FINCA LA PAZ II
LA VICHADA, COLOMBIA

CCB & VCS PROJECT DESCRIPTION

Project title	Finca la Paz II
Project ID	3594
Crediting period	01 December 2018 to 30 November 2071
Project lifetime	01 December 2018 to 30 November 2071
(CCB) GHG accounting period	01 December 2018 to 30 November 2071
Original date of issue	21/07/2022
Most recent date of issue	TBD
Version	V8-0
VCS Standard version	4.7
CCB Standards version	3.1
Project location	Colombia, Vichada
Project proponent(s)	**Col La Paz** Diego Norato diego.norato@12tree.de **GmbH-1.2.TREE** Andreas Voss andreas.voss@12tree.de **Terra Global Capital, LLC** Leslie Durschinger info@terraglobalcapital.com

Validation/verification body	SCS Global Services
History of CCB status	Not applicable since there are no issuance date(s) of earlier validation statements or dates of previous attempts at verification available, this issue is not applicable.
Gold Level criteria	Not applicable, the project is not applying for Gold Level Criteria
Expected verification schedule	TBD
Prepared by	Terra Global Capital, LLC

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1 SUMMARY OF PROJECT BENEFITS

La Paz farm is a reforestation project managed by Reforestadora La Paz (Col La Paz). 12Tree (one of the farm's investors) purchased a total of 3,091 hectares to establish an extensive forestry plantation to increase density of trees and recover degraded pastures (degraded by livestock). The First Project Activity Instance includes 2,378 hectares planted with *Acacia mangium*, which is a nitrogen fixing specie, that will rebuild the soil's fertility. The Project will be applying sustainable agricultural practices such as minimal-use of agrochemicals and soil conservation practices to recover the soil's properties. According to the Project's design and implementation phases, the first rotation of Acacia will be replaced by a multiple species system that will incorporate Pine, and Eucalyptus. This project is part of a bigger reforestation plantation that covers a total of 15,000 hectares.

Currently, the Project employs a total of 18 fixed workers, who benefit from long-term contracts, free meals three times a day, and in farm accommodation. The Project works on strengthening workers' sense of belonging and motivation, by improving wage levels with a salary scheme rewarding productivity, seniority, and loyalty. Moreover, the farm will be working to strengthen its relationships with local stakeholders and communities, to improve their perception of afforestation projects' impact, especially regarding biodiversity, soil, and water.

From the biodiversity conservation characteristics, Col La Paz Project includes a greater appropriation of local knowledge of wildlife, permanent areas of protection and conservation of wildlife (gallery forests and *Morichale*s within the farm properties). The project will provide greater mobility and connection for existing species due to the creation of forest plantations.
GHG emissions reductions and removals over the next 53 years, excluding buffer pool allocation, total 724,045 tCO2e, equivalent to 13,661 tCO2e per year.

1.1 Unique Project Benefits

Anticipated advantages of the project that are not encompassed by the standardized benefit metrics in Table 1, provided below. The advancement toward realizing each benefit mentioned here can be documented in the project monitoring reports. These benefits should align with the significant project outcomes or impacts outlined in the project's Theory of Change (shown in Figure 1). The estimates provided below must be supported in this document as indicated by the referenced section.

Table 1. Project Outcomes (climate, community, and biodiversity)

Outcome or impact estimated by the end of project lifetime	Section reference
1) Climate. • Land rehabilitation & soil restoration through forestry plantation practices to restore degraded pastures	3.4.2
2) Community.	4.2.1

Outcome or impact estimated by the end of project lifetime	Section reference
•Increased income for employees (including women) through formal long-term employment	
3) Biodiversity. •Increase biodiversity and awareness of the importance of conservation of vulnerable species in the Project Activity Instance	5.2.3

1.2 Standardized Benefit Metrics

Table 2 shows the metrics of the benefits that the project aims to achieve during the project lifetime for the first project activity instance.

Table 2. Metrics of the benefits to be achieved by the project.

