12/2022)
Estimated total and average annual GHG emission reduction amount	The total amount of GHG emissions reductions during the quantification period is 71,184,852 tCO_2e The estimated average annual amount of GHG emission reductions is 2,296,286 tCO_2e/year
Sustainable Development Goals	*2. Zero hunger* *4. Quality education.*

	5. Gender equality. *6. Clean water and sanitation.* *13. Climate action.* *15. Life on land.*
Special category, related to co-benefits	*N/A*

Table of contents

Equations index

Figures index

Illustration index

Tables index

7 Causes and agents of deforestation and forest degradation

The following chapter presents the results of the analysis of causes and agents of deforestation and forest degradation at the boundary of the REDD+ Emberá Wounaan project[2]. It includes the methodology used for collecting and obtaining the relevant information. The minutes[3] of the deforestation and forest degradation workshops present the outcomes of the participatory activities with the communities of the comarca.

7.1 Spatial and temporal dimensions

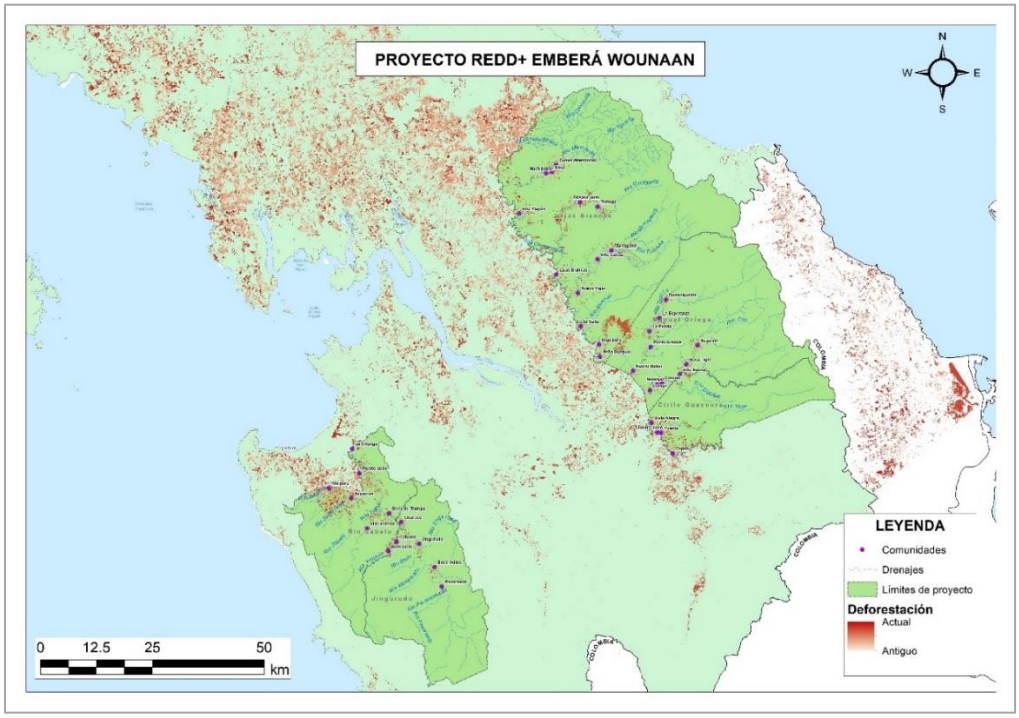
This subchapter describes the spatial and temporal elements that make up the analysis of the agents of deforestation and forest degradation within the project area. For their identification, the work team has made approaches based on secondary information and subsequently confirmed the information with primary sources through participatory activities in the territory.[4] And validated with semi-structured interviews with key stakeholders.

7.1.1 Spatial dimensions

The spatial dimension of the causes and agents of deforestation is presented through cartography, highlighting the project area and the effects generated in terms of deforestation and degradation. The description of the area involved in the initiative is presented in ***Error! Reference source not found.***.

Figure 1. Distribution of deforestation within and outside the project area.

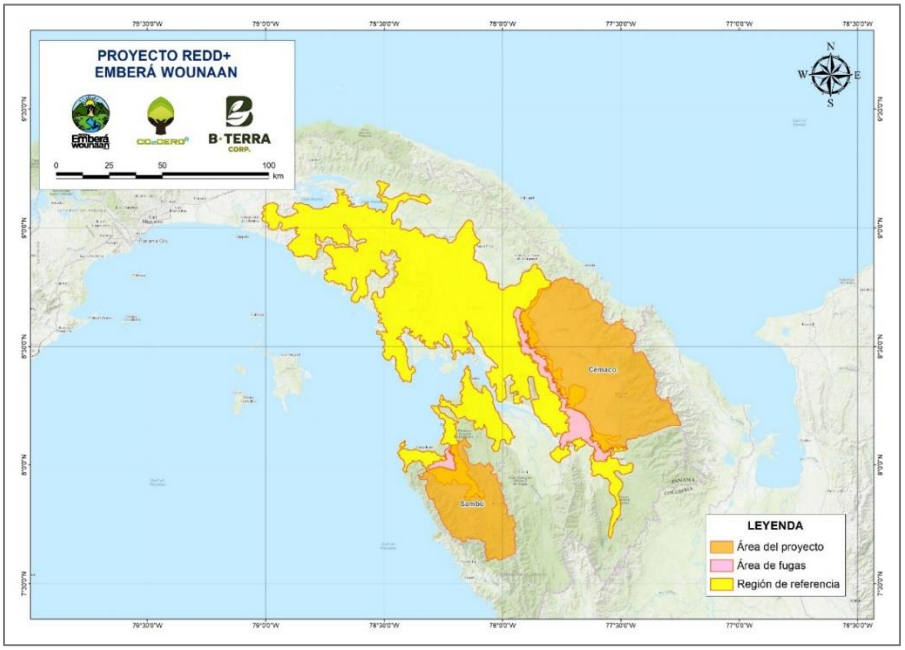
[2] See in: *08_Informacion de campo\Metodologia_AnalisisDefDeg_2022.pdf.*
[3] See in: *11_Anexos y complementarios/07_Actas/TALLER DRIVERS CEMACO 29-ENERO-2023.pdf y TALLER DRIVERS SAMBU 29-ENERO-2023.pdf*
[4] See in: *11_Anexos y complementarios/07_Actas/TALLER DRIVERS CEMACO 29-ENERO-2023.pdf y TALLER DRIVERS SAMBU 29-ENERO-2023.pdf*



Source: CO2CERO S.A.S., 2023.

Additionally, REDD+ Emberá Wounaan project has designed the reference region for analyses related to historical deforestation and degradation, the presence of deforestation and degradation agents, and the most probable mobility routes according to their dynamics. Additionally, the leakage belt has been designed based on the mobility of deforestation agents and causes.

Figure 2. Project boundaries, reference region, and leakage belt for the REDD+ Emberá Wounaan project.



Source: CO2CERO S.A.S., 2023.

7.1.2 Temporal dimension

The temporal dimension is defined through a timeline, which consolidates the events of deforestation and forest degradation that have led to the current configuration of the territory and constitute relevant milestones within indigenous tradition. According to (Lanly, 2003), in the time factor, the magnitude of the area that has been subject to deforestation must be taken into account in order to confront territorial reality with satellite information. Similarly, knowledge of the agents of deforestation and forest degradation allows us to understand the behavior of higher levels of aggregation of elements to establish specific dynamics regarding the forests involved.

7.1.3 Context

As a result of colonization and the global development of the world, indigenous communities and traditions have faced an ambiguous scenario, with both damages and benefits. Initially, those colonizations caused affectations and alterations of ethnic cultures since historically, those peoples were persecuted for extinction due to their way of thinking and living, their cosmobiological ideologies, and land ownership. However, those situations have promoted in the last century public policies on indigenous affairs that foster projects and programs highlighting the importance of human rights, cultural and ethnic preservation, and the fundamental role they play in society and environmental protection.

Thus, understanding the indigenous territorial context of the Comarca Emberá Wounaan and its districts of Sambú and Cémaco, from their current and historical problems according to social, environmental, and economic axes, allows analyzing from a community perspective those affectations that today are causing deforestation and degradation of the territory. Based on that diagnosis, collective actions can be addressed according to their own dynamics, favoring the processes of organization and interaction of the community, strengthening the exercise of active participation and individual and collective empowerment.

7.1.3.1 Territorial context

According to various historical, anthropological, and ethnographic studies of the Emberá and Wounaan indigenous peoples, they arrived in Panamanian territory in the 18th century from the Chocó region in Colombia due to the arrival and colonization of the Spanish, who seized their lands and violated their human rights. This event led to the emigration of these communities along the rivers of the Darién, but it was in the year 1950 where the violence and political reality of Colombia further affected the communities, contributing to their dispersal throughout Panama.

This event led to the union of two ethnicities with a difference in their ethnic dialects, where some speak Emberá and the other language is Woun meu, which means "Man or People". This union has since led to a population increase according to the (INEC, 2011), where there are currently 10,001 inhabitants within Sambú and Cémaco. This has generated medium-scale impacts on the logging of native forests for the construction of their homes, domestic and cultural use, agricultural crops, and the sale of commercial timber, being current factors of deforestation and degradation of the territory. Additionally, these activities cause minimal-scale loss of biodiversity due to disproportionate hunting and fishing.

It is worth noting that these communities, from their worldview and spiritual ideology, maintained a harmonious and integral coexistence with nature, respecting and sustainably using their resources, engaging in cultural practices, and utilizing timber resources with very low intensity. In most cases, these resources were used for home construction and, to a lesser extent, for domestic use such as firewood, cooking, kitchen utensils, and crafting canoes, which hold anthropomorphic and symbolic significance. However, with development, social evolution, and interaction with civilian populations, this vision has been disappearing and replaced by a less sustainable way of life (UPME, 2018).

In 1983, the Republic of Panama created Law 22, which established the Comarca Emberá del Darién, attributing two district Comarca: Sambú and Cémaco, which are further

divided into 3 corregimientos for Cémaco (Cirilo Guainora, Manuel Ortega, and Lajas Blancas) and 2 corregimientos for the Sambú district (Río Sábalo and Jingurudó), forming 41 communities. The territory spans an area of 4,383.50 square kilometers with an extensive river source connecting with Colombia and leading northward towards the United States. This territory has had to coexist with violence from illegal armed groups and drug traffickers, as well as an increase in the passage of loggers with permits from the state and caciques, and in other cases, under illegal scenarios. Additionally, new entrepreneurs in natural resource exploitation have emerged, causing increased complexity in deforestation and degradation, creating individual and collective political differences in decision-making within the organizational hierarchy of the Emberá Wounaan regarding the preservation and conservation of the territory.

According to (Mongaby, 2019), deforestation in the Darién region has been increasing over the last 15 years, describing social conflicts between indigenous peoples and timber colonizers. These companies arrive in the territory with heavy machinery, opening paths for uncontrolled logging for commercialization. The deforested areas are then used for cattle ranching, contributing to an increase in greenhouse gas emissions.

7.1.3.2 Sociocultural context

The Emberá Wounaan are ethnic groups known for their diverse ancestral multiculturalism, recognizing the importance of the legacies of their ancestors for present and future generations. According to the (INEC, 2011), the role of preserving indigenous tradition falls upon women, who are representatives of unity, life, and fraternity, as well as responsible for transmitting all kinds of knowledge to their sons and daughters. Men are taught the importance of crop harvesting and planting seasons, work that will yield food for their sustenance and generate new economic resources, while women are taught the importance of maintaining the female lineage and productivity, an action that allows ethnic cultures to thrive.

Transgenerational knowledge influences the relationship that communities have with the natural environment, as many of their cultural activities rely on the resources provided by nature. This includes land for cultivating crops such as plantains, maize, rice, beans, and tubers like cassava and sweet potatoes; rivers for fishing; wildlife for hunting; and seeds for supplementing their diet. Additionally, materials for building homes include Royal Palm leaves, Guagara (*Sabal allenii*) leaves for roofs, and Jira palm leaves for flooring. The infrastructure is constructed with woods such as Cocobolo, Caoba (*Swietenia macrophylla*), Espavé (*Anacardium excelsum*), Pinotea, Spiny Cedar (*Bombacopsis quinata*), and Yellow Cedar, among others. These woods are also used for building their canoes (Piraguas).

The Embera Wounaan are recognized as excellent carvers and goldsmiths, using the chunga palm (*Astrocaryum standleyanum*) and some seeds to make baskets, mats, masks, and accessories. Over the past 10 years, the sale of their handicrafts has increased, bringing benefits to the artisan women and their families. However, due to the decrease in biodiversity, especially from the overexploitation of natural resources, the communities feel a significant threat to their culture and families, leading to a social effect and territorial displacement of the ethnic groups.

On the other hand, due to the extensive land and difficult access because of its geographical location, the Comarca faces limitations in basic services such as potable water, electricity, education, and health, which are important for the quality of life and the development of communities and the territory. According to the International Committee of the Red Cross (CICR, 2016), one of the greatest challenges faced by indigenous people is the lack of access to potable water. Most of the water consumption comes from rivers contaminated with chemicals from resource exploitation companies or logging activities, as well as domestic use (personal hygiene, laundry, dishwashing, and plastic waste), causing health issues for the most vulnerable population, such as children, elderly adults, and pregnant women, resulting in acute diarrhea, skin infections, and even death.

Regarding decision-making within the Comarca Emberá Wounaan, it is possible to describe the instances involved in the process according to Law 22 of 1993, starting from its article 10, where it is defined that:

- Article 10: The general congress is the highest traditional body of decision and expression of the people. Its pronouncements are made through resolutions issued by the Congress Directive, which come into effect upon their proper promulgation. Additionally, regional and local congresses are traditional bodies of expression and decision, in addition to the existence of the Noko council as a consultative unit for both the congress and the chiefs.
- Article 11: The General Chief is the highest authority and principal representative of the comarca before the national government and external entities.
- Article 12: Each Comarcal District will have its regional chief who serves as the principal traditional authority of the corresponding district.

Additionally, according to Executive Decree 84 of 1999, which regulates the organic charter of the Comarca, its article 12 defines the decision-making and expression bodies as follows:

a) **General Congress:** The highest traditional body of decision and expression in the comarca. Among its objectives is the promotion of Emberá Wounaan people's development and quality of life through the use of natural resources and their relationship with the natural capital of the Comarca (*Article 14*). The general congress is composed of delegates elected by local congresses (*Article 15*). The decisions of the sessions of the General Congress of the Board of Directors are recorded in the minutes book between the president and the secretary of the Board of Directors (*Article 21*).

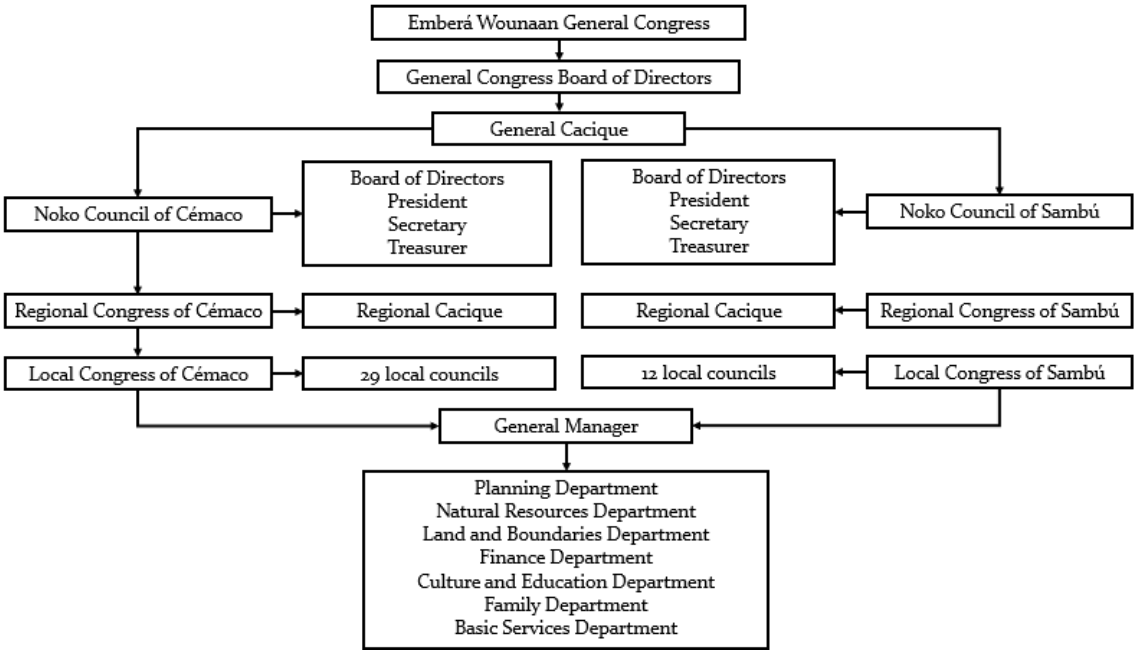
b) **Regional Congress:** Each comarcal area has a congress for decision-making and expression, which promotes and coordinates with the general administration and local congresses, the social, economic, and cultural development plans issued by the general congress and the national government. Its decisions are communicated through resolutions signed by the president and secretary of the Congress Directive (*Article 29*). Delegates of the regional congress are elected through local congresses, where they have the right to voice and vote during sessions, with a majority of community attendance (*Article 31*).

c) **Local Congress:** It directs, organizes, and develops projects at the community level and serves as the traditional decision-making and expression body at this level. Its decisions are socialized through resolutions issued by the president and secretary of the congress directive, which may be presented to the regional chief, regional congress, or respective municipality (*Article 34*). The local congress is composed of delegate members of the community, with the right to voice and vote during meetings (*Article 36*).

d) **Nokora Chi Pornaan Congress, as a consultative body of congresses and Caciques:** Consultative body where the general, regional Caciques, and presidents of the various congresses submit their plans, programs, and projects for consultation (*Article 39*). The recommendations of the council will be signed by the president and secretary (*Article 41*).

In **Figure 3Error! Reference source not found.**, the organizational structure of the Comarca Emberá Wounaan is presented, according to the regulations that describe and structure it, consistent with the previously described description and the guidelines defined in Law 22 of 1993 and Executive Decree 84 of 1999, corresponding to the creation of the Comarca and the adoption of its organic charter. This figure highlights the hierarchical sequence of the Comarca and the different roles with their corresponding members. Under this hierarchy, decisions are made, always ensuring active participation of the majority of Comarca residents.

Figure 3. Organizational structure of the Comarca Emberá Wounaan.



Source: CO2CERO S.A.S., 2022.

7.1.3.3 Economic context

According to (INEC, 2011), one of the economically significant activities in the Comarcas of Cémaco and Sambú is the use of timber forest resources and non-timber forest products. The utilization of timber forest resources involves the transformation of forest products into dimensioned wood for commercialization in the local market. This practice is carried out when families urgently need to meet basic needs. It is noteworthy that this activity is regulated by the National Environmental Authority under permit controls and authorization from the Comarca authorities. This regulation has caused divisions within the communities, as not everyone agrees with this practice due to the loss of native species.

Regarding the utilization of non-timber forest products, it has been primarily employed by women for crafting, strengthening their sales both nationally and internationally. They mainly use products derived from natural resources such as chunga palm, cocobolo, mahogany, and pinotea, which produce the most commercially sought-after wood types. This has led to the development of an illegal market, including exports to Asian countries, causing massive deforestation (Dogirama, 2009).

In agriculture, the main product for sale is green plantain, followed by grains such as corn and rice. Additionally, there has been an increase in the cultivation of annatto, a product

that is gaining commercial momentum nationally due to its high nutrient content for food preparation. The productive strategy not only includes agricultural activities but also hunting and fishing, which are important for obtaining resources. However, hunting wild animals is gaining economic significance, as its demand has been increasing, mainly due to the needs of indigenous families. Nevertheless, this practice is considered illegal and is punishable by law.

7.1.3.4 Historic context

The period of the 16th and 17th centuries was understood as the transition between two or more territorialities, leading to the formation of borders, a central element that explains the various changes of ethnic and Afro-descendant peoples in Colombia and Panama. This origin is fundamentally due to the pressure of conquest and colonization, where the foundation of Santa María la Antigua del Darién in 1509 and the frequent attempts and failures of the Spanish led to territorial transformations of the aboriginal nations. For five centuries, colonization attempts for economic reasons, mainly for mining, rubber, and timber exploitation, and others such as bipartisan violence, shaped the region (Vargas Sarmiento, 2022).

As a result of violence and slavery by the colonizers towards indigenous and Afro-descendant people, many of them decided to migrate to the northwest of Chocó and the border with Panama, especially in the Darién district, where the Comarca Emberá Wounaan is currently located, established in 1983 (Pujo, 1997). However, since 1990, due to the violence in Colombia, there has been an increase in undocumented migrants and Afro-mestizos, as well as the presence of guerrillas, bandits, and paramilitaries searching for vacant land for coca production, alarming the population with their looting and pillaging.

The population of the Emberá and Wounaan-speaking Chocó Indians has traditionally been considered as a single culture with a rainforest habitat, where their culture denotes a highly specialized adaptation. The ecological environment is typical, traditional, and ideal, guiding their migratory movements towards geographic areas where this type of ecological niche prevails.

7.2 Key actors, interests and motivations

According to the gathered secondary information, seven actors are identified as having a direct impact on the increase of deforestation and forest degradation in the project area and at the regional level, mainly in the Darién region where the Emberá and Wounaan

indigenous communities are located[5]. Below in **Table 1**, is a summary of the interests, motivations, and main causes that drive the development of alternative land use activities, such as livestock farming, illegal and legal logging, agriculture, drug trafficking, and internal consumption for subsistence.

Table 1. Analysis of key actors, interests, and motivations.

Key actors	Interests and motivation	Causes
Indigenous communities	• Subsistence, where they ancestrally and culturally carry out actions for their living conditions. • Construction of houses, canoes, and domestic use (firewood). On the other hand, the use of chunga palm to produce their handicrafts. • Establishment of plots dedicated to subsistence agriculture (rice, beans, cassava, fariña, and green plantain).	• Demand for dimensioned wood in the local market, regulated by the National Environmental Authority (ANAM). • Practices for family and community subsistence. • Food security.
Peasant communities	• Community permits for sustainable forest management plans (PIMF) (Telemetro, 2019). • Free territory for the development of logging and livestock activities (Telemetro, 2019).	• According to the GDP, the agricultural sector plays a predominant role in generating regional income (AMERICANOS, 1978). • The province of Darién is a region that boasts a lush variety of timber, mineral, and biodiversity resources, which characterize it as a region with great potential to contribute to the country's development (Panamá, 2022).

[5] See en: *11_Anexos y complementarios\2_Factores_DefDeg_EmberaWounaan*

Key actors	Interests and motivation	Causes
Cattle ranching community	Land valuation: Peasants create pastures to rent them out because they know that represents economic income (Arcia, J, 2017).	• Expansion of the agricultural frontier: Settlers tend to clear the forest to establish slash-and-burn crops and later pastures (Arcia, J, 2017). • Interprovincial migration: The trend of settlers selling depleted lands for agricultural use to new cattle rancher landowners (Arcia, J, 2017).
Groups operating outside the law	• Political and strategic motivations in terms of security (Niño, 2018). • Between Colombia and Panama lies a land border covered by dense jungle and topographic adversities, circumstances that have been used as an excuse for bilateral disconnection, state absence, and the breakage of the Pan-American Highway in the Darién, a route that crosses the continent (Niño, 2018).	• Their territories are separated by the Darién Gap, a natural barrier that harbors extraordinary biodiversity and where the indigenous territories of Madugandí, Guna Yala, Wargandí, and Emberá-Wounaan are located. These characteristics lead discussions of geopolitics and security in the border area to be distinct and diverge from traditional narratives of international relations (Niño, 2018). • The Colombian armed conflict, institutional absence of the State, and the proliferation of armed groups in the border zone have been structural causes for the diversification of actors and criminal activities (Cabrera, 2016) cited in (Niño, 2018) • Given the absence of a public policy on border issues between Colombia and Panama, border dynamics have come to be regulated by non-state actors, agendas, and interests (Suman, 2007 cited in (Niño, 2018).
Drug traffickers	• Economic income from the sale of cocaine in the United States. • Organized crime uses Panama as a bridge and warehouse, taking advantage of its 2,490 km of coastline distributed between the Atlantic and Pacific Oceans and only 555 km of border between Colombia and Costa Rica (CONAPRED, 2013).	• Drug, arms, and human trafficking crossing the Darién Gap to reach the United States (UNODC, 2016). • Construction of dirt roads for drug traffickers transporting cocaine and for migrants moving to the United States (UNODC, 2012). • The forest cover makes these territories ideal routes for traffickers who want to keep their operations invisible from the air (Rainforest Foundation, 2022).

Key actors	Interests and motivation	Causes
Illegal Loggers	• Economic income from the commercialization of valuable species such as *Dalbergia retusa* and *Dalbergia darienensis* (Cocobolo), *Swietenia macrophylla* (Mahogany), *Myroxylon balsamum* (Balsam), *Anacardium excelsum* (Espavé), *Podocarpus guatemalensis* (Pinotea) (Bech, 2014).	• Timber supply in the years 2010-2014; the prices paid in the international market, especially in China and Japan, have triggered the greed of loggers (Bech, 2014). • Lack of control and oversight mechanisms in natural resources within the Comarca Emberá (COONAPIP, 2009). • Primary and secondary wood processing industries are inefficient, of low competitiveness, and not integrated into forest production areas (COONAPIP, 2009). • Opening of roads to transport heavy machinery into the forest (Bilbao, 2019).
Illegal Loggers	• The commercialization of specific species leads to the expansion of plantations in the Darien, such as *Tectona grandis* (Teak), aimed at the Indian market due to high demand for its wood (Bech, 2014). • Restrictions in the international and national markets, which demanded only a small number of species from heterogeneous forests (FAO, 1972). • Selective mechanized extraction in the Darien was concentrated on species such as mahogany, cedar, and oak (FAO, 1972).	• Primary forest is being replaced by secondary growth forests; 21.62% of intervened forest was replaced by plantations, such as mixed cativo and homogeneous cativo in the Darién region, following the enactment of the Incentives Law (No. 24 of 1992) (Carrera et al, 2021). • Some caciques have granted "concessions" to logging companies to extract cocobolo (Bech, 2014). • Meeting internal and external demand for timber (Carrera et al, 2021).

Source: Compiled by CO2CERO S.A.S., 2022.

7.3 Economic activities and their importance

The Emberá Wounaan Region, due to its historical context and process of territorial development and evolution, has had to generate economic strategies based on its worldview and cultural practices. Below are the economic activities that indigenous peoples engage in for their territorial development and community and individual subsistence, data collected from both primary and secondary sources.

Understanding the economy of indigenous peoples leads us to rethink the paradigms of development, public policies, or socio-economic programs that governmental or private entities currently need to implement as strategies for social inclusion and equal opportunities for indigenous communities. However, as highlighted by the (Naciones

Unidas, 2010), the pursuit of economic growth at any cost is not only destructive for indigenous peoples but also for the rest of humanity and the planet. The focus on gross domestic product (GDP) as the main measure of progress has distorted the true meaning of progress and well-being. For example, damage to ecosystems, irreversible loss of biodiversity, and erosion of cultural and linguistic diversity, as well as traditional indigenous knowledge, which are not taken into account in the overall balance. Ecological, cultural, social, and spiritual indicators that provide a more comprehensive picture of national and global situations are rarely used.

The economic contextualization from the perspective of indigenous peoples is based on well-being and good living; therefore, obtaining monetary resources is related to:

1) The integrity of indigenous governance.
2) The importance of collective economic actors and community institutions.
3) The purpose of production should not be considered solely in terms of profit but rather in relation to improving the quality of life.
4) Enriching the concept of development so that humans are in harmony with the environment.
5) Self-determination.
6) Interaction among the population.
7) Resources, and spiritual aspects of life, as well as strengthening indigenous institutions related to knowledge (Naciones Unidas, 2010).

To the Emberá Wounaan, the following economic activities related to their traditional development can be attributed.

7.3.1 Agriculture

The main activity that involves a significant portion of the indigenous people's time for their subsistence and production for sale is collective participation, involving children, women, men, and elderly individuals who still preserve their strength for work.

Male activities include clearing land and slashing, seed preparation, planting, cleaning, harvesting, loading, and storing crops such as plantains, corn, coffee, cocoa, sugarcane, and rice. Men also handle commercial transactions and engage in wage labor when necessary. Female activities in the fields involve harvesting, loading products, and processing them for food preparation. They also participate in the cultivation of plantains, corn, rice, coffee, and sugarcane, as well as in clearing, seed preparation, planting, cleaning, and storage. Meanwhile, children perform activities according to their gender, similar to those of adults. Within the fields, they participate in clearing, planting, harvesting, and loading products.

Among the most consumed foods, **corn** stands out as a vital product. As a traditional crop, it is closely linked to subsistence economic activities and, in terms of ideology, to the worldview. Corn is planted twice a year during the dry season, which typically falls between May to July and August to October. It is planted in flat terrain, where the grains are covered with crop residue to protect them. Corn is primarily grown for making chicha, a beverage reserved for festivals, communal work, and daily activities. The harvest is also used for wraps, arepas, roasted corn on the cob, corn flour, cooked dishes, and porridge, serving as a source of subsistence food.

Plantain is another very important crop, a practice that originated in the Chocó department in Colombia and has become a staple food in the Emberá diet. Surpluses of this crop are left for commercialization. Plantains are consumed in various forms: boiled, fried, roasted, in porridge, as flour, etc., in all three daily meals. Being a perennial crop, it bears fruit all year round, and its harvest is obtained after eight months. It is planted in secondary vegetation areas using mounds, which are cared for in the first few months by preparing the land, but then left free, and eventually, during the harvest of the bunches, weeds are cleared or cut.

Rice is a relatively new crop for the Emberá region, and it is planted in wet terraces around March. It is a family activity, with men opening holes in the ground where women deposit the seeds. This crop is only weeded about a month and a half after being established, removing weeds. When ripe, the spikes are selected, cut, and stored in baskets, but the whole plant can also be cut; the spikes are dried and then stacked for further drying and subsequent storage in wooden containers.

Banana is another very important crop, a practice that developed in the department of Chocó in Colombia and which nowadays is a staple food especially in the Emberá diet. Surpluses of this crop are left for commercialization. This product is consumed in different forms: boiled, fried, roasted in porridge, in flour, etc., in the three daily meals. Being a perennial crop, it bears fruit all year round and its harvest is obtained after eight months. It is planted in secondary vegetation areas using hills, which are cared for in the first few months by arranging the land, but then left free, and eventually during the bunch picking, weeding or clearing of weeds is done.

Sugarcane is planted along riverbanks, and production begins after seven months of cultivation. Since it is considered a female crop, women are responsible for its care. It is consumed in pieces or processed to obtain sugarcane juice, and both men and women are involved in its extraction, usually using a manual sugarcane press.

Other crops are planted, but on a smaller scale, such as cassava, useful trees like jagua and annatto, which are used as natural dyes, especially in the areas of the Wounaan. Wild fruits for gathering are very scarce and may include wild tubers, certain fern shoots, sweet fruits, some larvae, honey, etc., but they do not represent a high percentage of the diet. Cultivation involves clearing forests in very humid areas and, in drier areas, occasional burning. Their cultivation techniques require leaving the land fallow for three to five years between plantings as a minimum. As a result, new lands must be rotated, but due to the lack of land in some regions, plots are cultivated several times in succession, leading to intensive soil use (UPME, 2018).

7.3.2 Hunting and fishing

A traditional and cultural practice that allows the Emberá and Wounaan to sustain themselves and has become an important economic activity due to their territorial social dynamics. Both ethnic groups are considered great hunters and fishermen. Hunting is done with bow and arrow, shotgun, blowgun, traps, and dogs, allowing them to catch deer, tapirs, peccaries, foxes, squirrels, anteaters, agoutis, rabbits, armadillos, and other mammals. They also hunt birds such as guans, ducks, rails, toucans, and parrots. The meat diet is supplemented with some domestic animals like ducks, chickens, and pigs, which are cared for by women. Some families may also have a few head of cattle. Freshly caught prey is consumed immediately, and any leftovers are salted or smoked. In times of abundance, it is shared with relatives and friends.

Fishing is the third most important activity in the economy, a daily task performed by men, women, and children, each with specific specialties. Fishing is practiced with hooks, harpoons, casting nets, and gillnets. The most sought-after catches include shad, tilapia, catfish, snook, sea bass, and river shrimp (UPME, 2018). However, these activities have been increasingly abandoned due to the loss of biodiversity caused by illegal poaching, migration of fauna due to deforestation and forest degradation, actions of both illegal and legal loggers, and practices of peasant and indigenous communities (Gelgado , y otros, 2019).

7.3.3 Handicraft

Due to the increase in tourists to the Darién region to learn about the experiences of ethnic groups, handicrafts have become one of their main economic activities, primarily benefiting female labor. Historically, women have been developing this activity with great skill, not only for production for sale but also from a perspective that allows for physical, mental, and spiritual integration. According to (Davis W. , 2009), the weaving and loom of fibers represent the union of territories from different clans, where through art, they

create a subtle philosophy, a way of thinking about perseverance, balance, and consistency. To produce their handicrafts, the materials used are:

- **Chunga palm:** It is a palm that grows in the tropical jungle, especially used for its leaves and trunk. Its processing goes through four stages:
    - Cutting the chunga buds, placing them in water to prevent drying in the sun, extracting 4 fibers from each leaf. Once all the fibers are removed, they are cooked to obtain a light green color.
    - Exposing the fibers to sunlight to dry, leaving them overnight to become white due to the dew.
    - Using various species that produce natural colors such as annatto - red, yuquilla - yellow, cocobolo - brown, and earth - black, they cook them with fiber to change it to the new color.
    - With the fibers dyed in permanent colors, the weaving of baskets begins, lasting from 3 to 60 days, dedicating between 6 to 8 hours daily depending on the quality of the braid, where some are finer than others (Tocamo, 2020).

- **Cocobolo:** It comes from a species of native timber tree, and its use is initially practiced by men who start at the age of 7, representing through their art the natural and ancestral beauty of their territory such as fauna species, flora, and ethnic artifacts. Cocobolo grows in tropical jungle with an approximate height of 30 meters; it is a very hard wood and resistant to termites. In addition to its use in handicrafts, it is also used for creating drums or posts for traditional houses.

The method of extracting cocobolo involves cutting the tree either with an axe or chainsaw; a piece can weigh up to a kilo, but after undergoing its due process, it can weigh only ½ a pound. For finishing the wood, indigenous people use different sandpapers to polish it. The waste is used by women to extract different colors for their baskets (Menguisama, 2020)

- **Tagua:** It comes from a palm tree that can reach 8 feet in height. For the creation of these handicrafts, they undergo three processes: 1) once the seeds are collected, they select the best quality ones and remove the husk; 2) they scrape them inside and out, and 3) they begin to craft the artwork inspired by animals using a tool called a chisel (Menguisama, 2020)

- **Chaquira:** Historically, it was crafted with stone, seeds, and animal tusks. Nowadays, it is made with a plastic material obtained in Panama City. To make the beads, they require materials such as cotton thread and a needle of at least 5 cm. The designs are created by women and are inspired by nature and traditional geometries of their ancestors. They craft bracelets, necklaces, earrings, traditional breastplates, and crowns (Casaimo, 2020)

Analyzing the economic activities of the Emberá Wounaan Region requires understanding the ongoing process of adaptation and change they are immersed in, due to the new lifestyles and social, economic, and environmental evolution of countries, situations that have both favored and disadvantaged indigenous peoples. This implies that many of their customs or cultures may change to adapt to industrial models, leaving behind perceptions from their worldview. Therefore, reclaiming culture from an indigenous sustainability perspective involves recognizing their legacies for the preservation of the world, considering the importance of their practices as rituals that maintain the balance and fertility of life.

For indigenous peoples, the central element identified as inherent to the economy is based on the power of giving and receiving within the cultural norms of reciprocal exchange. It is an economy based on personal appreciation as a source of obligation. While the guiding principle of market economy is accumulation, for indigenous economy, the guiding principle is distribution. As mentioned by (Davis W. , 2009), la the economy of an indigenous community determines the ecological footprint of a culture and the impact any society has on its environment.

7.4 Direct and indirect impact

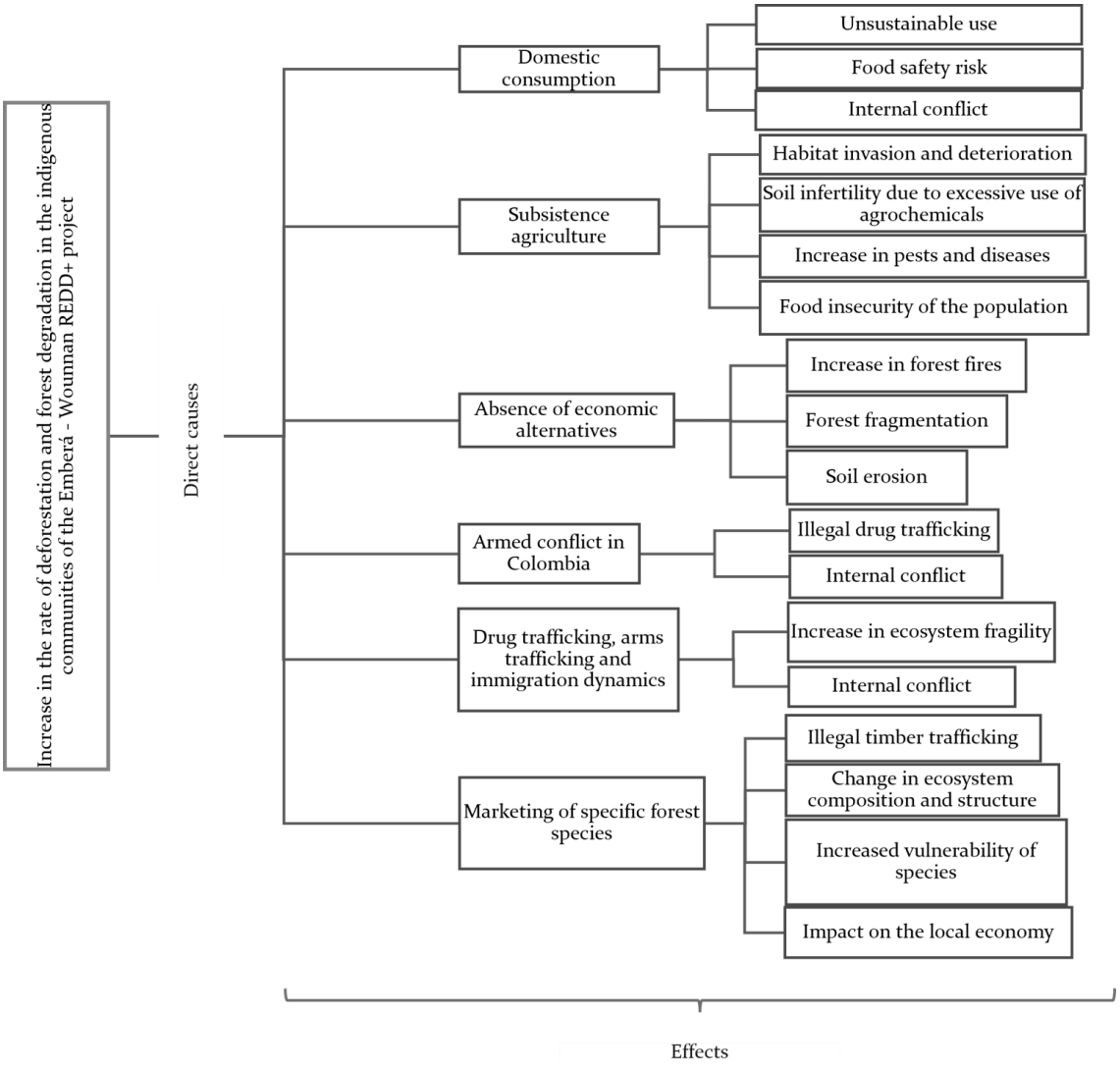
To establish the direct and indirect impacts generated by the causes and agents of deforestation and forest degradation, qualitative estimates are made through the use of participation techniques involving local community members in their territory, such as workshops to identify deforestation and degradation actors, social mapping, and timeline development[6]. Subsequently, the collected information is analyzed and incorporated into a cause-and-effect diagram aimed at identifying the direct causes present in the project area, along with their respective effects, in order to effectively propose activities that mitigate and reduce the risks of project non-permanence, while contributing to REDD+ objectives.

On the left side of **Figure 4**, the main causes of deforestation manifested in the project area are schematized. These include subsistence agriculture, selective forest harvesting for the commercialization of specific species, internal consumption, absence of economic alternatives, armed conflict in Colombia, and drug, arms, and immigrant trafficking. In turn, all of this contributes to the direct impact within indigenous groups, corresponding

[6] See in: *11_Anexos y complementarios\2_Factores_DefDeg_EmberaWounaan*.

to the increase in deforestation and forest degradation rates, which result in multiple effects such as unsustainable exploitation, risk to food security, internal conflict, increased anthropogenic forest fires, forest fragmentation, soil erosion, habitat invasion and degradation, soil infertility, illegal drug and timber trafficking, change in floristic composition, among others.

Figure 4. Analysis of Cause-Effect for REDD+ Emberá Wounaan Project.



Source: CO2CERO S.A.S., 2022.

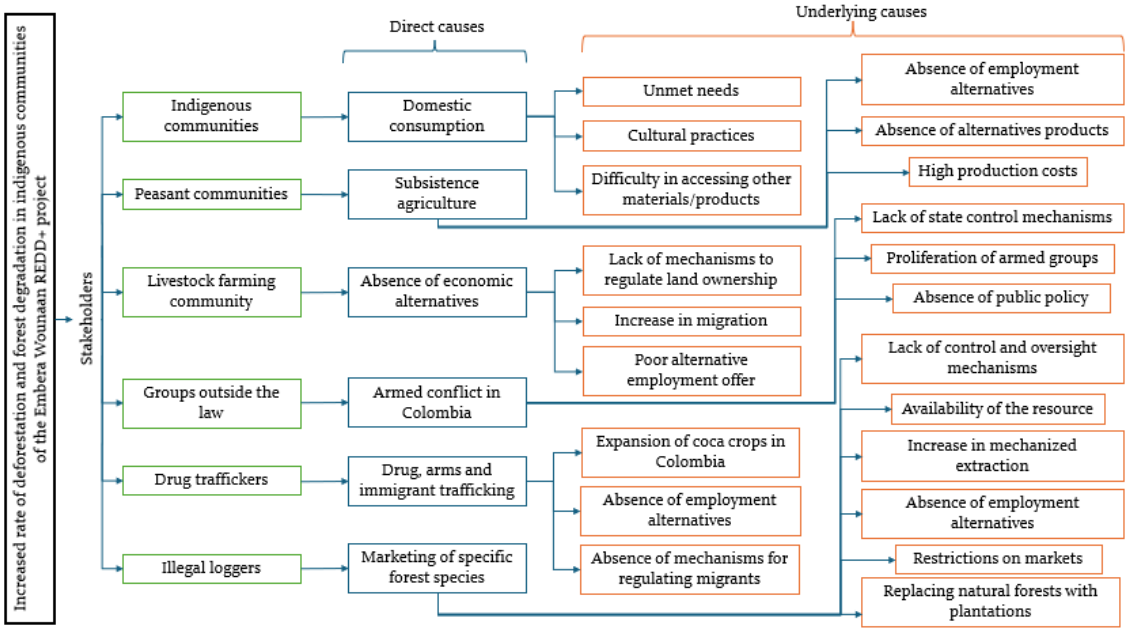
7.5 Relationships and synergies

Based on the information described above, interactions and synergies between actors (see **Figure 4)** and direct and underlying causes are identified, establishing for each actor its direct cause and the underlying causes for generating deforestation and forest degradation. According to **Figure 5,** indigenous communities engage in forest exploitation for internal consumption because they have limited access to alternative materials/products, and their basic needs are not adequately met due to deficient economic dynamics, while their cultural practices are based on forest use and utilization. Additionally, other actors who have migrated to the territory, such as peasant communities, engage in subsistence agriculture as their main activity due to limited employment alternatives, difficulties in acquiring other household products, and high production costs. The livestock community, together, has expanded the agricultural frontier due to underlying causes related to land tenure regulation organisms and mechanisms and the disparity between increasing employment demand and minimal supply.

Additionally, dynamics generated by illegal actors from the border area with Colombia are established, corresponding to groups operating outside the law and drug traffickers responsible for the trafficking of drugs, weapons, and immigrants to the United States. This activity leads to forest degradation due to the opening of roads, overloading the ecosystem, the construction of shelter or camping areas, including the establishment of campfires, and the selective exploitation of fauna and flora. This dynamic is caused by the proliferation of armed groups in the border area, the lack of state control mechanisms, the absence of public policy, the expansion of coca crops in Colombia, the lack of employment alternatives, and mechanisms for regulating immigrant mobility.

Finally, the country's timber sector is established as the main actor, through legal or illegal means, generating a selective demand for timber species, both domestically and internationally. This occurs due to the availability of resources, the absence of employment alternatives and control and monitoring mechanisms, the increase in mechanized extraction requiring the opening of greater road density with specific characteristics for the proper mobilization of necessary machinery, and the increase in forest plantations in natural forest areas, with the entry into force of Law No. 24 of 1992, which establishes incentives and regulates reforestation activity in the Republic of Panama. This law also grants benefits for the establishment of forest plantations such as exemption from payment of import duties and other fees for machinery and equipment, property tax, real estate transfer tax, income tax, among others.

Figure 5. Diagram of actors and causes of the REDD+ Emberá Wounaan project.