Category	Metric	Estimated by the end of project lifetime	Section reference
GHG emission reductions or carbon dioxide removals	Net estimated removals in the project area, measured against the without-project scenario	Net estimated removals for the lifetime (53 years) of the project are 639,763 tCO2e	3.2
	Net estimated reductions in the project area, measured against the without-project scenario	No reductions due to typology	3
Forest[1] cover	For REDD[2] projects: Estimated number of hectares of reduced forest loss in the project area measured against the without-project scenario	Not applicable because this is an ARR project	3
	For ARR[3] projects: Estimated number of hectares of forest cover increased in the project area measured against the without-project scenario	2,378 hectares of forest cover increased in the First Project Activity Instance measured against the without-project scenario	3
Improved land management	Number of hectares of existing production forest land in which IFM[4] practices are expected to occur as a result of project activities, measured against the without-project scenario	Not applicable because this is an ARR project	3
	Number of hectares of non-forest land in which improved land management practices are expected to occur as a result of project	Not applicable because this is an ARR project	3

[1] Land with woody vegetation that meets an internationally accepted definition (e.g., UNFCCC, FAO, or IPCC) of what constitutes a forest, which includes threshold parameters, such as minimum forest area, tree height and level of crown cover, and may include mature, secondary, degraded and wetland forests (VCS Program Definitions)

[2] Reduced emissions from deforestation and forest degradation (REDD) - Activities that reduce GHG emissions by slowing or stopping conversion of forests to non-forest land and/or reduce the degradation of forest land where forest biomass is lost (VCS Program Definitions)

[3] Afforestation, reforestation and revegetation (ARR) - Activities that increase carbon stocks in woody biomass (and in some cases soils) by establishing, increasing and/or restoring vegetative cover through the planting, sowing and/or human-assisted natural regeneration of woody vegetation (VCS Program Definitions)

[4] Improved forest management (IFM) - Activities that change forest management practices and increase carbon stock on forest lands managed for wood products such as saw timber, pulpwood, and fuelwood (VCS Program Definitions)

	activities, measured against the without-project scenario		
Training	Total number of community members who are expected to have improved skills and/or knowledge resulting from training provided as part of project activities	18 people (workers) are expected to have improved skills and/or knowledge resulting from training provided as part of project activities	4
	Number of female community members who are expected to have improved skills and/or knowledge resulting from training as part of project activities	2 female (workers) are expected to have improved skills and/or knowledge resulting from training as part of project activities	4
Employment	Total number of people expected to be employed in project activities[5], expressed as number of full-time employees[6]	18 people to be employed in project activities	4
	Number of women expected to be employed as a result of project activities, expressed as number of full-time employees	2 women will be employed in project activities	4
Livelihoods	Total number of people expected to have improved livelihoods[7] or income generated as a result of project activities	18 workers have improved livelihoods or income generated as a result of project activities	4
	Number of women expected to have improved livelihoods or income generated as a result of project activities	2 women (workers) have improved livelihoods or income generated as a result of project activities	4
Health	Total number of people for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	Not applicable as the project doesn't target outcomes in this category	

[5] Employed in project activities means people directly working on project activities in return for compensation (financial or otherwise), including employees, contracted workers, sub-contracted workers and community members that are paid to carry out project-related work.
[6] Full time equivalency is calculated as the total number of hours worked (by full-time, part-time, temporary and/or seasonal staff) divided by the average number of hours worked in full-time jobs within the country, region or economic territory (adapted from the UN System of National Accounts (1993) paragraphs 17.14[15.102];[17.28])
[7] Livelihoods are the capabilities, assets (including material and social resources) and activities required for a means of living (Krantz, Lasse, 2001. The Sustainable Livelihood Approach to Poverty Reduction. SIDA). Livelihood benefits may include benefits reported in the Employment metrics of this table.