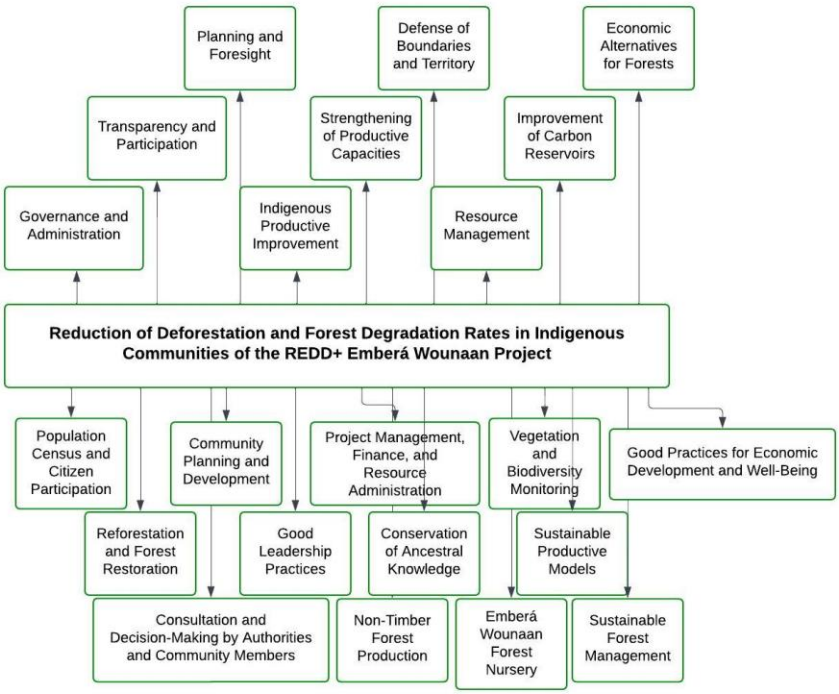


Source: CO2CERO S.A.S., 2022.

These drivers of deforestation and degradation strengthen the implementation of the REDD+ Emberá Wounaan Project, aiming to generate a positive impact on the indigenous communities in the project area by adhering to the Cancun Safeguards (see REDD+ Safeguards section for projects). This involves recognizing the rights of the communities and their role as protectors of the forest and its resources. The establishment and development of REDD+ activities in this project aim to mitigate both direct and underlying causes, as well as to prevent some effects influencing the social, economic, and natural context. Additionally, the overall goal is to reduce the rate of deforestation and forest degradation in the Comarca Emberá Wounaan. Therefore, to achieve these objectives, activities have been consolidated (See lower part of **Figure 6**) such as reforestation and commercial restoration, implementation of sustainable productive models, community planning and development, project management, finances, and resource administration, among others.

Furthermore, with the fulfillment of the general objective, conducive environments are generated for the development of additional activities that become positive impacts, strengthening governance structures and administration, socio-economic dynamics in the territory, increasing forest economic alternatives, and improving carbon reservoirs (See upper part of **Figure 5**).

Figure 6. Diagram of Objectives and Activities of the REDD+ Emberá Wounaan Project.



Source: CO2CERO S.A.S, 2022.

7.6 Deforestation and degradation chain of events

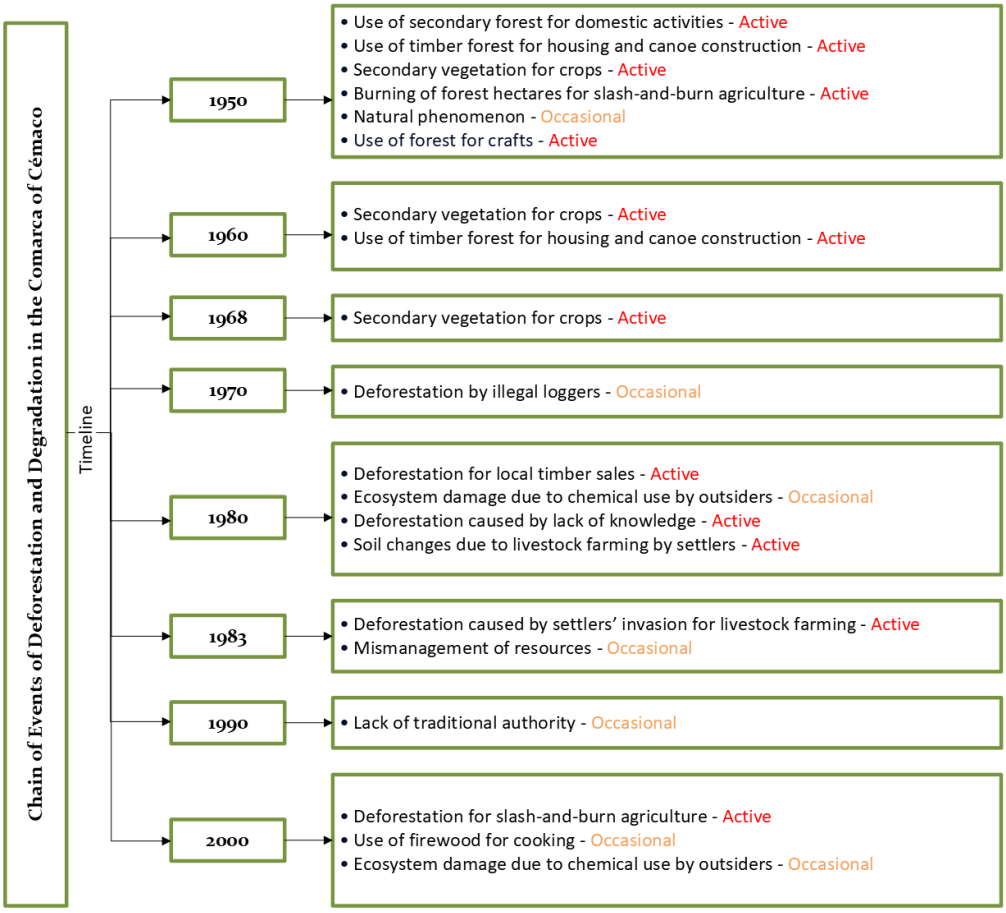
Through the development of various chapters analyzing deforestation and degradation factors, it is possible to identify a series of interconnected events that lead to effects on forest cover within the Emberá Wounaan Region. The territorial diagnosis conducted to consolidate the direct and indirect impact of deforestation on the territory spatially and temporally highlights the variables contributing to the deterioration of forest cover. Additionally, it brings to light internal situations involving communities and driving the use of forest resources as a source of supply, security, and survival.

The relationships and synergies configure diagnostic elements within a group of manifestations in the territory, connecting actors, activities, and effects in a single scenario, affirming the interrelation between environmental elements and the local population, all ultimately resulting in damage to natural capital. Identifying these events and causes guides the design of REDD+ activities for the project, aiming to mitigate their effects over longer periods to prevent greater damage and, in the case of the project, loss

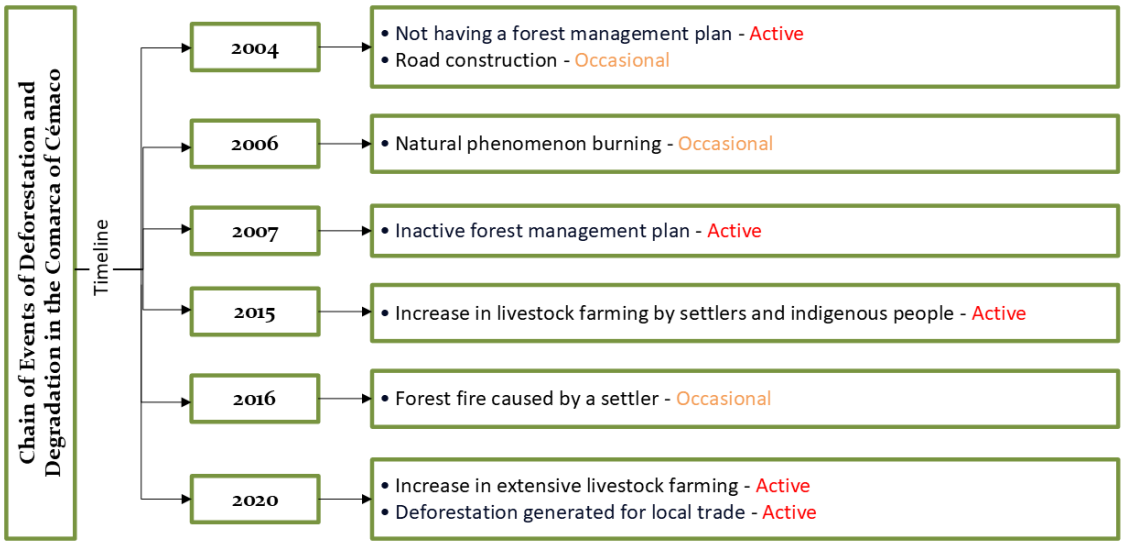
of sustainability. Consequently, cause-effect diagrams are consolidated with their corresponding involved actors, precisely highlighting chains of events. From the analysis of the drivers' workshops generated by the communities, it is identified that activities which have been significant contributors to the deforestation currently affecting the Darién territory, directly impacting the living conditions of the Emberá Wounaan.

According to the information, currently the Comarca Cémaco presents eighteen (18) active activities within the territory, factors exerted by communities and external actors that negatively affect environmental protection and conservation. However, it is also evident that through individual and collective will, ten factors have been reduced. This reduction is due to community concern about changes in land, soil, food security, and forest loss that have been occurring (**Figure 7**).

Figure 7. Chain of events of deforestation and degradation in the Comarca Emberá Wounaan.



Source: B-Terra Corp, 2022.



Source: B-Terra Corp, 2022.

On the other hand, based on the information generated by the communities of the Comarca Sambú, fourteen (14) active activities and two (2) occasional ones are reflected, which, like in Cémaco, are factors exerted by the communities and external actors that negatively impact the protection and conservation of the environment. Additionally, two (2) suspended activities are observed as positive outcomes, which were previously of great relevance for the environmental damage caused (**Figure 8**).

Figure 8. Deforestation and Degradation Chain in the Sambú District.

Source: B-Terra Corp, 2022.

7.7 Complementarity with planning documents.

The comarca's strategic plan for the period 2022–2027 and the strategic life plan 2022–2025 provides the foundation for defining the activities of the REDD+ Emberá Wounaan Project. The former supports its consolidation by aligning the REDD+ project with the focus on well-being and economic resources, as well as with the strategic axes of sustainability, innovation, and projects. The latter reinforces its prospects and future orientation[7].

[7] See in: *11_Anexos y complementarios/02_Factores_DefDeg_EmberaWounaan/Complementariedad_Instrumentos de planificación.*

8 Risk management

In this chapter, risks related to the implementation of activities in the REDD+ Emberá Wounaan project are evaluated. These activities are proposed for the reduction of emissions from deforestation and forest degradation in the Emberá Wounaan Region and its inhabitants. It is important to clarify that to consolidate this analysis, the risk management tool for permanence developed by the BioCarbon Standard in its version 1.0 is used.

Considering that risks can arise in environmental, financial, and social domains, possible measures were evaluated and designed to manage them. Below, each of the threats mentioned is defined, according to the proposal by the General Directorate of the National Civil Protection System (DG-SINAPROC, 2020).

- Environmental: Eventuality in which an activity related to the project causes environmental deterioration, deforestation, irrational exploitation of natural resources, exposure to toxic contaminants, loss of biodiversity, and disruption of the self-recovery of the ecological system.
- Social: Eventuality in which an activity related to the project generates organizational and knowledge weaknesses in organizations, institutions, governments, social groups, inequality, or discrimination, etc.
- Financial: Eventuality where an activity related to the project generates a lack of sufficient economic resources to assume losses in a risk event, as well as the mismanagement of these resources. It includes the economic capacity of individuals, institutions, and the Comarcal government to prevent or address an event.

The risks were classified according to impact and probability criteria, both qualitatively and quantitatively, following the parameters of the equation for calculating the risk level, specifying the following:

- Based on the probability level of occurrence:
    a. Low (0-30%): The event has a moderate probability of occurring; while not impossible, there is a low likelihood of it happening. It is assigned a score of 1.
    b. Medium (31-60%): The event has a moderate chance of occurring; it is likely but not certain. It is assigned a score of 3.

c. High (61-100%): It is almost certain that the event will materialize; it is considered inevitable or with a very high probability. It is assigned a score of 5.

- Based on the level of environmental or social impact of the activity:
  a. Severe impact with long-term damage; it is assigned a score of 5.
  b. Moderate impact: Medium impact with medium-term damage; it is assigned a score of 3.
  c. Low impact: Minor impact without noticeable short-term effects; it is assigned a score of 1.

After applying the mentioned formula, the values are multiplied, and the risk classification is constructed according to the following heat map.

Table 2. Heat map

Impact		Probability		
		1	3	5
	1	11	13	15
	3	31	33	35
	5	51	53	55

Source: B-Terra Corp &CO2CERO S.A.S., 2023.

Table 3. Reversal Risk Rating

Qualification	Type of risk	Rating proposed by BioCarbon Standard
11	Low risk	Less than 5%
13	Low risk	Less than 5%
15	Medium risk	(5-10%)
31	Low risk	Less than 5%
33	Medium risk	(5-10%)
35	High risk	Greater than 10%
51	Medium risk	(5-10%)
53	High risk	Greater than 10%
55	High risk	Greater than 10%

Source: B-Terra Corp &CO2CERO S.A.S., 2023.

Based on the results obtained, it is necessary to adopt a component of the forest management system within the Comarca to manage, monitor, evaluate, and follow up on any risk, whether present, potential, or unforeseen. When the risk is unforeseen, it is referred to as anomalies or chronic problems (depending on their magnitude and duration over time) and should be addressed through a participatory methodology that involves

policies, guidelines, procedures, and tools to scientifically address the identified risks (incorporating ancestral knowledge).

Due to the aforementioned, this set of mechanisms will be included in an Environmental, Social, and Financial Risk Management System as a subcomponent of the Forest Management System and Strategic Life Plan of the Comarca Emberá Wounaan. In *"12_Monitoring Report\02_Monitoring Report\REDD+ Emberá Wounaan_MonitoringReport_V14.docx\13.1.5 Monitoring the risk of non-permanence,"* the risk assessment is provided based on control and impact, analyzed by the development team and mitigation strategies.

8.1 Reversal Risk

To prevent the risk of reversal, a contract was executed on December 14, 2021, between B Terra Corp and CO2CERO SAS, with an initial duration term of 30 years, corresponding to the implementation period of the initiative. The contract includes penalty clauses for non-compliance by the parties and a clause that in case any change in circumstances occurs, affecting the project substantially, the Parties to the contract must cooperate and make their best efforts to allow its continuation[8].

Similarly, the commitment of the communities of the Comarca Emberá Wounaan, represented by the General Congress and its Regional Congresses, has been indicated under a contractual figure, ratifying the execution period of the initiative together with responsibilities, rights, and corresponding distribution of benefits for a period of 30 years[9].

Additionally, BioCarbon Standard applies a direct discount, maintaining a reserve of 20% on the total quantified greenhouse gas emission reductions for each verified period. This is done to compensate for the effects on project limits due to the occurrence of risks (BioCarbon Standard, 2021). As management measures for reversing progress and achievements in the environmental domain, an approach is made to a Management Information System based on Key Performance Indicators, favoring continuous monitoring and early and effective intervention, allowing for the mitigation of the root cause of each barrier, risk, or threat that arises, applying the inductive method and the ancestral knowledge of the communities of the Comarca. In the social sphere, the appropriation of the Comarca Emberá Wounaan Strategic Life Plan 2022-2052 and the

[8] See in: *01_Acuerdos\02_Acuerdos empresas\Contrato_BTerra-CO2CERO.pdf*
[9] See in: *01_Acuerdos\Acuerdo comunidad\Contrato_B Terra_Emberá.pdf*

institutionalization of the Sustainable Permanent Education System can be carried out. Finally, to comply with the necessary requirements for managing the risk of reversal, the Conformity Assessment Body (CAB) provides professional liability insurance that covers the validation and verification processes of the projects.

9 Environmental Aspects

Following the guidelines defined in the Environmental Net Impact Assessment and Socio-environmental Safeguards tool of BioCarbon Standard version 1.0, and in order to analyze the predictable effects on biodiversity and ecosystems within the project boundaries, an environmental assessment was conducted based on the categorization of effects using the methodology developed by (Conesa, 2011). This methodology assigns an importance value to each effect using value scales for the criteria established by it, allowing them to be classified into different ranges based on their nature. The parameters of this methodology were adapted to fit the specific characteristics of the REDD+ Emberá Wounaan project.

In total, seven (7) criteria were analyzed for negative effects and five (5) for positive effects, as the assessment for recoverability and reversibility criteria was not conducted, as indicated by (Conesa, 2011). For all effects, the nature, intensity, extent, persistence, and timing were evaluated. The definition of each criterion and the assessment of environmental effects with the respective justification of the assigned value in the evaluation conducted can be found in "*11_Anexos y complementarios\4_NNH\01_Environmental aspect*".

Table 4. Rating and level of environmental importance of the effects determined in the environmental assessment.

N°	Effect	Rating	Environmental level of importance
1	Increase in Forest Governance	11	Positive: Low
2	Conservation of forest mass	27	Positive: High
3	Provision of habitats for fauna	33	Positive: High
4	Reduction of pressure on natural ecosystems	29	Positive: High
5	Conservation of biological corridors	27	Positive: High
6	Forest fires	-29	Negative: Moderate
7	Emergencies due to floods or hurricanes	-29	Negative: Moderate

N°	Effect	Rating	Environmental level of importance
8	Impact on vulnerable or endangered species (terrestrial or aquatic) according to IUCN in the Comarca	-27	Negative: Moderate
9	Soil and water pollution with anthropogenic waste	-27	Negative: Moderate
10	Increase in the construction of unsustainable housing and the existence of traditional housing in precarious conditions	-23	Negative: Moderate
11	Limited knowledge of sustainable forest management within the Comarca	-15	Negative: Irrelevant
12	Susceptibility to scams related to carbon markets	-13	Negative: Irrelevant
13	Insufficient access routes to transport forest and agricultural production to consumers	-17	Negative: Irrelevant
14	Inappropriate land use	-36	Negative: Critical
15	Pressure from private timber companies on forest resources	-37	Negative: Critical
16	Illegal logging	-37	Negative: Critical

Source: CO2CERO S.A.S., 2022.

Finally, it is determined that for the REDD+ Emberá Wounaan project, there are five (5) positive effects, of which four (4) were classified as having a high level of environmental importance and one (1) with a low level of environmental importance. Additionally, there are ten (11) negative effects, five (5) moderate, three (3) irrelevant, and three (3) critical.

10 Socio-economic aspects

Following the guidelines set forth in the Environmental Net Benefit and Socioenvironmental Safeguards tool of BioCarbon Standard version 1.0, the REDD+ Emberá project seeks, in the course of its development, to generate economic resources that can be used to improve the quality of life of indigenous peoples in accordance with their social dynamics of the territory and ethnic culture, as a result of the protection and conservation of natural forests and the mitigation of GHGs.

Thus, through the participation of project proponents along with beneficiaries, socializations have been conducted to generalize the types of benefits the project can contribute to the well-being of the population. For this purpose, social and economic categories have been determined, allowing for an analysis of the main effects that can arise from REDD activities. The following are the socioeconomic effects of the project.

Table 5. Main Socioeconomic Effects of REDD+ Activities.

N°	Component	Categories	Units of Analysis - Socioeconomic Effects
1	Economic	Employability	Hiring of local labor
2	Economic	Employability	Access to economic resources
3	Economic	Value chain	Development of agricultural productive projects
4	Economic	Value chain	Development of ethnic productive projects
5	Economic	Value chain	Economic territorial growth
6	Economic	Value chain	Devaluation of the carbon market
7	Economic	Value chain	Misuse of economic resources
8	Economic	Value chain	Abandonment of ventures
9	Social	Territorial development	Community disintegration
10	Social	Territorial development	Strengthening of good governance
11	Social	Territorial development	Community participation
12	Social	Territorial development	Strengthening of land tenure
13	Social	Territorial development	Improvement of roads
14	Social	Territorial development	Recognition of territorial boundaries
15	Social	Security	Incursion of illegal groups or drug traffickers
16	Social	Security	Strengthening of territorial boundary security
17	Social	Inclusion	Participation of children, youth, elderly
18	Social	Inclusion	Gender participation
19	Social	Inclusion	Non-participation of children, youth, women, and elderly
20	Social	Living conditions	Strengthening of community relationships
21	Social	Living conditions	Strengthening of health
22	Social	Living conditions	Strengthening of education
23	Social	Living conditions	Food security
24	Social	Living conditions	Housing improvement
25	Social	Living conditions	Improvement of basic services
26	Social	Living conditions	Strengthening of family welfare
27	Social	Living conditions	Solid waste management

N°	Component	Categories	Units of Analysis - Socioeconomic Effects
28	Social	Living conditions	Exposure to future pandemics
29	Social	Ethnic conservation and culture	Rescue of cultural activities
30	Social	Ethnic conservation and culture	Loss of cultural identity
31	Social	Ethnic conservation and culture	Disrespect for dignity and cultural diversity
32	Social	Ethnic conservation and culture	Self-rejection of indigenous identity and culture

Source: Compiled by CO2CERO S.A.S., 2023.

With the above, seven (7) categories and thirty-two (32) socio-economic effects are identified, which over time favor and strengthen community and territorial dynamics, generating well-being for the population. However, within the analysis, effects are identified that may contradict the real objective of the project, having a negative impact, either on the population or on the territory itself. Therefore, in the "*12_Reporte de monitoreo\02_Reporte de monitoreo\REDD+ Emberá Wounaan_MonitoringReport_V14.docx\9. Socioeconomic aspects*" document, the result of the evaluation is found, describing the level of importance and impact of each effect.

For this analysis, a socio-economic evaluation was conducted based on the categorization of effects, adopting the methodology developed by (Conesa, 2011). This methodology assigns an importance value to each effect using value scales for the criteria established by it, allowing them to be classified into different ranges based on their nature. The parameters of this methodology were adapted to fit the specific characteristics of the REDD+ Emberá Wounaan Project[10].

It is worth mentioning that the categories and effects were established according to theoretical references from organizations such as the UN, UNICEF, FAO, UNDP, among others, being important contents for the development of ethnic populations. In this way, each category is described in general terms, emphasizing its importance for the project from the social and economic component and how these aspects can impact the environment.

10.1 Employability

Indigenous peoples have historically lived in rural areas and have mainly relied on agriculture and natural resources to sustain themselves (mundial, 2023). However,

[10] See in: *11_Anexos y complementarios\4_NNH\02_Socieconomic aspect*

nowadays, they increasingly reside in urban areas and work in different economic sectors (Indígena, 2021).

Due to the lack of employment opportunities within indigenous territories, the population opts to migrate to cities in search of better living conditions. However, they are exposed to violations of their basic needs and human rights in urban realities.

On the other hand, in the face of environmental change and crisis, indigenous populations have been affected by changes in natural environments, impacting their farming, fishing, or natural resource utilization processes, which are essential activities for the livelihoods of various families.

Therefore, REDD+ activities aim to strengthen projects aligned with indigenous culture, promoting local labor and enhancing the economic incomes of Emberá and Wounaan families. Similarly, projects focus on sustainability, reducing impacts on natural resources and ecosystems.

10.2 Productive chains

The territory is not just a framework for the economy but an economic resource. In this sense, it is the quality of the territory that allows technology to intersect with culture; companies to find a conducive environment; the market to translate competition into cooperation, and the economy as a whole to mobilize society and the intentions of each of its members (Campero, 2015).

Under the framework of the project, and according to the communities' prospecting, integrating productive chains based on the knowledge of the population allows for cultural and ethnic recognition at the local and national levels, generating marketable products. These avenues serve as sources of income for the regions and their inhabitants. Likewise, the focus would be on activities that reduce the impact on forests, thereby decreasing deforestation and degradation.

10.3 Territorial development

Territorial development is a perspective that starts by analyzing where social and economic relations take place. Economic activity, people, jobs, and the standard of living are often not distributed evenly throughout the intervention scenario (Mundial, 2020).

Therefore, through the actions of REDD+ activities, the promotion of territorial development is aimed at across social, environmental, and economic components, which are long-term endeavors. For this aspect, it is crucial to identify the basic needs of the

population and prioritize them properly, yielding efficient results with quality and real impact.

10.4 Security

According to the rights of indigenous peoples, security is one of the main and key actions for the preservation of communities, where their territorial boundaries, sacred places, and the quality of life of the people are respected (Unidas, 2023)

With the above, it is sought, through the legal regulation of the indigenous territory, to strengthen actions that promote the security of both the territory and the population, as they are affected by activities of external factors that may, over time, undermine their rights and basic needs.

10.5 Inclusion

The EU defines social inclusion as *"a process that ensures that those at risk of poverty and social exclusion have the opportunities and resources necessary to fully participate in economic, social, and cultural life, enjoying a standard of living and well-being considered normal in the society in which they live." It emphasizes the right of individuals to "have an associated life as a member of a community"* (Jímenez, S.F).

The project aims to promote the participation of the diverse population of the territories, generating activities that involve knowledge from children to the elderly, as well as emphasizing the importance of women's participation, which is essential for decision-making in the territory. Furthermore, these spaces allow for the generation and strengthening of leaders in different areas, fostering community empowerment for present generations.

10.6 Life conditions

Historically, indigenous peoples have been immersed in eventualities where their living conditions have been affected, leading to the loss of traditional knowledge and culture. Likewise, they have been adapting to new ways of life, where in some areas they fail to meet their basic needs.

Therefore, as well mentioned by (Marriaga & Nohora Mercado, 2022), positively impacting the quality of life of communities involves analyzing each of the focal points that are part of this term (health, nutrition, education, economic sustainability). Faced with this reality, it is essential to identify strategies that allow for the improvement of these basic conditions

without limiting or disrupting their traditional customs, while respecting their collective, family, and individual rights.

10.7 Ethnic and cultural conservation

Indigenous peoples are the primary guardians of the world's forests. Thanks to their ancestral practices, they have **ensured the conservation of 80% of the planet's biodiversity, and the forests they inhabit provide one-third of the solution to climate change**. Reinforcing respect for their rights, elevating their importance, and incorporating their vision and knowledge of nature are crucial to achieving climate, development, and conservation goals (wwf, 2022).

Understanding the ways of life of the Emberá and Wounaan leads us to analyze the importance of preserving their traditional and indigenous customs for the protection and conservation of forests, which are fundamental ecosystems for obtaining their basic resources, especially food security, health, and housing.

Therefore, one of the positive effects that REDD+ activities can generate is the strengthening of indigenous governance, where people of all ages can participate and share knowledge and experiences that strengthen community relationships and collective decision-making.

11 Consultation with interested parties (stakeholders)

The Emberá Wounaan REDD+ project guarantees, in accordance with the Cancun safeguards, the flow of information, respect for culture and free, prior and informed consent. The following is a description of the processes and activities used to achieve the consultation and approval phases of this project by the indigenous comarcas, considering their governance and decision-making models[11].

11.1 Project idea.

The initial consolidation of the REDD+ project idea emerged between the managing and technical partners (B-Terra and CO2CERO S.A.S.) as a result of an analysis of the regulatory, legal, and technical framework, which was necessary to ensure that the project benefits the community, reduces GHG emissions, and is permanent for a minimum period

[11] See in: *11 Anexos y complementarios\8_Guia_AcercamientoSocial_ Emberá Wounaan_V2.pdf.*

of thirty (30) years. The initial consolidation of the REDD+ project idea emerged between the managing and technical partners (B-Terra Corp and CO2CERO S.A.S.) because of an analysis of the regulatory, legal, and technical framework, which was necessary to ensure that the project provides benefits to the community, reduces GHG emissions, and remains permanent for a minimum period of thirty (30) years. This process was supported by strategic allies such as the Fundación Panamá Canal de Vida, which carried out the first approaches to the Emberá Wounaan community in the districts of Cémaco and Sambú and is part of the organizational structure of B-Terra Corp.

Ensuring a responsible and committed workflow, these two parties (CO2CERO S.A.S. y BTerra Corp.) establish a temporary partnership contract,[12] wherein they commit, according to their abilities, to contribute to the fulfillment and achievement of the objectives of the REDD+ initiative within the national territory, specifically in the Comarca Emberá Wounaan, involving the districts of Darién, Cémaco, and Sambú.

Within this phase of communication between partners, the percentages of participation related to management and technical application, payment mechanisms, benefit transfer, general project objectives, and certification program based on the analysis of alternatives are defined. From this framework, the first direct communication channel of the project is created, wherein B-Terra Corp establishes a direct relationship with the community or their representatives to gather the necessary information for the design and structuring of the initiative. At the same time, this channel extends to the technical developer, consistently consolidating it with the certification program. The information channels designed in this phase include direct contact with field visits, phone calls, and intermediation through workers of the B-Terra Corp and/or CO2CERO S.A.S.

Once the essential structuring elements of the project and the possible benefits generated by the initiative are consolidated, approaches are made to the communities to provide a frame of reference on REDD+ initiatives, their influence on climate change mitigation, conservation, and the improvement of the living conditions of community members through nature-based solutions and result-based payments. According to the guidelines set by B-Terra, these approaches to the communities are made due to the trust and closeness that the company has with the community. Similarly, community engagement with the population is conducted under the principles of the governance structure of the territory, articulated with the second Cancun safeguard (Transfer and effectiveness of

[12] See in: *11 Anexos y complementarios\8_Guia_AcercamientoSocial_ Emberá Wounaan_V2.pdf.*

forest governance structures), ensuring open, honest, transparent, and participatory dialogues. This generates interest from the population in developing a REDD+ project within their territory, safeguarding their cultures, traditions, lifestyles, and land.

In the first socialization, the aim was to convey to the participating population the idea and importance of implementing a REDD+ project as a strategy to promote the development of the territory through the improvement of the quality of life of indigenous communities and the preservation of the High Conservation Values of the territory, starting from a sustainable approach. It is explained that this idea arises from rigorous work to assess the feasibility of the project's execution, the monetary and non-monetary benefits of its implementation, and the joint responsibilities, where the population is essential for the project's cycle durability. This is based on good leadership, community and collective engagement, equitable and fair benefits, inclusive participation, and democratic decision-making, respecting their collective and fundamental rights as ethnic peoples and territories of the country.

Illustration 1. Socialization of the REDD+ Emberá Wounaan project.

Source: B-Terra Corp, 2022.

For the implementation of this phase, B-Terra Corp personnel were deployed to the territories, ensuring the greatest possible participation of the population in the different communities, giving it a representative character, in order to generate an internal discussion that could lead to the approval of the initiative within the territory in later stages of the visit, with the understanding of autonomy and respect for the decision-making tradition of each community[13]. For the execution of the socialization of the REDD+ project, the previous procedures before the traditional authorities were taken into account, using methods and channels of communication with the representatives of the communities.

Table 6 describes the different spaces[14] generated by B-Terra with the communities that make up the district of Cémaco; and **Table 7** describes the spaces generated with the communities that make up the district of Sambú. Ensuring transparency of information, active participation for decision making, primary information gathering, and strengthening indigenous governance.

Table 6. Socialization and approval of the Emberá Wounaan REDD+ project in the District of Cémaco.

Community	Date	Meeting object	Meeting place
Corregimiento Cirilo Guaynora			

[13] See in: *11 Anexos y complementarios\07_Actas y 11 Anexos y complementarios\ 1_Asistencia.pdf*
[14] See in: *11_Anexos y complementarios/07_Actas/Matriz de registro de socializaciones.xlsx*.

Community	Date	Meeting object	Meeting place
Capetí	12 September 2021	Meeting of the communities of Corregimiento Cirilo Guaynora	Panama City, Parque Omar Torrijos
	31 October 2021	Capetí Local Congress - REDD+ project training	Community Capetí
	5 y 6 November 2021	First workshop seminar on climate change, REDD+ and the carbon market.	Community Capetí
	14 November 2021	Capetí Local Congress - Extraordinary Session - Resolution No. 04-2021	Community Capetí
	13 April 2022	Workshop on socialization and deforestation drivers	Community Capetí
	29 January 2023	Workshop on Factors and Agents of Deforestation and Degradation. Benefit Sharing	Lajas Blancas, River Chucunaque, Cémaco
El Puente	12 September 2021	Meeting of the communities of Corregimiento Cirilo Guaynora	Panama City, Parque Omar Torrijos
	31 October 2021	Delivery of resolution, local congress and - REDD+ project training	Community Puente
	5 y 6 November 2021	First workshop seminar on climate change, REDD+ and the carbon market.	Community Capeturía
	13 April 2022	Socialization workshop	Community Unión Chocó
	10 January 2023	Puente Local Congress- Resolution No. 04 of January 10, 2023	Community Puente
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, River Chucunaque, Cémaco
Unión Choco	25 April 2016	Presentation of conservation project idea	Hotel Continental, Panama City

Community	Date	Meeting object	Meeting place
	20 January 2020	Discussion on the items proposed by the timber company with the pro-road committee and B-Terra Corp.	Community Unión Chocó
	5 Aprill 2021	Training	Community Unión Chocó
	12 September 2021	Meeting of the communities of Corregimiento Cirilo Guaynora	Panama City, Parque Omar Torrijos
	5 y 6 November 2021	First workshop seminar on climate change, REDD+ and the carbon market.	Community Capetí
	13 April 2022	Workshop on socialization and deforestation drivers	Community Unión Chocó
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, River Chucunaque, Cémaco
	8 January 2023	Resolutions of approval	Community Unión Chocó
Vista Alegre	25 April 2016	Presentation of conservation project idea	Hotel Continental, Panamá city
	5 August 2021	Resolutions of approval	Community Vista Alegre
	12 September 2021	Meeting of the communities of Corregimiento Cirilo Guaynora	Panamá city, Parque Omar Torrijos
	5 y 6 November 2021	First workshop seminar on climate change, REDD+ and the carbon market.	Community Capetí
	12 April 2022	Workshop on socialization and deforestation drivers	Community Vista Alegre
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, River Chucunaque, Cémaco
Corregimiento Manuel Ortega			
Barranquillita	18 January 2022	Socialization workshop	Metetí
	24 March 2022	Socialization workshop	Community Barranquillita

Community	Date	Meeting object	Meeting place
	30 December 2022	Resolutions of approval	Community Barranquillita
La Esperanza	15 March 2022	Resolutions of approval	Community la Esperanza
	24 March2022	Socialization workshop	Community la Esperanza
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, River Chucunaque, Cémaco
La Pulida	15 March 2022	Resolutions of approval	Community la Pulida
	24 March 2022	Socialization workshop	Community la Esperanza
	27 June 2022	Socialization workshop	Community la Pulida
	27 June 2022	Resolutions of approval	Community la Pulida
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, River Chucunaque, Cémaco
	14 February 23	Training and socialization	Community la Pulida
Punta Grande	18 January 2022	Socialization workshop	Metetí
	15 March 2022	Resolutions of approval	Community Punta Grande
	24 March 2022	Socialization workshop	Community la Esperanza
	27 June 2022	Socialization workshop	Community Punta Grande
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, River Chucunaque, Cémaco
	13 February-23	Training and socialization	Community Punta Grande
Nuevo Belén	28 June 2022	Training and resolution search	Yaviza
	30 December 2022	Resolutions of approval	Community Nuevo Belén

Community	Date	Meeting object	Meeting place
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, Río Chucunaque, Cémaco
	13 February 23	Training and socialization	Community Nuevo Belén
El Común	30 December 2022	Resolutions of approval	Community el Común
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, Río Chucunaque, Cémaco
	13 February 2023	Training and socialization	Community el Común
	25 October 2023	Emberá Wounaan REDD+ Project Training	Community el Común
Naranjal	1 January 2022	Resolutions of approval	Community Naranjal
	13 December 2022	REDD+ project presentation	Community Naranjal
	16 February 2023	Training and socialization	Community Naranjal
	25 October 2023	Emberá Wounaan REDD+ Project Training	Community Naranjal
Corozal	25 October 2022	Socialization workshop	Corregimiento Manuel Ortega
	25 y 26 October 2022	Informative forum and resolution of concerns about the current B-Terra situation in communities	Corregimiento de Río Sábalo
	30 December 2022	Resolutions of approval	Community Corozal
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, River Chucunaque, Cémaco
	24 October 2023	Emberá Wounaan REDD+ Project Training	Community Corozal
Villa Nueva	18 January 2022	Training and socialization	Metetí
	5 December 2022	Consultation and understanding process	Panamá, salon sky park

Community	Date	Meeting object	Meeting place
		between B-terra and the county	
	30 December 2022	Resolutions of approval	Community Villa Nueva
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, River Chucunaque, Cémaco
	15 February 23	Training and socialization	Community Villa Nueva
	24 October 2023	Emberá Wounaan REDD+ Project Training	Community Villa Nueva
Boca Tigre	1 January 2022	Resolutions of approval	Community Boca Tigre
	28 June 2022	Training and resolution search	Distrito Cémaco
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, River Chucunaque, Cémaco
	15 February 23	Training and resolution search	Community Boca Tigre
	23 October 2023	Emberá Wounaan REDD+ Project Training	Community Boca Tigre
Nazareth	1 January 2022	Resolutions of approval	Community Nazareth
	5 December 2022	Consultation and understanding process between B-terra and the county	Panamá, salon sky park
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, Río Chucunaque, Cémaco
	15 February 2023	Training and socialization	Community Nazareth

Community	Date	Meeting object	Meeting place
	23 October 2023	Emberá Wounaan REDD+ Project Training	Community Nazareth
Corregimiento Lajas Blancas			
Canáan	28 June 2022	Training and resolution search	Distrito Cémaco
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, River Chucunaque, Cémaco
	2 July 2023	Resolutions of approval	Community Canáan
	23 October 2023	Emberá Wounaan REDD+ Project Training	Community Canáan
Sinaí	29 February 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, Río Chucunaque, Cémaco
	25 October 2023	Emberá Wounaan REDD+ Project Training	Community Sinaí
	30 June 2023	Resolutions of approval	Community Sinaí
Maach Pöbör	24 June 2022	Resolutions of approval	Comunidad Maach Pöbör
	28 June 2022	Training and resolution search	Distrito Cémaco
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, River Chucunaque, Cémaco
	24 October 2023	Emberá Wounaan REDD+ Project Training	Community Maach Pöbör
Alto Playón	25 June 22	Training and resolution search	Community Alto Playón
	3 July2022	Resolutions of approval	Community Alto Playón
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, River Chucunaque, Cémaco
	16 February 23	Socialization workshop	Community Villa Caleta

Community	Date	Meeting object	Meeting place
	26 October 2023	Emberá Wounaan REDD+ Project Training	Community Alto Playón
Peña Bijagual	18 January 2022	Socialization workshop	Metetí
	20 February 2022	Socialization workshop	Community Peña Bijagual
	28 December 2022	Resolutions of approval	Community Peña Bijagual
	29 January 2023	Taller Factores y Agentes de Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, River Chucunaque, Cémaco
	28 October 2023	Emberá Wounaan REDD+ Project Training	Community Peña Bijagual
El Salto	26 October 2022	Extraordinary minutes of the Cémaco Board of Directors and the Regional Cacique of Cémaco	El Salto, official venue of the Emberá Wounaan General Congress
	30 December 2022	Resolutions of approval	Community El Salto
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, River Chucunaque, Cémaco
	27 October 2023	Emberá Wounaan REDD+ Project Training	Community El Salto
Baja Purú	20 February 2022	Socialization workshop	Community Baja Purú
	30 December 2022	Resolutions of approval	Community Baja Purú
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, River Chucunaque, Cémaco
	27 October 2023	Emberá Wounaan REDD+ Project Training	Community Baja Purú
Lajas Blancas	18 January 2022	Training and socialization	Metetí
	2 October 2022	Training and socialization	Community Lajas Blancas

Community	Date	Meeting object	Meeting place
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, River Chucunaque, Cémaco
	1 June 2023	Resolutions of approval	Community Lajas Blancas
	29 October 2023	Emberá Wounaan REDD+ Project Training	Community Lajas Blancas
Tortuga	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, River Chucunaque, Cémaco
	9 March 2023	Resolutions of approval	Community Tortuga
	27 October 2023	Emberá Wounaan REDD+ Project Training	Community Tortuga
Dosake Purú (Riocito)	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, River Chucunaque, Cémaco
	30 June 2023	Resoluciones de aprobación	Community Dosake Purú (Riocito)
	28 October 2023	Emberá Wounaan REDD+ Project Training	Community Dosake Purú (Riocito)
Nuevo Vigía	18 January 2022	Training and socialization	Metetí
	8 February 2022	Training and socialization	Community Nuevo Vigía
	28 February 2022	Resolutions of approval	Community Nuevo Vigía
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, River Chucunaque, Cémaco
	26 October 2023	Emberá Wounaan REDD+ Project Training	Community Nuevo Vigía
Villa Caleta	18 January 2022	Training and socialization	Metetí
	5 April 2022	Training and socialization	Community Villa Caleta

Community	Date	Meeting object	Meeting place
	30 June 2022	Resolutions of approval	Community Villa Caleta
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, Río Chucunaque, Cémaco
	15 February 23	Training and socialization	Community Villa Caleta
	25 Octubre 2023	Emberá Wounaan REDD+ Project Training	Community Villa Caleta
Marraganti	18 January 2022	Training and socialization	Metetí
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, River Chucunaque, Cémaco
	15 February 23	Training and socialization	Community Marraganti
	24 October 2023	Training and socialization	Community Marraganti
	4 July 2023	Resolutions of approval	Community Marraganti
Bajo Chiquito	18 January 2022	Training and socialization	Metetí
	25 March 2022	Presentación de la compañía B-Terra Corp. y Fundación Panamá Canal de Vida	Corregimiento Lajas Blancas
	30 December 2022	Resolutions of approval	Community Bajo Chiquito
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Lajas Blancas, River Chucunaque, Cémaco
	23 October 2023	Emberá Wounaan REDD+ Project Training	Community Bajo Chiquito

Source: CO2CERO S.A.S., 2022.

Table 7. Socialization and approval of the Emberá Wounaan REDD+ project in the District of Sambú.

Community	Date	Meeting object	Meeting place
Corregimiento Río Sabalo			

Community	Date	Meeting object	Meeting place
Puerto Indio	25 y 26 October 2022	Informative forum and resolution of concerns about the current B-Terra situation in communities	Community Puerto Indio
	27 October 2022	Training and socialization of REDD+ project	Community Puerto Indio
	31 December 2022	Resolutions of approval	Community Puerto Indio
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits.	Community Puerto Indio
Bayamón	25 y 26 October 2022	Informative forum and resolution of concerns about the current B-Terra situation in communities	Puerto Indio
	27 October 2022	Training and socialization of REDD+ project	Puerto Indio
	31 December 2022	Resolutions of approval	Community Bayamón
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits	Puerto Indio
La Chunga	25 y 26 October 2022	Informative forum and resolution of concerns about the current B-Terra situation in communities	Puerto Indio
	27 October 2022	Training and socialization of REDD+ project	Puerto Indio
	31 December 2022	Resolutions of approval	Community La Chunga

Community	Date	Meeting object	Meeting place
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits	Puerto Indio
Boca Trampa	25 y 26 October 2022	Informative forum and resolution of concerns about the current B-Terra situation in communities	Puerto Indio
	27 October 2022	Training and socialization of REDD+ project	Puerto Indio
	28 December 2022	Resolutions of approval	Community Boca Trampa
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits	Puerto Indio
Villa Keresia	25 y 26 October 2022	Informative forum and resolution of concerns about the current B-Terra situation in communities	Puerto Indio
	27 October 2022	Training and socialization of REDD+ project	Puerto Indio
	30 December 2022	Resolutions of approval	Community Villa Keresia
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits	Puerto Indio
Dai- Purú	25 y 26 October 2022	Informative forum and resolution of concerns about the current B-Terra situation in communities	Puerto Indio
	27 October 2022	Training and socialization of REDD+ project	Puerto Indio

Community	Date	Meeting object	Meeting place
	31 December 2022	Resolutions of approval	Community Dai Purú
	29 January 23	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits	Puerto Indio
Corregimiento Jingurudó			
Pavarandó	25 y 26 October 2022	Informative forum and resolution of concerns about the current B-Terra situation in communities	Puerto Indio
	27 October 2022	Training and socialization of REDD+ project	Puerto Indio
	31 December 2022	Resolutions of approval	Community Pavarandó
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits	Puerto Indio
Boca Wina	25 y 26 October 2022	Informative forum and resolution of concerns about the current B-Terra situation in communities	Puerto Indio
	27 October 2022	Training and socialization of REDD+ project	Puerto Indio
	31 December 2022	Resolutions of approval	Community Boca Wina
	29 January 2023	Deforestation and Degradation Factors and Agents Workshop. Distribution of benefits	Puerto Indio
Jingurodó	25 y 26 October 2022	Informative forum and resolution of concerns about the current B-Terra situation in communities	Puerto Indio

Community	Date	Meeting object	Meeting place
	27 October 2022	Training and socialization of REDD+ project	Puerto Indio
	30 December 2022	Resolutions of approval	Community Jingurudó
	29 January 2023	REDD+ project presentation	Puerto Indio
Churuco	25 y 26 October 2022	Informative forum and resolution of concerns about the current B-Terra situation in communities	Puerto Indio
	27 October 2022	Training and socialization of REDD+ project	Puerto Indio
	30 December 2022	Resolutions of approval	Community Churuco
	29 January 2023	REDD+ project presentation	Puerto Indio
Condoto	25 y 26 October 2022	Informative forum and resolution of concerns about the current B-Terra situation in communities	Puerto Indio
	27 October 2022	Training and socialization of REDD+ project	Puerto Indio
	30 December 2022	Resolutions of approval	Community Condoto
	29 January 2023	REDD+ project presentation	Puerto Indio
Borobichi	25 y 26 October 2022	Informative forum and resolution of concerns about the current B-Terra situation in communities	Puerto Indio
	27 October 2022	Training and socialization of REDD+ project	Puerto Indio
	30 July 2023	Resolutions of approval	Community Borobichi

Community	Date	Meeting object	Meeting place
	29 January 2023	REDD+ project presentation	Puerto Indio

Source: CO2CERO S.A.S., 2022.

11.2 Stablishment of agreements.

Once socialized with the legal representatives of each community in the two districts, a deadline is granted for the Nokora Councils, General Congress Board, District Authorities, and General Cacique, representative authorities for decision-making, to deliberate the possibility of establishing a REDD+ project model in their territory, taking into account the factors of positive and negative impacts that may arise. In this way, an approach is made to ratify firstly, the related concepts associated with the project, followed by profiling the development possibilities, and finally, the decision made by both the communities in general and the legal representatives of Cémaco and Sambú.

It is worth mentioning that the agreement is a contractual model that commits the communities and the associated developers in the different phases of diagnosis, design, execution, evaluation, and monitoring of the project's development. Likewise, the managing partner is the guarantor figure of the process, generating joint and collective work supported by technical teams in the social and environmental areas, whose results largely depend on the performance of the communities in the execution of alternative and sustainable activities capable of reducing emissions from deforestation and degradation.

Illustration 2. Establishment of agreements with decision-making representatives of the Comarca.

Source: B-Terra Corp, 2021.

Additionally, the agreement presents the bases of benefit distribution mechanisms, commitments, and responsibilities of the parties, ensuring compliance with principles of equality, gender equity, and inclusion, according to the UN; likewise, it is stated and confirmed that the ownership of the reduced GHG emissions is the responsibility of all the involved communities[15].

11.3 Analysis of deforestation and forest degradation factors

Considering the Cancun safeguards, as per (Camacho A., 2017) Full and effective participation and respect for traditional knowledge and rights of the communities are linked to the communities as holders of the initiative, in its design and structuring, as well as in the creation and definition of the project's objectives, according to the specific needs of each community and the territory in general. To this end, a territorial diagnosis is conducted, in which the economic, social, and cultural activities generating deforestation and forest degradation, their underlying causes, and their effects on well-being are identified.

Bearing in mind the collection of data from primary sources, a direct communication model[16] is consolidated and integrated into the development of the project document, which in turn provides the developer with elements that allow structuring and establishing action plans and activities to reduce deforestation and forest degradation and

[15] See in: *01_Acuerdos\Acuerdo comunidad\Contrato_B Terra_Emberá.pdf*

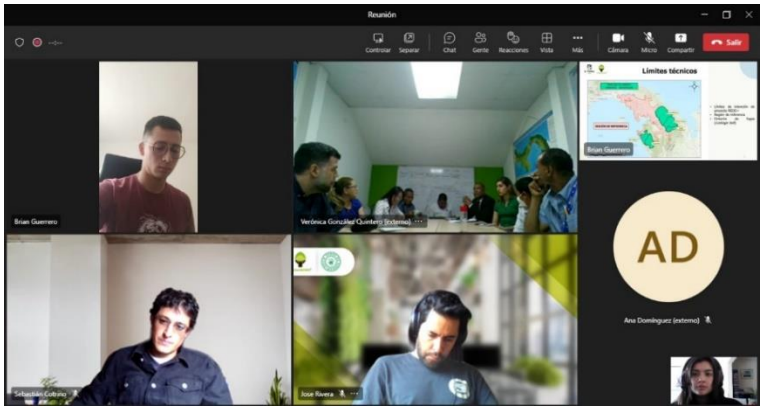
[16] See in: 08*_Información de campo\Revisiones\Anexo_AnalisisAgentesdefDeg_V1.docx*

improve the living conditions of ethnic communities, with greater certainty given the level of recognition acquired. As a result, the main causes and factors of deforestation are described in terms of their temporality, actor, frequency and current manifestation, together with a prospective analysis, which indicates where community interests and possible project activities are oriented.

11.4 Socialization to environmental authorities

Considering the importance of the functionality of environmental authorities within the territory and at the national level, they are regarded as fundamental external actors for the project's execution. Therefore, the objectives of the government and regulatory entities regarding the REDD+ initiative are taken into account. This is aimed at aligning objectives and designing activities in accordance with the normative, legal, social, cultural, economic, and environmental framework of ethnic communities. The development of socializations with environmental authorities is educational in nature, aiming to introduce the generalities of the project (objectives, scope, potential benefits, and project activities), as well as establishing channels and communication links between the institution's actors and those involved in the project. This is intended to create a favorable context across various aspects that involve the initiative (legal, normative, social, cultural, and economic).

Illustration 3. Presentation held at the Ministry of Environment of Panama.



Source: CO2CERO S.A.S., 2023.

11.5 Scope of consultation with stakeholders

Once all the stages of socialization and information transfer have been completed, the goal is to ensure transparent and accurate information to the community. This allows them to understand the commitment and responsibility involved in participating in

REDD+ projects and implementing activities associated with reducing deforestation and forest degradation. The second scope is to provide stakeholders outside the territory with information that allows them to validate and verify that the initiative complies with the guidelines set by the UNFCCC, the certification standard, and related national strategies, shaping the scenario towards alignment of objectives of different normative and planning instruments at the national level. Finally, it confirms that the initiative falls within the framework of compliance with the Cancun safeguards, with free, prior, and informed consent being the fundamental pillar of engagement and implementation of activities with rural communities. Within this project, it is possible to identify annexes related to assistance in different engagement spaces, photographic reports, and assembly minutes for events involving multiple actors, as well as contractual documents ratifying decisions made in different consultation spaces with results oriented towards the execution of the initiative[17].

11.6 Summary of comments received

Based on the social management developed by B-Terra Corp, during the socialization and consolidation stages of the Emberá Wounaan REDD+ project, concerns were identified by the community regarding technical, social and economic[18] issues. In order to provide the relevant answers and ensure that these were within the reach of the participating population, translators were requested according to the ethnic dialect, guaranteeing clear and transparent information.

11.7 Consideration of comments received

With the commitment to be the effective means of communication between the external parties to the Comarca Emberá Wounaan during the process of development of the initiative and the inhabitants of the same; within these communications and rectifying the ownership of the initiative by the districts, these have the possibility to request at any time and according to their needs, spaces of explanation and accountability, the latter, in a mandatory manner, will be held at least once a year. Likewise, the signed consent documents from the communities belonging to the Comarca Emberá Wounaan contain the acceptance of the project[19]. In addition, a virtual PQRS mechanism is being developed through the e-mail preguntasredd@b-terra.com that will be managed directly by B-Terra

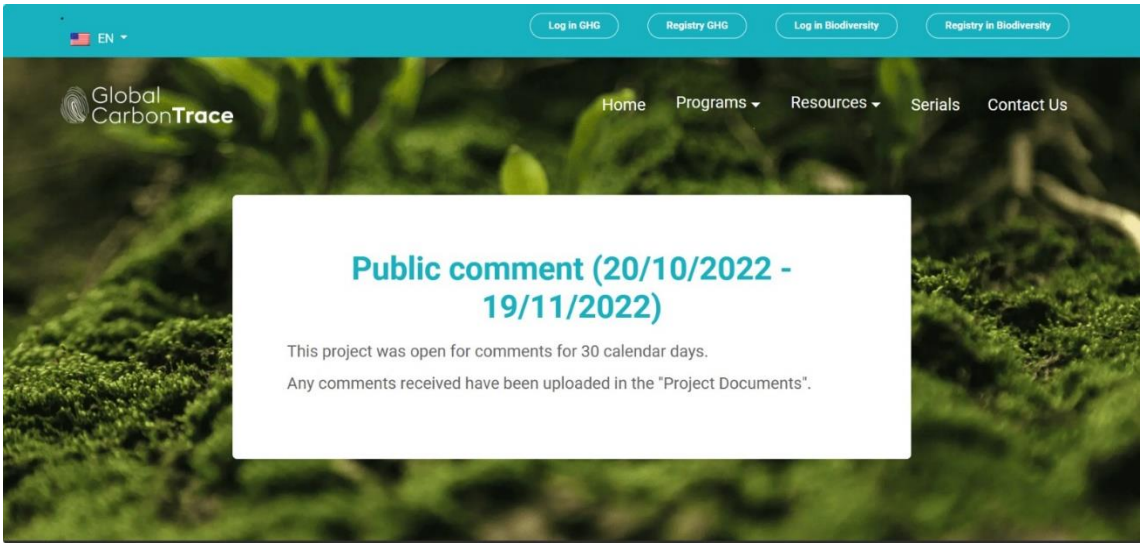
[17] See in: *11_Anexos y complementarios\1_Asistencia.*
[18] See in: *11_Anexos complementarios\6_Anexo_Consolidado de preguntas_ProyectoREDD+.pdf*
[19] See in: *01_Acuerdos\01_Acuerdo comunidad*

Corp. Finally, it should be noted that these mechanisms must complete the development phase in order to be subsequently disseminated and approved through the participation and consensus of the entire comarca before beginning the implementation process.

11.8 Consideration of comments related to the public consultation.

The REDD+ Emberá Wounaan project underwent a public consultation process within the BioCarbon Standard certification program for a period of thirty (30) days, from October 20, 2022, to November 19, 2022, as shown in the attached illustration. During this period, no comments were received from the public, which does not result in any modifications to the project documentation.

Figure 9. Results of the public consultation on the Emberá Wounaan REDD+ project within the Global Carbon Trace platform.



Source: BioCarbon Standard, 2022.

12 Sustainable Development Goals (SDGs)

At the local level, Panama adopted the 2030 Agenda for Sustainable Development during the Sustainable Development Summit held at the 70th United Nations General Assembly in New York in 2015. This agenda sets forth transformational perspectives in the social, economic, and environmental frameworks of 193 Member States, encompassing 17 Sustainable Development Goals (SDGs) aimed at ending poverty, inequality, and injustice while addressing climate change.

To monitor the progress towards achieving the SDGs at the national level, Panama annually publishes the National Strategic Plan in collaboration with the United Nations Development Programme. This plan was ratified by Executive Decree No. 393 in September 2015, consolidating the strategic axes that the country aims to pursue to fulfill the 2030 agenda in the state's vision. It emphasizes clearly defined public policies and relevant actions aligned with the spheres of the Sustainable Development agenda.

- Good life for all.
- Grow more and better.
- Environmental sustainability.
- Democracy, institutionalism, and governance.
- Strategic partnerships for development. (Consejo de la Concertación Nacional para el Desarrollo, 2017).

At the project level, indicators measuring the project's contribution to the SDGs are presented through the BCR Standard's tool for determining contributions to the Sustainable Development Goals in its version 1.0. This contribution is made through the REDD+ activities designed and implemented by the project during its execution period, with results presented in the *Monitoring Report/Contribution to SDGs*. In the **Table 8**, provides a summary of the applicable SDG indicators for the initiative, which are aligned with the National Strategic Plan with a State Vision "Panama 2030" developed by the National Development Consultation Council in conjunction with the United Nations Development Program (UNDP). It is important to clarify that some of these indicators are applied with restrictions in their manifestation, given the scale at which they are proposed by the tool (International) and their relationship with the scale at which the project is applied (Regional). To review the REDD+ activities, refer to *2_Cobeneficios/03_Actividades REDD+_Emberá Wounaan*.

Table 8. Indicators of Sustainable Development Goals (SDGs) related to the initiative.

SDG	Indicator	Variable	Strategic axis according to the National Strategic Plan
2. Zero hunger	2.a.2	Total official flows of resources (official development assistance plus other official flows) allocated to the agricultural sector.	Good life for all

SDG	Indicator	Variable	Strategic axis according to the National Strategic Plan
4. Quality education	4.1.1	Completion rate (primary education, first cycle of secondary education, and second cycle of secondary education).	Good life for all
	4.3.1	Rate of participation of youth and adults in formal and non-formal education and training in the last 12 months, disaggregated by sex.	Good life for all
5. Gender equality	5.1.1	Determine whether there are legal frameworks to promote, enforce, and monitor gender equality and non-discrimination.	Good life for all
	5.5.2	Proportion of women in managerial positions.	Good life for all
6. Clean wáter and sanitation	6.1.1	Proportion of the population using safely managed drinking water services.	Environmental sustainability
13. Climate action	13.2.1	Number of countries that have communicated the establishment or implementation of an integrated policy, strategy, or plan that increases their capacity to adapt to adverse effects of climate change and promotes climate resilience and low greenhouse gas emissions development without compromising food production (e.g., national adaptation plan, nationally determined contribution, national communication, or biennial update report).	Environmental sustainability

SDG	Indicator	Variable	Strategic axis according to the National Strategic Plan
15. Life on land	15.1.1	Forest area as a proportion of total land area.	Environmental sustainability
	15.1.2	Proportion of important sites for terrestrial and freshwater biodiversity included in protected areas, disaggregated by ecosystem type.	Environmental sustainability
	15.2.1	Progress towards sustainable forest management.	Environmental sustainability
	15.3.1	Proportion of degraded land compared to total land area.	Environmental sustainability
	15.4.1	Important biodiversity sites in mountains included in protected areas.	Environmental sustainability
	15.4.2	Mountain green cover index.	Environmental sustainability
	15.5.1	Red List Index.	Environmental sustainability

Source: Compilado por CO2CERO S.A.S., 2022.

13 REDD+ Safeguards (For REDD+ projects)

Below are some relevant approaches for the consolidation process of assessing and verifying compliance with socio-environmental safeguards, which facilitate the completion of the tool to demonstrate compliance with the REDD+ safeguards proposed by the BioCarbon Standard in its version 1.1.

The REDD+ safeguards of the UNFCCC constitute the common global framework and must be applied to all REDD+ activities. Decision 1/COP.16 paragraph 69 states that all

REDD+ measures must be carried out in accordance with the safeguards of the Convention.

The term 'safeguard' is common in the language of financial institutions such as the World Bank. They refer to 'safeguards' as "measures to anticipate, minimize, mitigate, or otherwise address the adverse impacts associated with a given activity."

Although there is a series of multilateral-focused safeguards, such as those adopted by the United Nations Framework Convention on Climate Change (UNFCCC); those of the World Bank used and adapted by the Forest Carbon Partnership Facility (FCPF), the Forest Investment Program (FIP), and the Global Environment Facility (GEF), and the UN-REDD Social and Environmental Criteria and Principles, the international performance assessment of REDD+ Strategies is based on the Cancun safeguards of the UNFCCC.

The international performance of REDD+ is based on compliance with the safeguards agreed upon in COP. 16. The Strategy must be designed to ensure its approach and compliance. To access financing, countries must demonstrate that they have an Information System that reports on the approach and compliance with these safeguards.

The Convention's safeguards originate from the recognition that the implementation of REDD+ can pose significant environmental and social risks, as well as an opportunity to promote multiple benefits. These safeguards cover a wide range of issues, including good forest governance, respect for the rights of local communities and indigenous peoples, protection of biodiversity, and the sustainability and integrity of emissions.

Regarding the benefits achievable through the approach and compliance with the safeguards, environmental benefits can be mentioned (conservation and sustainable use of biological diversity, improvement of water resources, provision of timber and non-timber products), socio-economic benefits (improvement in livelihoods - environmental, cultural, social, and economic -, capacity and skills strengthening - education for human empowerment-, inclusion of women, youth, and children, strengthening of forest governance, contributions to food and nutritional security, improvement of healthy lifestyles), and cultural and traditional benefits in terms of respect and appreciation for ancestral and traditional knowledge.

The seven safeguards adopted at COP16 are a set of general principles, so it follows that it will be up to the countries to interpret their scope and purpose and implement them according to their own national context (Ministerio de Ambiente, 2023).

The REDD+ safeguards of the UNFCCC reflect obligations related to human rights, environmental protection, and governance; for example, safeguard (a) links REDD+

objectives with those of international conventions and agreements, and (d) expresses relevant international obligations and makes direct reference to the United Nations Declaration on the Rights of Indigenous Peoples.

Table 9. REDD+ Safeguards.

Safeguard	**Text** (UNFCCC, COP 16, Appendix I)
a)	The complementarity or compatibility of measures with the objectives of national forest programs and international conventions and agreements on the subject.
b)	Transparency and effectiveness of national forest governance structures, taking into account national legislation and sovereignty.
c)	Respect for the knowledge and rights of indigenous peoples and members of local communities, considering relevant international obligations and national circumstances and legislation, and bearing in mind that the United Nations General Assembly has adopted the United Nations Declaration on the Rights of Indigenous Peoples.
d)	Full and effective participation of stakeholders, particularly indigenous peoples and local communities, in the measures mentioned in paragraphs 70 and 72 of this decision.
e)	Compatibility of measures with the conservation of natural forests and biological diversity, ensuring that those mentioned in paragraph 70 of this decision are not used for the conversion of natural forests, but rather serve to incentivize the protection and conservation of those forests and the ecosystem services derived from them, as well as to enhance other social and environmental benefits.
f)	Adoption of measures to address the risks of reversal.
g)	Adoption of measures to reduce emissions displacement.

Source: Compiled by CO2CERO S.A.S., 2022.

13.1 Indicators as a part of an information system that monitors a certain activity or process.

Without an indicator system, it is impossible to know whether something is improving, worsening, or staying the same over time because of certain activities. Conversely, with a timely and well-designed information system based on indicators, the participation of all involved parties is facilitated, assumptions and subjectivities are reduced, improvement or mitigation initiatives can be implemented, and the possibility of reacting to crises blindly and reactively is reduced.

1. **Definition**: An indicator is a variable or set of variables to monitor for a specific goal or objective definition, such as greenhouse gas emissions, deforestation, forest programs, laws, reversal, cost, security, biodiversity.
2. **Reference Level:** It is the starting point from which the project or improvement activity begins to meet the planned goal. It can be historical, standard, theoretical, customer (internal and external) or supplier (internal and external) requirement, competition, governmental requirement (national or international), consensus.
3. **Goal:** It expresses the value of the variable that is intended to be controlled (improved or maintained) in terms of results within a specified period.
4. **Mathematical Formula:** Mathematical expression or equation to measure the indicator's results at the monitoring moments of the system.
5. **Responsibility:** It is the designation of who or whom will collect the information, analyze it, and take actions if the trend shows unfavorable behavior according to the goal.
6. **Sources of Information and Instruments:** When and how data will be obtained, where it will be taken, and with what instrument data will be collected (balance, survey, professional recording, satellite imagery, financial balance...).
7. **Periodicity:** It is the definition of the frequency at which data collection will be carried out, and when they will be presented (daily, weekly, monthly, annually, biennially, every five years...).
8. **Processing and Decision-Making System (Management of Indicators):** It is the methodology used to present the results of the indicators, how actions will be taken and by whom, how actions will be monitored, and how the effectiveness of the system or project will be evaluated.

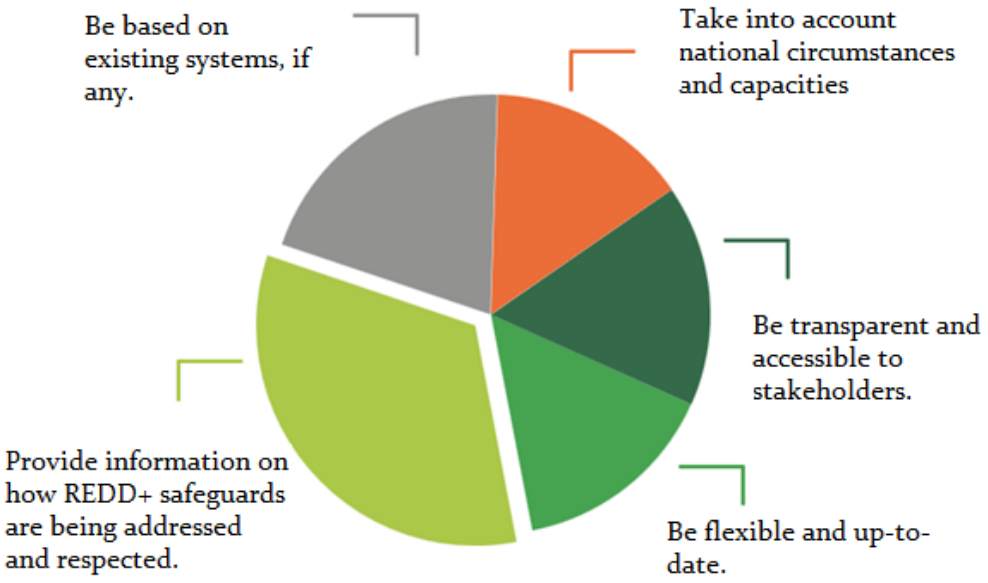
13.2 About a REDD+ safeguards information system

The Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) establishes that developing countries, when developing and implementing their REDD strategies, must address the safeguards defined in paragraph 2 of Appendix I of the Conference of the Parties 16. Similarly, it urges developed countries,

through their bilateral and multilateral mechanisms, to support the development of strategies that include the analysis of safeguards (COP 16, paragraph 76).

Developing countries opting to implement REDD+ strategies are undertaking a national commitment, which implies the obligation to report on the addressing and compliance with REDD+ safeguards. This obligation is reinforced by conditioning the provision of resources on the existence of a Safeguard Information System. The information from countries must be generated by established official mechanisms, in order to provide information that accurately reflects how safeguards are addressed and respected. Not all sources of information will necessarily be valid unless they can be classified as official information. Therefore, the system is an integral part of the REDD+ Strategy. This system is the fourth component of REDD+ as clearly stated in subparagraph d) of paragraph 71 of COP 16 decision. Consequently, the system will address the information needs of legitimate stakeholders.

Illustration 4. Components of a socio-environmental safeguards system.



Source: Decision 2/COP. 17 paragraph 2.

In the case of Panama, there is not yet a proper national REDD+ Safeguards Information System (SIS), but rather a regulatory framework developed in 2019, titled Panama's Safeguards Information System (SIS) within the REDD+ project framework. This was done with the assistance of UNDP and the Forest Carbon Partnership, outlining the elements for interpreting the safeguards in the national and international context, in accordance

with the relevant legal framework applicable to the country and the scope of its application, as well as the components to be considered in such a system. This complements the First Summary of Safeguards Information for REDD+ in Panama (2009 – 2021), where Panama's initial approach to safeguards is described, detailing the main advances in the REDD+ preparation process and early implementation actions undertaken between 2009 and 2022. Its focus is on how the safeguards are addressed and respected in implementation.

13.3 Administration of safeguards indicators

This design serves as guidance for evaluating the implementation of safeguards according to the tool proposed by BioCarbon Standard in its version 1.1. In this way, necessary contextual approaches are made to recognize the dynamics of socio-environmental safeguards in the country, and which direct and indirect metrics may be compatible, leading to a more accurate assessment that over time may complement national requirements based on commitments to a National Safeguards System (NSS). The objectives leading to this analysis and its consistency with other instruments include:

Integrate and report information on the approach to and compliance with REDD+ safeguards in the Project within the Emberá Wounaan Territory, managing indicators requires following a methodology to make good use of their information, especially key performance indicators (KPIs), and thereby achieve real improvements in the development of the REDD project regarding Safeguards.

- Aiming to guide decision-making related to the fulfillment of national and international policy frameworks for the management of forest resources.
- Integrate and report information on Multiple Benefits, Other Impacts, and Management, both socio-environmental issues and those related to the rights of the Emberá and Wounaan populations living within the Territory.
- Collect relevant information for the construction of information reports to be delivered to national authorities and international organizations on safeguards and Multiple Benefits associated with the Project.
- Provide information for decision-making at the comarcal (local) and national levels.

To demonstrate compliance with the Cancun Safeguards, the methodology suggested in the BioCarbon Standard's *Tool for Demonstrating REDD+ Safeguard Compliance* (2022)

version 1.1[20] This tool demonstrates compliance with the requirements established for each safeguard during the design, structuring, and implementation of the REDD+ Emberá Wounaan project and its activities.

In this case, laws, decrees, or policies aligning with forest management in the Republic of Panama and those referencing climate change mitigation initiatives or strategies were selected. Based on the above approach, complementarity justifies how the project's development aligns with the strategic principles of the analyzed regulations, while compatibility analysis confirms how project activities strive for compatibility and avoid contravening national government provisions according to the requirements of Safeguard 1.

Table 10. Safeguard elements and requirements suggested by BioCarbon Standard.

N°	Safeguard	Requirement
1	Complementarity or compatibility of measures with the objectives of national forest programs and international conventions and agreements on the subject.	Show that national forest programs have been considered for the structuring and implementation of the Project and that the Project's actions are complementary to them. (This analysis must be documented).
2	Transparency and effectiveness of national forest governance structures, taking into account national legislation and sovereignty. Providing transparent and coherent information accessible to all stakeholders and updating it regularly. Being transparent and flexible to allow for improvements over time. Building on existing systems, if any.	The Project holder must have tools to ensure effective, transparent, and efficient dissemination of information associated with the Project activities. To do this, they must keep records of the means used for dissemination.
3	Respect for the knowledge and rights of indigenous peoples and members of local communities, taking into account relevant international obligations and national circumstances and legislation, and bearing in mind that the United Nations General Assembly has adopted	The Project holder must recognize and respect the rights of the communities present in the territory. This must be done according to the minimum applicable legal standards and international declarations regarding the rights of indigenous peoples.
		The Project holder must implement work meetings with the communities and other

[20] See in: *11_Anexos y complementarios/09_Herramienta de Salvaguardas_REDD+ Emberá Wounaan_v4*

N°	Safeguard	Requirement
	the United Nations Declaration on the Rights of Indigenous Peoples.	mechanisms that allow their involvement in the Project from its pre-feasibility and structuring phase, regarding the integration of traditional ancestral knowledge into the Project.
		The Project holder may propose new forms of sustainable land use. Additionally, they may restrict certain activities carried out by the communities, provided that they agree to this through an agreement signed by their representatives.
4	Full and effective participation of stakeholders, particularly indigenous peoples and local communities, in the measures mentioned in paragraphs 70 and 72 of this decision.	The Project holder must demonstrate with evidence that they have disseminated, socialized, and shared information with the communities in a transparent, clear, comprehensive, inclusive, and effective manner through appropriate means.
		The Project holder must demonstrate with evidence that the community had the opportunity to participate, both actively and effectively, from the feasibility and structuring phase of the Project.
5	Compatibility of measures with the conservation of natural forests and biological diversity, ensuring that those mentioned in paragraph 70 of this decision are not used for the conversion of natural forests, but instead serve to incentivize the protection and conservation of those forests and the services derived from their ecosystems and to enhance other social and environmental benefits.	Project holders must work in coordination with the communities to conserve, protect, restore, and sustainably utilize ecosystems.
		The activities implemented in the Project must comply with the applicable environmental regulations regarding the use and exploitation of natural resources.
		The project owner must demonstrate that the project has not engaged in activities that involve the conversion of natural forests into other types of land use.
6	Adoption of measures to address the risks of reversal.	The project owner must take measures to reduce the risks of reversal.
7	Adoption of measures to reduce emissions displacement.	The project owner must identify leaks and their causes and design strategies to: (i) ensure monitoring and control of these, and (ii) minimize them.
		The project owner must implement response protocols upon identifying leaks and how to control them.

Source: BioCarbon Standard, 2022.

14 Other GHG program

The REDD+ Emberá Wounaan Project is one of the first initiatives to be developed in Panama. For this reason, there is no evidence that the project or the community is part of another AFOLU sector registry and certification program as shown in the **Table 11**.

15 Double counting avoidance

Following international objectives and guidelines set forth in the BCR Standard V 3.1 and the "BCR avoiding double counting of emissions reductions/removals V 1.0" tool from the BioCarbon Standard program, the REDD+ Emberá Wounaan Project aims to prevent double counting of greenhouse gas emission reductions it intends to generate over the implementation period. This is achieved through the evaluation and search for the presence of registered REDD+ projects in Panama on platforms such as Verra, BioCarbon Standard, Cercarbono, Gold Standard, and COLCX with a cut-off date of August 8, 2023. The result obtained indicates that there are no overlaps of project boundaries nearby with the REDD+ Emberá Wounaan initiative (See **Table 11**).

Table 11. REDD+ projects registered in certification programs.

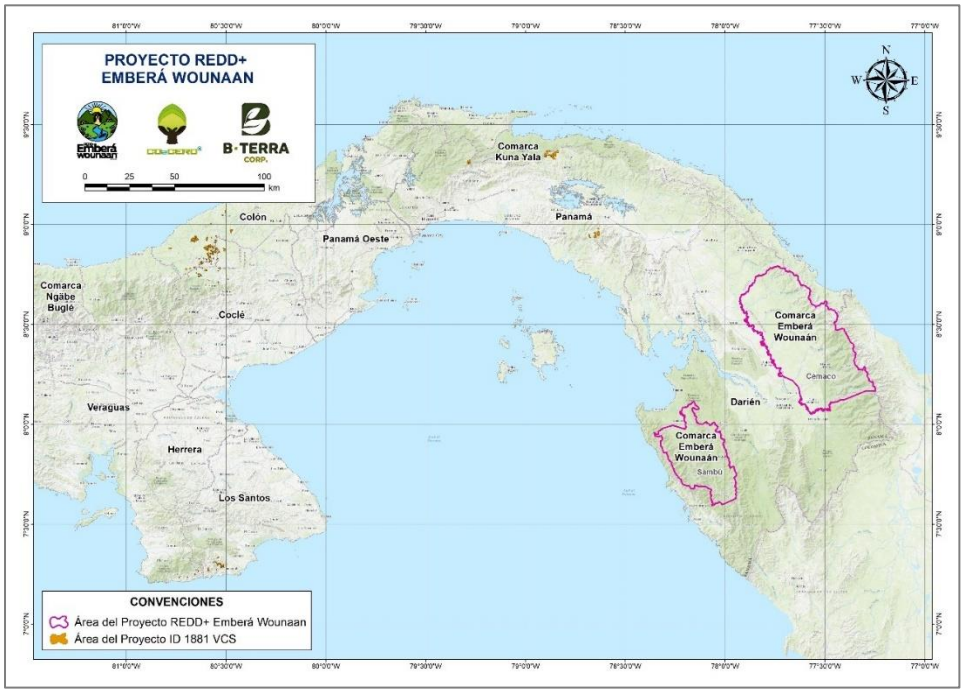
N°	Certification program	ID Proyect	Name	Location
1	BioCarbon Standard	N/A	Not registered	N/A
2	Verra	2578	Panama forests conservation project reduction of ghg emissions through deforestation and avoided degradation. - alliance of indigenous peoples and rural communities of Panama	Inactive Provincia Veragua
3		1881	Conservation of Panama forests - reduction of ghg emissions from deforestation. Grouped project	Provinces: Bocas del Toro, Chiriquí, Coclé, Colón, Panamá, Los Santos and Veraguas
4	Cercarbono	N/A	Not registered	N/A

N°	Certification program	ID Proyect	Name	Location
5	COLCX	N/A	Only registered in Colombia	N/A
5	Gold Standard	N/A	Not registered	N/A

Source: Compiled by CO2CERO S.A.S., 2023.

Taking into account the results obtained in the search for projects in each of the standards mentioned in **Table 11**, the **Figure 10**, below shows the overlap map with initiative 1881[21] registered in VERRA, considering it is the only active project registered in the Republic of Panama. However, as observed, the polygons do not present any spatial or temporal overlap that could lead to potential double counting.

Figure 10. Graphical output of the KML for project 1881 registered in VERRA.



[21] See in: *04_SIG/6_ANEXOS/OTRAS_INICIATIVAS*

Source: B-Terra Corp, 2024.

16 Monitoring plan

The following are the monitoring variables for the subsequent stages of the REDD+ Emberá Wounaan project. These are evaluated based on project boundaries, execution of REDD+ activities, co-benefits, and the Cancun safeguards. It is important to clarify that the monitoring plan is developed following the guidelines of methodology BCR0002 version 3.1 and the tool "monitoring, reporting, and verification version 1.0". The REDD+ Emberá Wounaan project ensures a baseline scenario consistent with the methodological requirements of the BioCarbon Standard as follows:

Table 12. Methodological requirements of the baseline scenario.

Aspect	Description
Transparency regarding assumptions, methods, parameters, data sources, and factors.	Taking into account the principles of transparency and traceability, each of the assumptions, methods, parameters, data sources, and emission factors used will be subject to a validation and verification process to ensure the accuracy of the information recorded in this document. Additionally, it is important to note that the baseline was modeled considering the guidelines of the BioCarbon Standard in terms of additionality and baseline scenario, as outlined in section 3.3 of this document.
Consideration of uncertainty and using conservative assumptions.	In order to meet the present criterion and considering that, according to the Biocarbon Standard, data uncertainty cannot exceed 10%, the REDD+ Emberá Wounaan project adheres to the guideline by achieving a result of 17.16% and applying the respective discount, as mentioned in Section 3.4 on ***Error! Reference source not found.***. Additionally, to ensure an acceptable level of certainty in terms of spatial processing, an accuracy analysis is conducted to reduce uncertainty, achieving a result greater than 90% for all areas in the activity

Aspect	Description
	years (see **Table 16**[22]), in the estimates of forest degradation and deforestation. This process is described in the following document: *4_SIG/informe Geoprocesamientos SIG REDD+ Emberá Wounaan_V6.*
Specificity for the project.	As can be seen in section 3.3 on additionality and baseline scenario selection, consolidation is carried out specifically for the Emberá Wounaan REDD+ initiative.
Inclusion of relevant national and/or sectoral policies and circumstances.	Section 3.3 demonstrates how the initiative overcomes barriers related to national policies. Additionally, two legal matrices on environmental legislation and fundamental rights of the Emberá Wounaan indigenous peoples are consolidated to demonstrate compliance with each guideline as indicated in Chapter 4 "***Error! Reference source not found.***".
Consistency in emission factors, activity data, greenhouse gas emission projection variables, and other parameters used to construct the baseline scenario.	To determine the current state of forest cover associated with the project and ensure consistency in emission factors, activity data, greenhouse gas (GHG) emission projection variables, and other parameters used to construct the baseline scenario, a methodological reconstruction of Panama's NREF was carried out. This process included: *__Emission Factor Estimation:__ An analysis was conducted based on field sampling, compiling data on forest structure and composition, carbon content in litter, and soil

[22] See in: *06_Documento de proyecto/PARTE 1 – ENG_PDD_Emberá Wounaan_V14*

Aspect	Description
	organic carbon. These data were processed following the principles established by the IPCC to ensure alignment with international best practices. *__Activity Data:__ Landsat satellite images with 30-meter resolution were used, along with a model that determined forest cover changes over time with accuracy values exceeding 95% (see Section *3.4. Uncertainty Management*). Additionally, the areas were locally validated through validation points and confusion matrix analyses, ensuring accuracy above 90% as required by BCR0002 methodology version 3.1. *__Projection Variables:__ GHG emission projection variables were established based on realistic and credible land-use scenarios, taking into account historical deforestation patterns. The reference region was adjusted to maximize similarity with the project area and verified with local experts.
Implementation of procedures to ensure data quality, in accordance with ISO 14064-2 standards and requirements of the selected methodology.	To meet the quality requirements proposed by the ISO 14064-2 standard, the project's information and quality management procedures were established[23].
Non-attainment of emission reductions due to activity shifts outside the project boundaries.	The Emberá Wounaan REDD+ project is developed within the boundaries of the Comarca Emberá Wounaan of the Republic of Panama. Through activities aimed at protecting the project boundaries, the project seeks to exercise territorial sovereignty and

[23] *13_Gestión de información/PC-Po8 Procedimiento de Calidad PdC Forestal.pdf*

Aspect	Description
	ensure that drivers and agents of deforestation do not access the project area.
Use emission reductions defined in the methodologies within the project boundary.	The REDD+ Emberá Wounaan project considers emissions reductions from deforestation and forest degradation activities in accordance with applicability guidelines. In this case, aerial biomass, subterranean biomass, soil organic carbon, litter, and deadwood reservoirs were considered for CO_2 emissions quantification. Additionally, based on monitoring results in the project area, CO_2, CH_4, and N_2O emissions are quantified for forest areas affected by wildfires.

Source: CO2CERO S.A.S., 2023.

16.1 Project boundaries monitoring

The parameters presented below are linked to the evaluation of project boundaries over time.

Table 13. Parameters to monitor.

Data / Parameter	Area deforested and degraded during the period 2018 - 2022
Unit of Measurement	Hectares
Description	Total project area according to geographic information system (GIS) formulation.
Source of Information	Review of forest boundaries in the project area, vehicle surveys, and coverage control points
Monitoring Methods	Global Positioning System (GPS)
Monitoring Frequency	Each project verification (triennial), maximum every five years.

Monitoring Frequency	At the beginning of project socialization, during monitoring visits, during validation, and each verification
Purpose of Information	Monitor project boundaries

Source: CO2CERO S.A.S., 2023.

16.2 REDD+ execution activities monitoring

The project consists of a total of 21 REDD+ activities that will be implemented during the crediting period (30 years). Considering the set objectives and expected outcomes, a series of indicators consistent with its reality are proposed. In the file "*12_Reporte de monitoreo\02_Reporte de monitoreo\REDD+ Emberá Wounaan_MonitoringReport_V14.docx\14.1 Implementation status of the project*" the indicators defined for each designed REDD+ activity can be found. It also specifies the specific activity carried out, the number of beneficiaries and actors involved, among others. Further details are provided in **Table 14**.

Table 14. Content of the indicators analyzed for the project.

ID - REDD+ Activity	Activity ID and REDD+ activity
Indicator Name	Variables to be measured to evidence their results over time, specifying the temporal scale for reporting.
Type - Unit	Determination if the indicator is qualitative or quantitative and its corresponding unit of measure.
Indicator Result	Evidence of the indicator's result based on actions implemented within or outside the territory, involving the Comarca Emberá Wounaan.
Specific Activity	Description of the event, situation, or specific action that generated the obtained result.
Beneficiaries/Involved	Number of people present or involved in the execution of the described actions, which can be direct or indirect depending on the spectrum under which the action manifests.

Date	Temporal scale of the executed activities defined.
Location	Spatial scale of the executed activities defined.
Support	Elements demonstrating how the activity has been executed and involves community members.

Source: CO2CERO S.A.S., 2023.

Additionally, for each REDD+ activity, its objectives, benefits, and expected results have been established, each based on design assumptions according to the community's dynamics and expectations regarding the project implementation[24]. Regarding the entity responsible for measuring the indicators, initially, the project developers will perform this role for gathering information. Subsequently, the intention is to instruct the communities in collecting the relevant data.

16.3 REDD+ safeguards monitoring

The evaluation of the Cancun safeguards applied within the REDD+ Emberá Wounaan project is guided by the guidelines provided through the BioCarbon Standard version 1.1 tool for demonstrating compliance with safeguards. This tool outlines methods for demonstrating compliance with the seven (7) safeguards determined by the UNFCCC[25,26].

Additionally, the REDD+ Emberá Wounaan project will design a set of indicators for the safeguards, related to the specific dynamics of the territory, aiming to address them in coordination with other design elements such as REDD+ activities and co-benefits. The process of designing these indicators has been accompanied by analysis activities involving direct community personnel, involving guidance sessions on the definition of socio-environmental safeguards, their community-level objectives, and their applicability within the territorial context[27].

[24] See folder *2_Cobeneficios\3_Actividades REDD+*
[25] See in: *13 REDD+ Safeguards (For REDD+ projects)*
[26] See in: *11_Anexos y complementarios\4_Herramienta de Salvaguardas_REDD+ Emberá Wounaan_V4*
[27] See in: *11_Anexos y complementarios\1_Asistencia\Sesiones_Lideres_Encargados_17 11 2022.pdf*

16.4 REDD+ permanence monitoring

The monitoring plan for the continuity of the REDD+ Emberá Wounaan Project allows for the identification of biophysical and socioeconomic risks and includes mitigation measures, monitoring indicators, and procedures for reporting fires, disputes related to land tenure, conflicts among project stakeholders, non-appropriation of project activities, and governance deficits[28].

It's important to note that according to Version 3.1 of the BioCarbon Standard Methodology, in the event of fires, the affected area must be identified, CO_2 and CH_4 emissions must be estimated, and these emissions must be included in the project's emission quantification for the monitoring period. Additionally, the risk of floods is not considered for this project because forest establishment reduces the impact of this event and adapts to the environment where it is located.

Finally, indicators are used to monitor the continuity monitoring plan, some of which are proposed to fulfill the activities designed for the REDD+ Emberá Wounaan Project, contributing to the achievement of some sustainable development goals and ensuring the quality and continuity of the local and national population.

16.5 Monitoring of GHG emissions of the project

Below, the fundamental procedures for monitoring emissions in the REDD+ Emberá Wounaan project are described.

16.5.1 Activity data

Below, the mechanisms for monitoring project emissions associated with deforestation and forest degradation activities are presented.

16.5.1.1 Annual deforestation in the project area

According to the REDD+ BCR 0002 methodology version 3.1, deforestation in the project area during the monitoring period is estimated using **Equation 1**.

Equation 1. Deforestation in the forest area.

[28] See in: *12_Reporte de monitoreo\2_Reporte de monitoreo\Indicadores de Plan de Monitoreo Emberá Wounaan_V2.xlsx\Permanencia*

$$FSC_{REDD+project,yr} = \left(\frac{1}{t_2 - t_1}\right) x \ (A_{REDD+Project1} - A_{REDD+Project2})$$

$FSC_{REDD+project,yr}$ = Annual change in the surface covered by forest in the project area; ha

t_2 = Final year of the reference period; yr

t_1= Initial year of the reference period; yr

$A_{REDD+Project1}$= Forest surface in the Project área at the beginning of the monitoring period; ha

$A_{REDD+Project2}$= Forest surface in the Project area at the end of the monitoring period; ha

Source: Taken from BioCarbon Standard, 2022.

16.5.1.2 Annual deforestation in the leakage area

For the case of the leakage area, the monitoring of annual deforestation identified within it is estimated based on the number of years monitored, the forest area present at the beginning and end of monitoring, using the **Equation 2**.

Equation 2. Annual deforestation in the leakage area.

$$FSC_{lk,yr} = \left(\frac{1}{t_2 - t_1}\right) x \ (A_{lk,1} - A_{lk,2})$$

Where:

$FSC_{lk,yr}$ = Annual change in the surface covered by forest in the leakage area; ha

t_2 = Final year of the reference period; yr

t_1= Initial year of the reference period; yr

$A_{lk,1}$= Forest surface in the leakage area at the beginning of the monitoring period: ha

$A_{lk,2}$= Forest surface in the leakage area at the end of the monitoring period: ha

Source: Taken from BioCarbon Standard, 2022.

16.5.1.3 Annual degradation in the project area

Taking into account the start and end years of the monitoring period, the amount of core project area and its transition to core-patch, it is possible to estimate the annual primary degradation within the project area, following **Equation 3**.

Equation 3. Primary degradation in the project area.

$$PFD_{REDD+project,yr} = \left(\frac{1}{t_2 - t_1}\right) x \ (A_{core} - A_{c-p})$$

Source: Taken from BioCarbon Standard, 2022.

Similarly, it is necessary to determine secondary degradation within the project area, taking into account the area in a perforated state at the beginning of the monitoring period and the transition from perforated to patchy at the end of the monitoring period. **Equation 4** is used for this purpose.

Equation 4. Annual secondary degradation in the project area.

$$SFD_{REDD+project,yr} = \left(\frac{1}{t_2 - t_1}\right) x \ (A_{perforated} - A_{perforated-patch}$$

Where:

$SFD_{REDD+project,yr}$ = Annul secondary forest degradation in the project area; ha

t_2 = Final year of the reference period; yr

t_1= Initial year of the reference period; yr

A_{core}= Area in perforated class in the Project area, in the year of the start of the monitoring period; ha

A_{c-p}= Project area that changes from perforated to patch in the final year of the monitoring period; ha

Source: Taken from BioCarbon Standard, 2022.

16.5.1.4 Annual degradation in the leakage area

Similarly to the annual degradation in the project area, for the leakage area, primary and secondary degradation is determined through changes in forest cover from core to core-

patch, and its transition to perforated-patch, respectively. **Equation 5** is applied for primary degradation.

Equation 5. Annual primary forest degradation in the leakage area

$$PFD_{lk,yr} = \left(\frac{1}{t_2 - t_1}\right) x \ (A_{core} - A_{c-p})$$

Where:

$PFD_{REDD+project,yr}$ = Annual primary forest degradation in the leakage area; ha

t_2 = Final year of the reference period; yr

t_1= Initial year of the reference period; yr

A_{core}= Area in core class in the leakage area, in the year of the start of the monitoring period; ha

A_{c-p}= Leakage area that changes from the core to patch in the final year of the monitoring period, ha

Source: Taken from BioCarbon Standard, 2022.

Equation 6 is applied for secondary forest degradation.

Equation 6. Annual secondary forest degradation in the leakage area.

$$SFD_{lk,yr} = \left(\frac{1}{t_2 - t_1}\right) x \ (A_{perforated} - A_{perforated-patch,lk})$$

Where:

$SFD_{lk,yr}$ = Annual primary forest degradation in the leakage area; ha

t_2 = Final year of the reference period; yr

t_1= Initial year of the reference period; yr

$A_{perforated}$= Area in perforated class in the leakage area, in the year of the start of the monitoring period; ha

$A_{perforated-patch,lk}$= Area in the leakage that changes from perforated to patch in the final year of the monitoring period; ha

Source: Taken from BioCarbon Standard, 2022.

16.5.2 GHG emissions in the monitoring period

Following that, the mechanisms for monitoring project activities (deforestation and forest degradation) during the verification period are presented.

16.5.2.1 Deforestation

The annual emissions due to deforestation in the project area are calculated based on the annual deforestation identified in the project area and the carbon dioxide equivalent, following Equation 7Equation 7. Annual emission due to deforestation in the project area.

.

Equation 7. Annual emission due to deforestation in the project area.

$$AE_{REDD+project,yr} = AD_{REDD+project,yr}\, x\, TCO_{2eq}$$

Where:

$AE_{REDD+project,yr}$ = Annual emission in the Project area; tCO_2 ha^{-1}

$AD_{REDD+project,yr}$ = Annual deforestation in the Project area; ha

TCO_{2eq} = Total carbon dioxide equivalent; tCO_{2e} ha^{-1}

Regarding the annual emission associated with deforestation in the leak area, the following equation was considered.

Source: Taken from BioCarbon Standard, 2022.

As for the calculation of annual emissions from deforestation within the leakage area, **Equation 8** is used.

Equation 8. Annual emission due to deforestation in the leakage area.

$$EA_{f,año} = (DEF_{f,año}\ x\ TCO_{2eq}) - EA_{lb,f,año}$$

Donde:

$EA_{f,año}$ = Emisión anual en el área de fugas; $tCO_2\ ha^{-1}$

$DEF_{f,año}$ = Deforestación anual en el área de fugas; ha

TCO_{2eq} = Dióxido de carbono equivalente total; $tCO_2e\ ha^{-1}$

$EA_{lb,f,año}$ = Emisión anual de la deforestación en el área de fugas en el escenario de línea base; tCO_2e

Source: Tomado de BioCarbon Standard, 2022.

16.5.2.2 Forest degradation

The annual emissions from degradation within the project area take into account the annual historical primary and secondary degradation, and the corresponding carbon dioxide equivalent for each type. Its application is given by **Equation 9**.

Equation 9. Annual emission due to degradation in the project area.

$$AE_{fd,REDD+project,yr} = (PFD_{fd,REDD+project,yr}\ x\ DTBCO_{2eq,1}) + (SFD_{REDD+project,year}\ x\ DTBCO_{2eq,2})$$

Where:

$AE_{fd,REDD+project,yr}$ = Annual emisión due to degradation in the Project area; $tCO_2\ ha^{-1}$

$PFD_{fd,REDD+project,yr}$ = Annual primary forest degradation in the Project area; ha

$SFD_{REDD+project,year}$ = Annual secondary degradation in the Project area; ha

$DTBCO_{2eq,1}$= Carbon dioxide equivalent in the difference of total biomass per hectare, in the class of primary degradation; $tCO_{2e}\ ha^{-1}$

$DTBCO_{2eq,2}$= Carbon dioxide equivalent in the difference of total biomass per hectare, in the class of secondary degradation; $tCO_{2e}\ ha^{-1}$

1, 2 = Degradation type; 1- primary degradation, 2- secondary degradation

Source: Taken from BioCarbon Standard, 2022.

Equation 10Error! Reference source not found. is used for forest degradation in the leakage area.

Equation 10. Annual emission due to forest degradation in the leakage area.

$$AE_{fd,lk,yr} = (PFD_{lk,yr}\ x\ DTBCO_{2eq,1}) + (SFD_{lk,year}\ x\ DTBCO_{2eq,2})$$

$AE_{fd,lk,yr}$ = Annual emisión due to degradation in the leakage area; $tCO_2\ ha^{-1}$

$PFD_{lk,yr}$ = Annual primary forest degradation in the leakage area; ha

$SFD_{lk,year}$ = Annual secondary degradation in the leakage area; ha

$DTBCO_{2eq,1}$= Carbon dioxide equivalent in the difference of total biomass per hectare, in the class of primary degradation; $tCO_{2e}\ ha^{-1}$

$DTBCO_{2eq,2}$= Carbon dioxide equivalent in the difference of total biomass per hectare, in the class of secondary degradation; $tCO_{2e}\ ha^{-1}$

1, 2 = Degradation type; 1- primary degradation, 2- secondary degradation

Source: Taken from BioCarbon Standard, 2022.

16.5.3 Cuantification of GHG emissions reduction in the project

Finally, the equations applied to quantify the emissions reduced by the REDD+ Emberá Wounaan project during the monitoring period for deforestation and forest degradation activities are presented.

16.5.3.1 Deforestation

The reduction of emissions from avoided deforestation is identified according to **Equation 11**, taking into account the monitoring period, the annual emission from deforestation in the baseline scenario, project area, and leakage area.

Equation 11. Emission reduction due to avoided deforestation.

$$ER_{DEF,REDD+proy} = (t_2\ -\ t_1)\ x\ (AE_{DEF,lb,yr}\ -\ AE_{DEF,REDD+proy,yr}\ -\ AE_{DEF,lk,yr})$$

Where:

$ER_{DEF,REDD+proy}$ = Emission reduction due to avoided deforestation, monitoring period; $tCO_2\ ha^{-1}$

t_2 = Final year of the reference period; yr

t_1= Initial year of the reference period; yr

$AE_{DEF,lb,yr}$ = Annual emission by deforestation in the baseline scenario; tCO_{2e}

$AE_{DEF,REDD+proy,yr}$ = Annual emission by deforestation in the Project area; tCO_{2e} ha^{-1}

$AE_{DEF,lk,yr}$ = Annual emission by deforestation in the leakage area; tCO_{2e} ha^{-1}

Source: Taken from BioCarbon Standard, 2022.

16.5.3.2 Forest degradation

The reduced emissions due to forest degradation are quantified considering the difference between the emissions from the baseline and the emissions from the project area and the leakage belt, as presented in Equation 12.

Equation 12. Emission reduction due to avoided forest degradation in the monitoring period.

$$ER_{FD,REDD+project} = (t_2 - t_1) \, x \, (AE_{FD,lb,yr} - AE_{FD,REDD+project,yr} - AE_{FD,lk,yr})$$

Where:

$ER_{FD,REDD+project}$ = Emission reduction due to avoided foresst degradation monitoring period; tCO_2 ha^{-1}

t_2 = Final year of the reference period; yr

t_1= Initial year of the reference period; yr

$AE_{FD,lb,yr}$ = Annual emission from degradation in the baseline scenario; tCO_{2e} ha^{-1}

$AE_{FD,REDD+project,yr}$ = Annual emission from degradation in the project area for the monitored period; tCO_{2e} ha^{-1}

$AE_{FD,lk,yr}$ = Annual emission from degradation in the leakage area for the monitored period; tCO_{2e} ha^{-1}

Source: Taken from BioCarbon Standard, 2022.

16.6 Procedures established for the management of GHG emission reductions or removals and related to quality control.

Below, the processes of control and quality assurance for the REDD+ Emberá Wounaan project are described according to the guidelines defined by the development team in line with quality assurance and control as indicated by the IPCC and the certification program. The procedures for information management and data handling are in folder 13_*Gestión de información* where are the information procedures in Forest Carbon Projects, quality review, and information management in REDD+ projects found.

16.6.1 Review of information processing

Within the design of the REDD+ Emberá Wounaan project, it was necessary to acquire information from various sources, achieving a necessary complementarity to holistically address the phenomena and dynamics present in the territory. In this way, the three levels of information suggested by the IPCC, linked to the international, national, and local scales, are applied. **Table 15** presents in a general manner the sources of information used for the consolidation of the project with their corresponding frame of reference.

Table 15. Sources of information applied in the project design.

Content	Frame of reference	Information requirement
Project location	International – National	Official cartographic information of Panama
Deforestation analysis	Local – National	Landsat Mission satellite images
Degradation analysis	Local – National	Landsat Mission satellite images Land cover data for Panama
Start date	Local – National	Official information at the national government and Comarca level
Additionality	Local – National	National government regulations, guidelines, and strategies applicable to the local environment
Legal compliance	International – National	Regulations and rules associated with mitigation initiatives
Climate change adaptation	National	Regulations and rules associated with mitigation initiatives

Content	Frame of reference	Information requirement
Causes of deforestation and degradation	Local	Analysis of deforestation and forest degradation factors at the community scale, information acquired during the field phase
REDD+ activities	Local	Evidence, records, and reports related to the execution of activities within the territory
Emission factor	Local	Forest inventory in project-eligible areas
Deforestation data	National – International	Landsat Mission satellite images
Degradation data	National – International	Emission factors and forest inventory methodologies
Territorial characterization	National – International	Descriptive reports of the project area in its biophysical, economic, and cultural context
Stakeholder consultation processes	Local	Methodology for on-site approaches by the developer
Co-benefits	Local – National	Information gathering and regulations related to gender equity, community dynamics, and biodiversity conservation.

Source: (CO2CERO SAS, 2023)

The sources of information used encompass different frames of reference, with some cases presenting local and national scales, considering the need to align strategies from higher information scales to more specific ones, given the methodological requirements. In this regard, it is ensured that the information comes from official sources, demonstrating its quality and relevance, while also using the most updated and available data. In cases where information is not found, adaptations are made consistent with the national source of information with the highest similarity, such as forest inventories, adaptation strategies, and assessment of contributions to SDGs.

The certification program and methodology employed are based on the principles of ISO 14064-2:2019 on quantification of GHG emissions reductions and adopt the guidelines proposed for the validation and verification process according to ISO 14064-3:2019 and ISO 14065:2013 standards, aligning the project with international quality. Similarly,

internationally recognized tools related to SDG contributions and demonstration of socio-environmental safeguards application are used. Finally, risks to which the project may be exposed are identified so that strategies can be contemplated to mitigate effects on the base information and alter the project's results.

Regarding the information collected for estimating emissions reductions from deforestation and degradation, adaptations of officially approved methodologies by Panama were applied, such as the national forest inventory, adjusting local information consistently. Upon these results, relevant quality reviews are applied, managing outliers and determining sampling error. Field information related to workshops and interviews is consolidated with supporting evidence, which confirms the involvement of actors through their name, identification, and signature, as well as other applicable graphic supports (photographs, social cartographies, etc.).

Geographic information is acquired from specialized platforms, where data are processed without distortions, cloud cover, or gaps, generating optimal results. Additionally, sources of homogeneous satellite information over time are identified, allowing for appropriate correlation of multi-temporal data.

16.6.2 Registration and data filling system

The fundamental storage system of the project is digital media, considering the requirements for rapid information transfer and the ability to be viewed by parties in the shortest time possible; in any case, the information provided to external agents regarding the developers is protected with confidentiality agreements. Similarly, at the central level, the information is maintained on the developers' digital platform. In the case of the Emberá Wounaan project, the information is protected under a Windows PowerShell console with two-factor authentication, login with a password for the user, and access permission to information by the platform administration. In extraordinary cases, protected information links with expiration dates are granted, as well as granting viewing, editing, or sharing features. For core documents (project document and monitoring report), version history is used, indicating progress and modifications to these documents.

At the internal level, the developing organization has management and information administration systems stemming from both external and internal agents, defining appropriate routes according to the type of information, storage mechanisms, and filing requirements analogously in cases where documents have high vulnerability. Folder *13_Gestión de información* demonstrates the internally created procedures by CO2CERO S.A.S. for information management in forest sector projects, procedure for quality management of information, and procedure for information management in REDD+ type

initiatives. Additionally, a document characterization mechanism is established to guide the user in the use of information within the project folder, categorizing according to sources, purpose, and type of file to be entered.

In accordance with the requirements of the BioCarbon Standard certification program, the information contained herein will be protected and preserved for a minimum of two years after the completion of the credit period determined for this project, thus April 2050 will report its existence.

Finally, in order to address each of the requirements of the standard regarding the monitoring plan, below, in **Table 16**, the justification for compliance with each of the proposed clauses by BioCarbon Standard is shown.

Table 16. Compliance with the monitoring plan requirements.

Monitoring Plan			
Requirement	**Literal**	**Description**	**Compliance**
1	a	The data and information necessary to estimate greenhouse gas (GHG) removals or emissions reductions during the project quantification period.	In the design of the Emberá Wounaan REDD+ project, it was necessary to acquire information from various sources, achieving the required complementarity to holistically address the phenomena and dynamics of the territory. Thus, the three levels of information suggested by the IPCC are applied, linked to international, national, and local scales. The details of the recorded information are found in section *16.6.1 Review of information processing* of the project document.
2	b	The data and complementary information are used to determine the baseline or reference scenario.	The delimitation of the reference region and the baseline scenario was carried out in accordance with the guidelines of methodology BCR0002 version 3.1, complying with items a, b, c, and d, which are described procedurally in section 3.6.1.1 of the project document, using as a key input the cartography available from the National Geographic Institute "Tommy Guardia". Additionally, the information described here is complemented by chapter 3.3. *Identification of the baseline scenario and additionality for AFOLU projects*.

Monitoring Plan			
Requirement	**Literal**	**Description**	**Compliance**
3	c	The specification of all potential emissions occurring outside the project boundaries, attributable to the GHG project activities (leakages).	In order to carry out the monitoring of emissions occurring outside the project boundaries and define the leakage belt, areas experiencing deforestation and degradation throughout the entire reference period were verified.
4	d	The information related to the assessment of environmental and social impacts of the GHG project activities.	In order to identify the environmental and social effects resulting from the implementation of the REDD+ Emberá Wounaan project, an analysis of predictable impacts on biodiversity, ecosystems, livelihoods, and the communities' ability to generate economic resources was conducted using the Net Impact and Socioenvironmental Safeguards tool. In the environmental aspect, the effects were categorized using (Conesa, 2011) methodology to assign importance values. As a result, seven criteria for negative effects and five for positive effects were obtained. On the other hand, in terms of the social dimension, primary information from project beneficiaries was used to determine social and economic categories to define the effects derived from the implementation of the REDD+ project activities. As a result, seven categories and thirty-two effects were identified.
5	e	The established procedures for managing greenhouse gas emission reductions or removals and quality control for monitoring activities.	See *"13_Gestión de información"* and *"PC-Po8 Procedimiento de Calidad PdC Forestal"* Additionally, it is important to highlight that to ensure the management of GHG emission reductions, qualified personnel for the formulation of REDD+ projects are employed, and the document on indicators for the Emberá Wounaan_V2 monitoring plan is created. Along with the REDD+ activity matrix of the project, objectives, targets, and indicators are defined to ensure the project's permanence within the defined time frame for the crediting period. On the other hand, related to quality control for monitoring activities, periodic training is conducted for the involved personnel,

Monitoring Plan			
Requirement	**Literal**	**Description**	**Compliance**
			measurement equipment is calibrated to ensure accuracy, and geospatial analysis methods are chosen to guarantee minimal error and uncertainty. Internally, the development team frequently performs cross-checks to assess the consistency, accuracy, traceability, and transparency of the reported activity progress. To evaluate the results obtained, the collected data is compared with the targets and indicators defined in the REDD+ activity matrix and the monitoring indicators matrix to detect improvement opportunities, possible deviations, and analyze causes to take corrective actions based on the schedule set for the execution of the project activities. Finally, to ensure document management, a digital information system is provided and stored in the cloud, accessible to both the managing partner and the technical partner. This includes a repository of document support and files to ensure the traceability of the project's implementation progress.
6	f	Description of the procedures defined for the periodic calculation of greenhouse gas emissions reductions or removals and leakage.	The procedures carried out involve spatial analysis of forest cover using GIS tools. In this case, according to section 3.2.3.3. Monitoring periods, triennial verifications with a maximum period of five years are proposed to monitor emissions from deforestation and degradation in the project area and leakage belt. It is important to highlight that, according to the BioCarbon Standard guidelines, monitoring of the reference region and baseline scenario will be conducted every 10 years.

Monitoring Plan			
Requirement	**Literal**	**Description**	**Compliance**
7	g	The allocation of roles and responsibilities for monitoring and reporting of relevant variables for the calculation of greenhouse gas (GHG) reductions or removals.	The REDD+ activities of the Emberá Wounaan project will be monitored by three main roles: Community: Comprised of general, regional, and local comarcal authorities, as well as individual community members, who will have defined roles within different activities according to the project design. To ensure proper management and administration of information from monitoring and control actions, the community will be guided through the necessary processes, materials, and equipment required for monitoring activities. Monitoring forest cover, a fundamental activity for recognizing deforestation and forest degradation reduction, will be emphasized. The comarca will implement surveillance within its territorial boundaries and serve as the primary supervisor of its status and conservation. The results will be a fundamental input to provide certainty of satellite-derived information within project limits in terms of forest and non-forest areas. Managing Partner: Acts as a liaison with the communities of the comarca, accompanying them in monitoring and controlling the execution and performance of proposed REDD+ activities. This role ensures the full implementation of activities by the community, fulfilling the objectives set for each of them. Additionally, it supports capacity-building processes, education, and design of territorial planning strategies (five-year plans, adjustments to life plans, etc.), or can impart them when their knowledge permits. It serves as the connecting entity between the monitored information on the different REDD+ activities and the technical partner for project monitoring reporting. Technical Partner: Organization responsible for generating data and information from digital sources such as cartography, spatial processing, software, and quantification of reduced GHG emissions. Monitoring carbon reservoirs to

Monitoring Plan			
Requirement	**Literal**	**Description**	**Compliance**
			determine deforestation and forest degradation trends falls under their purview. They will provide all the relevant inputs to integrate a monitoring report, quantify reduced GHG emissions, and reveal forest dynamics in different verification periods. Within REDD+ activities mainly associated with quantification, they are attributed to monitoring forest cover and generating early warnings within project limits.
8	h	The procedures related to the assessment of the project's contribution to the Sustainable Development Goals (SDGs)	In order to contribute to the Sustainable Development Goals (SDGs), the project aligns with the National Strategic Plan of Panama, which consolidates the country's guidelines for achieving the 2030 agenda. In this case, the alignment is conducted by considering the project activities and utilizing the tool proposed by the BioCarbon Standard. Specific targets for each SDG are taken into account, and an analysis of similarity is performed for each strategic line. The procedure for contributing to the SDGs involves conducting a thorough assessment of the progress made in the REDD+ Emberá Wounaan project activities according to the initiative's activity matrix. For each monitoring period, conformity and alignment will be evaluated based on progress in meeting targets and indicators for each activity, ensuring they align with the SDG indicators and Panama's National Strategic Plan. Once the contribution is identified, the tool proposed by the BioCarbon Standard is filled out, taking into account the activity ID, the details of the contribution based on the results of the activity execution, where it was carried out, and the unit of measurement. It is important to highlight that, to demonstrate traceability, any contribution will be verifiable through documentary support that serves as evidence of compliance.

Monitoring Plan			
Requirement	**Literal**	**Description**	**Compliance**
9	i	The criteria or indicators related to the project's contribution to sustainable development goals, applicable to the project activities proposed by the project proponent.	The REDD+ activities that contribute to the SDGs are defined in the SDG Tool proposed by BioCarbon Standard. Additionally, the indicators associated with each activity can be found in the path *02_Cobeneficios\3_Actividades REDD+\ActividadesREDD+_Emberá Wounaan_V4.xlsx*' and in Chapter 4 'Contribution to Sustainable Development Goals (SDG)' of the monitoring report. Once the REDD+ activity matrix is completed for each monitoring period, the results and documentary evidence supporting the partial or total progress of the activity are attached to feed into the initiative's monitoring indicators. Subsequently, the SDG contribution tool proposed by BioCarbon Standard is used to register alignment according to the results of the work with the communities. In this case, the indicators and criteria focus on SDGs 2, 4, 5, 6, 13, and 15, specifically on the indicators shown in Chapter 4 "Contribution to Sustainable Development Goals" of version 11 of the monitoring report. The indicators for the REDD+ Emberá Wounaan project activities are formulated to define a unit of measurement that allows for the evaluation of each activity's performance. Specific, measurable, achievable, relevant indicators with a defined time frame are selected. As observed in the REDD+ activity matrix, these indicators have a defined unit of measurement, an objective, a target, a compliance schedule, responsible actors, expected results, and a compliance support record column.
20	j	The procedures related to monitoring co-benefits and the special category, when applicable.	Not applicable, the project does not validate or verify any additional seals related to the existence of co-benefits.
11	k	The criteria and indicators defined to	

Monitoring Plan			
Requirement	**Literal**	**Description**	**Compliance**
		demonstrate additional benefits and measure co-benefits and the special category, when applicable.	

Source: CO2CERO S.A.S., 2022.

17 Bibliography

AED. (2004). Caracterización de la Actividad Ganadera en las Subcuencas de Los Hules-Tinajones y Caño Quebrado.

AMERICANOS, S. G. (1978). Proyecto de Desarrollo Integrado de la Región Oriental de Panamá - Darién. *La económia de la Región*.

ANCON. (s.f). *Reserva Natural Privada Punta Patiño*. Retrieved from https://ancon.org/reserva-de-punta-patino/

Arcia, J. (2017, Mayo 07). *Panamá: la ganadería amenaza al Parque Nacional Darién.* Retrieved from https://es.mongabay.com/2017/05/panama-darien-ganaderia/

Arcia, J. (2017, Mayo 07). *Panamá: la ganadería amenaza al Parque Nacional Darién*. Retrieved from https://es.mongabay.com/2017/05/panama-darien-ganaderia/

Armenteras, D., & González, T. (2016). CLASIFICACIÓN DE GRADOS O ESTADOS DE DEGRADACIÓN. In D. Armenteras, T. González, J. Retana, & J. Espelta, *Degradación de bosques en Latinoamérica: Síntensis conceptual, metodologías de evaluación y casos de estudio nacionales* (pp. 21-27). IBERO-REDD+.

Autoridad del Canal de Panamá (ACP). (2022). *Plan Indicativo de Ordenamiento Territorial Ambiental (PIOTA).* Ciudad de Panamá: IDOM; BID.

Autoridad Nacional del Ambiente (ANAM). (2010). *Atklas Ambeintal de la República de Panamá* . Panamá.

B TERRA; KAMCA FORESTAL. (2018). *Análisis de la biodiversidad de fauna vertebrada en una finca en Metití, Provincia de Darien.* Ciudad de Panamá: Fundación Panamá Canal de Vida.

Banco de Occidente. (1999). *Sierras y serranias de Colombia.* Bogotá.

BDA. (2022). *Sector Agrícola. Información General.* Retrieved from https://www.bda.gob.pa/requisitosagricola/

Bech. (2014, Abril 30). *PANAMÁ ¿SON LOS MADEREROS LOS AMOS DE LA PROVINCIA DE DARIÉN ?* Retrieved from https://www.cetri.be/Panama-Son-los-madereros-los-amos?lang=fr

Bilbao. (2019, Junio 01). *La estrategia de los indígenas panameños para proteger los bosques del Tapón del Darién.* Retrieved from https://es.mongabay.com/2019/06/indigenas-panama-darien-video/

BioCarbon Standard. (2021). *automáticamente y se mantendrá una reserva del 15% sobre el total de las reducciones de emisiones o remociones de GEI cuantificadas por cada periodo verificado.*

Camacho A., L. I. (2017). Interpretación Nacional de las Salvaguardas Sociales y Ambientales para REDD+ en Colombia. *Salvaguardas de Cancún* , 11.

Campero, E. (2015, Abril 27). *Universidad Cooperativa de Colombia* . Retrieved from https://revistas.ucc.edu.co/index.php/in/article/download/993/947/2153

Carrera et al. (2021, Mayo). *Dinámica de la reforestación durante el periodo 1992 -2017 en la región del Darién, Panamá, como resultado de la Ley No. 24 de 1992.* Retrieved from https://www.researchgate.net/publication/351883756_Dinamica_de_la_reforestacion_durante_el_periodo_1992_-2017_en_la_region_del_Darien_Panama_como_resultado_de_la_Ley_No_24_de_1992

Casaimo, M. (2020). artesanias de los embera. *Chaquiras*.

CGIAR. (2014). *La agricultura de Panamá y el cambio climático: ¿Dónde están las prioridades para la adaptación?* Costa Rica: CGIAR - CCAFS.

CICR. (2016). Agua de lluvia, agua segura - Darién, Panamá.

CO2CERO SAS. (2023). *Proyecto REDD+ Emberá Wounaan.*

Coates, A., Collins , L., Aubry, M., & Berggren W. (2004). The Geology of the Darien, Panama, and the late Miocene.Pliocene collisión of the Panama are with borthwestern South America. *Geological Society of America Bulletin, 116*(11/12).

Comisión Interamericana de Derechos Humanos. (2017). Mujeres Indígenas. 1.

CONAPRED. (2013). *ESTRATEGIA NACIONAL SOBRE DROGAS 2012-2017.* Retrieved from https://ministeriopublico.gob.pa/wp-content/uploads/2017/04/ESTRATEGIA-NACIONAL-SOBRE-DROGAS-2012-2017.pdf

Conesa, V. (2011). *Guía Metodológica para la evaluación del impacto ambiental.* México: Ediciones Mundi-Prensa.

Congreso General Emberá/Wounaan. (2000). *Manual de organización y funciones del congreso general Emberá Wounaan.* Panamá: Ministerio de Economia y finanzas.

Congreso General Emberá-Wounaan. (2000). *Manual de organización y funciones del congreso general Emberá Wounaan.* Panamá: Ministerio de Economia y finanzas.

Consejo de la Concertación Nacional para el Desarrollo. (2017). *Plan estratégico Nacional con Visión de Estado Panamá 2030.* Retrieved from https://observatorioplanificacion.cepal.org/sites/default/files/plan/files/Panama PlanEstrategicoNacionalconVisiondeEstado.pdf

COONAPIP. (2009, Octubre 21). *CONSULTORÍA PARA LA FACILITACIÓN DE TALLERES DE REDUCCIÓN DE EMISIONES POR DEFORESTACIÓN Y DEGRADACIÓN (REDD) Y PARTICIPACIÓN DE LOS PUEBLOS INDÍGENAS DE PANAMÁ EN LA RED.* Retrieved from https://www.forestcarbonpartnership.org/sites/fcp/files/Documents/PDF/Jul2010/IX-Info_Final_REDD_Comarca%20Embera%20Wounaan_0.pdf

Davis, E. (2010). *Diagnóstico de la Población Indígena de Panamá con base en los Censos de Población y Vivienda de 2010.* Panama.

Davis, W. (2009). los guardianes de la sabiduria ancesatral, su importancia en el mundo moderno. In W. Davis, *Geografias Sagradas* (p. 99). Canada: Silaba.

davis, W. (2009). los guardianes de la sabiduria ancestral. In W. Davis, *los guardianes de la sabiduria ancestral, su importancia en el mundo moderno* (p. 126). canada : Silaba .

Davis, W. (2009). Los guardianes de la sabiduria ancestral. In W. Davis, *los guardianes de la sabiduria ancestral, su importancia en el mundo moderno* (p. 126). canada: Silaba.

Davis, W. (2009). *Los guardianes de la sabiduria ancestral, su importancia en el mundo moderno.* Canada: Silaba.

DG-SINAPROC. (2020). *Guía Municipal de Gestión de Riesgo de Desastres en Panamá.* Retrieved from https://www.sinaproc.gob.pa/wp-content/uploads/2020/05/Guia-Municipal-Panam%C3%A1.pdf

Dogirama, E. (2009). En cuanto al aprovechamiento de Productos Forestales No Maderables, se ha empleado especialmente por mujeres para la elaboración de artesanías, fortaleciendo su venta a nivel nacional e internacional. Utilizando en su gran mayoría productos derivados de l.

Fagua, J., Baggio, J., & Ramsey, D. (2019). *Ecosphere*, 1-21.

FAO. (1972). *B.2 Diagnostico.* Retrieved from http://www.oas.org/dsd/publications/unit/oea30s/ch032.htm#b.2.2%20explotaci%C3%B3n%20maderera

FAO. 1998. Citado en Villota. (1991). *Geomorfología aplicada a levantamientos edáficos y zonificación fisica de las tierras.*

FMBBVA. (2020, agosto 13). *FMBBVA en Panamá canaliza financiación en el sector agro para combatir la crisis.* Retrieved from https://www.fundacionmicrofinanzasbbva.org/fmbbva-en-panama-canaliza-financiacion-en-el-sector-agro-para-combatir-la-crisis/

FSC. (2000). *Principios y Criterios para el manejo Forestal. Documento No 1.2.*

Gelgado , A., Vargas Gonzales , J., Vargas , H., Curti , M., D.L , A., Munir , V., . . . De Atencio , C. (2019). *Taller de Actores para la conservación del Darién.* Ciudad de Panamá .

Gobierno Nacional de Panamá. (2010). *Atlas ambiental de la República de Panamá.* Ciudad de Panamá: Autoridad Nacional del Ambiente.

Gobierno Nacional de Panamá. (2010). *Atlas Ambiental de Panamá.*

GOFC-GOLD. (2016). *A source of methods and procedures for monitoring and reporting anthropogenic greenhouse gas emissions and removals caused by deforestation, gains and losses of carbon stock in forests remaining forests, and forestation.* Warsaw.

Gregorio, J. R. (2012). APROXIMACIÓN AL CONCEPTO DE COMUNIDAD COMO UNA RESPUESTA A LOS PROBLEMAS DEL DESARROLLO RURAL EN AMÉRICA LATINA. *Contribuciones a las ciencias sociales* .

Hansen, M. C., Potapov, P. V., Moore, R., Hancher, M., Turubanova, S. A., Tyukavina, A., . . . Townshend, J. R. (2013). High-Resolution Global Maps of 21st-Century Forest Cover Change. *Science*, 850-853.

Hansen, M. C., Stehman, S. V., & Potapov, P. V. (2010). Quantification of global gross forest cover loss. *Proceedings of the National Academy of Sciences*, 8650-8655.

Herlihy, P. (1985). Chocó Indian Relocation in Darién, Panamá. *Cultural Survival Quarterly, 9*(2), 43-45.

Herlihy, P. (1985). Settlement and subsistence change among the chocó indians of the Darien Providence, eastern Panamá. In *Yearbook, Conference of latin americanist geographer 11* (pp. 11-16).

Herlihy, P. (1986). *A cultural Geography of the Emberá and Wounaan (Chocó) Indians of Darién, Panamá, with emphasis on recent Village formation and economic diversification.* Ph.D. Dissertation, Louisiana State University .

Herlihy, P. (1986). Indias and Rain Forest Collide: the cultura survival Quarterly. *9*(2), 43-45.

Herlihy, P. (1987). Cambios en el paisaje cultural de los indios Emberá y Wounan (Chocoes) del Darién, Panamá. *Revista Lotería*(368), 131-143.

Herlihy, P. (2003). Participatory Research Mapping of Indigenous Lands in Darién, Panama. *Human Organization*, 315-333.

Herlihy, Peter. (1987). Cambios en el paisaje cultural de los indios Emberá y Wounan (Chocoes) del Darién, Panamá. *Revista Lotería*(368), 131-143.

Herlihy, Peter. (1987). *Cambios en el paisaje cultural de los indios Emberá y Wounan (Chocoes) del Darién, Panamá.*

Herlihy, Peter. (1987). *Cambios en el paisaje cultural de los indios Emberá y Wounan (Chocoes) del Darién, Panamá.*

Hessim, P. (2001). Consulta Comunitaria:el caso de Darién, Panamá. *Resultados de la consulta*, 30.

Indígena, N. (2021, Mayo). *International Labour Organization.* Retrieved from www.ilo.org/wcmsp5/groups/public/---dgreports/---gender/documents/publication/wcms_804303.pdf

INEC. (2011). *Diagnóstico de la población indígena en Panamá con base en los censos de población y vivienda de 2010.* Panamá.

INEC. (2021, Noviembre 25). *Economía de Panamá creció 10% al primer semestre 2021, impulsada por incremento en 40% del segundo trimestre.* Retrieved from https://elcapitalfinanciero.com/economia-de-panama-crecio-10-al-primer-semestre-2021-impulsada-por-incremento-en-40-del-segundo-trimestre/

INEGI. (2015). *Criterios para definir áreas de acceso restringido.* Aguascalientes: Instituto Nacional de Estadística y Geografía.

Jímenez, G. P. (S.F). *FAMSI* . Retrieved from http://www.andaluciasolidaria.org/que-hacemos/inclusion-social

Lanly, J.-P. (2003). *Los factores de la deforestación y la degradación de los bosques.* Roma: FAO.

Lüber, K. (2022, 12 27). *Deutschland.de*. Retrieved from https://www.deutschland.de/es/topic/medio-ambiente/the-generation-forest-cop-15-salvando-bosques-en-panama

Marriaga, M., & Nohora Mercado. (2022, abril 04). *Revista cientifica* . Retrieved from https://revistascientificas.cuc.edu.co/bilo/article/view/4181/4076

Menguisama, J. (2020). Artesanias embera. *El cocobolo*.

MiAmbiente. (2020). *Programa Nacional de Restauración Forestal con énfasis en cuencas productoras de agua 2021-2025.*

MiAmbiente. (2022). *Estrategia Nacional para la Reducción de Emisiones por Deforestación y Degradación de los bosques (Estratégia Nacional REDD+).* Panamá: ENREDD+.

MiAmbiente. (2022a). *Presentación oficial de los niveles de referencia de emisiones forestales de Panamá.* Ciudad de Panamá: República de Panamá.

Ministerio de Ambiente. (2018). *Niveles de Referencia de Emisiones Forestales de Panamá.* Panamá: Gobierno de la República de Panamá.

Ministerio de Ambiente. (2023). *redd.unfccc.int.* Retrieved from https://redd.unfccc.int/media/actualizaci__n_del_sis_para_redd__en_panam__.pdf

Ministerio de Ambiente Panama. (2015). Inventario Nacional Forestal y de Carbono de Panamá.Programa ONU REDD.

Mongaby. (2019). *La estrategia de los indígenas panameños para proteger los bosques del Tapón del Darién*.

Montes, C., & Hoyos, N. (2020). Isthmian bedrock geologt: Tilted, bent and broken. In J. Gómez, & D. Mateus-Zabala, *The geology of Colombia, Volume 3 Paleogene - Neogene.* (pp. 451-467). Servicio Geologico Colombiano, Publicacione sGeologicas especiales 37.

Mundial, B. (2020, Noviembre 02). *Banco Mundial* . Retrieved from https://www.bancomundial.org/es/news/feature/2020/11/02/desarrollo-territorial-latinoamerica

mundial, B. (2023, abril 06). *https://www.bancomundial.org/*. Retrieved from https://www.bancomundial.org/es/topic/indigenouspeoples

Myers, N., Mittermeier, R., Mittermeier, C., A.B. Da Fonseca, G., & Kent, J. (2000). Biodiversity hotspots for conservation priorities. *Nature, 403*, 853-858.

Naciones Unidas. (2010). Los pueblos indígenas: desarrollo con cultura e identidad – Artículos 3 32 de la Declaración de las Naciones Unidas sobre los Derechos de los Pueblos Indígenas. *Paradigmas de desarrollo dominantes que no son apropiados para los pueblos*, 1.

NASA Earthdata. (n.d.). *30-meter SRTM Tile Downloader*. Retrieved from Nasa Earthdata: http://dwtkns.com/srtm30m/

Newton Parcionik, M. G. (2006). CHAPTER 3 UNCERTAINTIES. In L. B. Simon Eggleston, *2006 IPCC Guidelines for National Greenhouse Gas Inventories.* Japan.

Niño, G. y. (2018). Una aproximación geopolítica a la política binacional de seguridad fronteriza entre Colombia y Panamá.

Olson , D., Dinerstein, E., Wikramanayake, E., Burgess, N., Powell, G., Underwood, E., . . . Kassem, K. (2001). Terrestrial Ecoregions of the world: a new map of life on Earth. *BioScience, 51*(11), 933-938.

Paciornik, N., Gillenwater, M., De Lauretis, R., Romano, D., Monni, S., & Ogle, S. (2006). CHAPTER 3. UNCERTAINTIES. In S. Eggleston, L. Buendia, K. Miwa, T. Ngara, & K. Tanabe, *2006 IPCC Guidelines for National Greenhouse Gas Inventories.* Japan: IPCC National Greenhouse Gas Inventories Programme.

Panamá, U. d. (2022). Centro Regional del Darién .

Pujo, A. (1997). LA FRONTERA COLOMBO-PANAMEÑA: UNA FRONTERA SELVÁTICA, CERRADA AL PROGRESO, PERO ABIERTA A LASMIGRACIONES MÁS DISÍMILES. *Grupos étnicos* .

Rainforest Foundation. (2022, Agosto 09). *IN EASTERN PANAMA, INDIGENOUS PEOPLES FIGHT DEFORESTATION AS THEY'RE SCAPEGOATED FOR IT.* Retrieved from https://rainforestfoundation.org/darien-indigenous-people-fight-deforestation/

Rangel Ch., O. (2004). *Colombia Diversidad Biotica IV El choco biogeográfico/Costa pacífica.* Bogotá: Universidad Nacional de Colombia .

Regidor, A., & Gil Tébar, P. (2017). *La lucha de los pueblos por el reconocimiento de sus derechos: los Emberá de Panamá.* Huelva: Universidad de Huelva.

Republica de Panamá. (2019). *Taller de Actores para la conservación del Darién.*

Requena, A. (2010). *Un nuevo modelo de uso del suelo para la región del Darién panameño.* Madrid: CONAMA.

Rodriguez, 2022 citado en Gomez Mendez, Derly Alejandra; Martínez Barbosa, Nathaly Yuliana; Londoño Montoya, Dayana. (2021). *Factores de riesgo que inciden en la pérdida de identidad cultural*, 8.

Sistema Nacional de Información Ambiental. (2021). *Datos Abiertos y Geoservicios.* Retrieved from https://www.sinia.gob.pa/index.php/extensions/datos-abiertos-y-geoservicios

Soille, P., & Vogt, P. (2009). Morphological segmentation of binary patterns. *Pattern Recognition Letters*, 456-459.

Soille, P., & Vogt, P. (2022). MORPHOLOGICAL SPATIAL PATTERN ANALYSIS: OPEN SOURCE RELEASE. *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, 427-433.

Telemetro. (2019). Deforestación en Panamá amenaza corredor biológico americano.

Tocamo, N. (2020). Artesanias embera. *La Chunga*.

Tosi, J. (1971). *Zonas de Vida. Una base ecológica para investigaciones silvícolas e inventariación forestal en la República de Panamá.* Panamá: PNUD - FAO.

Tyukavina, A., Potapov, P. H., Pickens, A., Stehman, S., Turubanova, S., Parker, D., . . . Harris, N. (2022). Global trends of forest loss due to fire, 2001-2019. *Frontiers in Remote Sensing*, 1-20.

Unidas, N. (2023). *los pueblos indígenas y el sistema de derechos humanos de las naciones unidas.* Nueva York . Retrieved from www.ohchr.org/sites/default/files/Documents/Publications/fs9Rev.2_SP.pdf

Universidad de Panamá. (2022). *Centro Regional del Darién*.

UNODC. (2012, Septiembre 20). *Cocaína desde Suramérica a los Estados Unidos.* Retrieved from https://www.unodc.org/documents/toc/Reports/TOCTASouthAmerica/Spanish/TOCTA_CA_Caribb_cocaina_SA_US_ES.pdf

UNODC. (2016, Julio). *Colombia. Monitoreo de territorios afectados por cultivos ilícitos 2015.* Retrieved from https://www.unodc.org/documents/colombia/2016/Julio/Censo_Cultivos_Coca_2015_SIMCI.pdf

UPME. (2018). Etnohistoria . *PERFIL ETNOAMBIENTAL DE LAS COMUNIDADES INDÍGENAS EN ZONAS CARBONIFERAS Y ESTRATEGIA PARA EL DESARROLLO DE RPOYECTOS CARBONÍFEROS EN ESTAS ZONAS*.

Vargas Sarmiento, P. (2022). Los embera, los waunana y los cuna. Cinco siglos de transformaciones territoriales en la región del Chocó.

Vega, J., Arroyo, J., & Potvin, C. (2019). Tree aboveground biomass and species richness of the mature tropical forests of Darien, Panama, and their role in global climate

change mitigation and biodiversity conservation. *Conservation science and practice*, 1-11.

wwf. (2022, agosto 09). *WWF* . Retrieved from https://www.wwf.org.co/?364960/El-aporte-de-los-pueblos-indigenas-al-pais-es-invaluable

WWF Colombia, Fundación Ecotróopico y Cecoin. (2008). *Análisis Ecoregional para la construcción de un plan de conservación de la biodiversdiad en el complejo Ecorregional Chocó-Darien.* Santiago de Cali, Colombia .

18 Document version history

Document version control				
Produced by:	**Nicolás Canaría Cotacio**	**Reviewed and approved by:**	**Daniel Obando Vargas**	
VERSION	**DATE**	**RESPONSIBLE FOR:**	**CHANGE**	**DETAILS**
1	15/02/2023	Brian Guerrero	Versión inicial (V1)	
2	10/04/2023	Brian Guerrero	Versión dos (V2)	
3	01/06/2023	Brian Guerrero	Versión tres (V3)	
4	11/08/2023	Nicolás Canaría	Versión cuatro (V4)	
5	19/09/2023	Nicolás Canaría	Versión cinco (V5)	
6	19/10/2023	Nicolás Canaría	Versión seis (V6)	
7	09/11/2023	Nicolás Canaría	Versión siete (V7)	
8	22/01/2023	Nicolás Canaría	Versión ocho (V8)	
9	23/02/2024	Nicolás Canaría	Versión nueve (V9)	
10	08/05/2024	Nicolás Canaría	Versión diez (V10)	i. The section 3.1.1. is modified by adding a description of each of

Document version control				
Produced by:	Nicolás Canaría Cotacio	Reviewed and approved by:	Daniel Obando Vargas	
VERSION	DATE	RESPONSIBLE FOR:	CHANGE	DETAILS
				the applicability conditions proposed by the methodology. ii. A paragraph is added in section 3.2.3.1. Project start date, clarifying that the signature date of the validation and verification proposal falls within five years following the definition of the project start date. iii. The section 3.2.3.3. referring to monitoring periods is modified to provide clarity on the procedures that will be carried out to monitor areas and quantify emissions from deforestation and degradation. iv. The section 5.2. is modified by adding the responsibilities of each stakeholder in terms of monitoring the REDD+ Emberá Wounaan project. v. Section 11.3 is added, where evidence of the outcome of the public consultation conducted by the REDD+ Emberá Wounaan project on the BioCarbon Standard's Global Carbon Trace platform is provided. vi. The Double Counting Avoidance section is adjusted by attaching

Document version control				
Produced by:	Nicolás Canaría Cotacio	Reviewed and approved by:	Daniel Obando Vargas	
VERSION	DATE	RESPONSIBLE FOR:	CHANGE	DETAILS
				the map of VERRA's Initiative 1881 with the polygons of the REDD+ Emberá Wounaan project. vii. Section 3.6.1.1 Reference Region is modified by justifying the delimitation of this area. Section 3.6.1.1.1 Geographic Information of the reference region is added, and a comparison with the project area is conducted. viii. Table 54 is added to define compliance with the monitoring plan requirements proposed by BioCarbon Standard. ix. The results concerning the monitoring period for degradation data are removed from Chapter 3. x. The description of compliance with the modeling criteria of the reference region proposed by BioCarbon Standard is added. xi. The ex ante area and emissions data for deforestation and degradation are adjusted considering the data cleaning conducted for the modeling of the reference region.

Document version control				
Produced by:	Nicolás Canaría Cotacio	Reviewed and approved by:	Daniel Obando Vargas	
VERSION	DATE	RESPONSIBLE FOR:	CHANGE	DETAILS
11	31/07/2024	María Fernanda López	Version eleven (V11)	i. The KML for project 1881 of the VERRA program is related. ii. A review of all bibliographic references is conducted. iii. Adjustments are made to Table 55 concerning the following items: e, defining procedures related to quality control for monitoring activities; h, specifying procedures for evaluating SDGs; and i, generally specifying how the project's criteria and indicators are established. iv. The PQRS email is changed to the BTerra Corp domain. v. It is specified in section 3.6.2.2 Quantification of the emission factor that litterfall and Soil Organic Carbon are not part of the emission factor for degradation activities. vi. All titles and labels of figures, tables, and illustrations are translated. vii. Table 38 is added in compliance with the BCR Template requirements. viii. Section 3.4 Uncertainty Management is

Document version control				
Produced by:	Nicolás Canaría Cotacio	Reviewed and approved by:	Daniel Obando Vargas	
VERSION	DATE	RESPONSIBLE FOR:	CHANGE	DETAILS
				adjusted according to the requirements of the BCR0002 v 3.1 methodology. ix. Table 51 is adjusted, describing how the items a, b, c, d, e, f, g, and h of the BCR Standard are met. x. The name of the tool for degradation quantification is corrected.
11	02/08/2024	Laura Acosta Poveda	Version eleven (V11)	i. Structural and wording adjustments are made in section 2.3 Project Activities.
12	11/10/2024	María Fernanda López	Version twelve (V12)	i. The document is divided into two parts at the request of OVV to better track changes. ii. The accuracy data of the maps are updated according to OVV's request, to be calculated annually (Section 3.4 Uncertainty Management and Table 10). iii. The NIT and RUC of the project participants are added. iv. The paragraph in Section 6 Climate Change Adaptation is adjusted. v. Emissions are updated based on area adjustments.

Document version control				
Produced by:	Nicolás Canaría Cotacio	Reviewed and approved by:	Daniel Obando Vargas	
VERSION	DATE	RESPONSIBLE FOR:	CHANGE	DETAILS
				vi. Citations from the National Geographic Institute "Tommy Guardia" and Hansen et al. (2013) are included as key inputs for determining deforestation and degradation factors, and for building the reference region (Section 3.6.1.1 Reference Region). vii. Tables 13 and 14 are modified regarding the use of base cartographic information from the National Geographic Institute "Tommy Guardia."
13	14/11/2024	María Fernanda López	Version thirteen (V13)	i. Baseline values are adjusted according to updates to the quantification methodology for degradation activity. ii. Table 15 is modified according to the adjustments requested by the CAB. iii. It is clarified that the initial approaches were carried out through the Fundación Panamá Canal de Vida.

NOTE: This Project Document (PD) shall be completed following the instructions included. However, it is important to highlight that these instructions are complementary to the BCR STANDARD, and the Methodology applied by the project holder, in which more information on each section can be found.