	Number of women for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	Not applicable as the project doesn't target outcomes in this category	
Education	Total number of people for whom access to, or quality of, education is expected to improve as result of project activities, measured against the without-project scenario	Not applicable as the project doesn't target outcomes in this category	
	Number of women and girls for whom access to, or quality of, education is expected to improve as result of project activities, measured against the without-project scenario	Not applicable as the project doesn't target outcomes in this category	
Water	Total number of people who are expected to experience increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	Not applicable as the project doesn't target outcomes in this category	
	Number of women who are expected to experience increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	Not applicable as the project doesn't target outcomes in this category	
Well-being	Total number of community members whose well-being[8] is expected to improve as a result of project activities	18 workers whose well-being is expected to improve as a result of project activities	4
	Number of women whose well-being is expected to improve as a result of project activities	2 women whose well-being is expected to improve as a result of project activities	4
Biodiversity conservation	Expected change in the number of hectares managed significantly better by the project for biodiversity conservation[9], measured against the without-project scenario	2,378 hectares managed significantly better by the project for biodiversity conservation, measured	5

[8] Well-being is people's experience of the quality of their lives. Well-being benefits may include benefits reported in other metrics of this table (e.g. Training, Employment, Livelihoods, Health, Education and Water), and may also include other benefits such as strengthened legal rights to resources, increased food security, conservation of access to areas of cultural significance, etc.
[9] Managed for biodiversity conservation in this context means areas where specific management measures are being implemented as a part of project activities with an objective of enhancing biodiversity conservation, e.g. enhancing the status of endangered species

		against the without-project scenario	
	Expected number of globally Critically Endangered or Endangered species[10] benefiting from reduced threats as a result of project activities[11], measured against the without-project scenario	0 species IUCN listed as Critically Endangered (CR) or Endangered Species (EN) that will benefit from Project Activities are expected to be found in and around the Project Area Instance.	5

[10] Per IUCN's Red List of Threatened Species
[11] In the absence of direct population or occupancy measures, measurement of reduced threats may be used as evidence of benefit

2 PROJECT DETAILS

2.1 Project Goals, Design and Long-Term Viability

2.1.1 Summary Description of the Project (VCS, 3.2, 3.6, 3.10, 3.11, 3.13, 3.14; CCB, G1.2)

Col La Paz is implementing an Afforestation/Reforestation Project in degraded grasslands in Colombia. The Vichada Department is home to vast tropical grasslands, which have been subject to unsustainable grazing. La Paz Farm is an extensive forestry plantation with multiple introduced species. The estate is managed by Reforestadora La Paz and encompasses 15,000 ha, of which 12Tree owns 3,091 ha, mainly planted with *Acacia mangium* which is undergoing the process of soil regeneration. This productive ecosystem will produce several timber products used for construction materials and charcoal.

La Paz applies practices such as low level of agrochemical use and regenerative agriculture. It employs a total of 37 workers who benefit from long-term contracts, free meals three times a day and comfortable accommodation.

The farm is also an important biodiversity corridor and optimal habitat for different wildlife species connecting surrounding natural habitats and increasing habitat areas within the plantation through the establishment of tree cover. A total of 645 different animal species, including jaguars, a great indicator of a thriving fauna, have been recorded in the area. La Paz's conservation efforts include the protection of wildlife, preservation of springs and conservation of streams. Moreover, the project would bring several climate benefits to the degraded area turning it into a productive system by preventing erosion and increasing carbon sequestration.

Col La Paz has also developed social and environmental policies to enhance livelihoods and rejuvenate the land. Social policy on the farm primarily centers around establishing relationships with its employees and this will extend to community outreach. The environmental policy is based on guaranteeing an adequate development of its forestry operation in compliance with national, local, and environmental regulations, focused on the care and enhancement of natural resources, and the prevention and mitigation of negative impacts.

This is a Grouped Project that seeks to create verified emission reductions/removals under the Verified Carbon Standard and the Climate, Community and Biodiversity Standard. Furthermore, the increase in forest cover and sequestration of carbon in living biomass will contribute to the reduction of GHG emissions by sequestering an average of 12,071 tCO_2e per year. This amounts to 639,763 tCO_2e over the 53-year crediting period.

This project is not located within a jurisdiction covered by a jurisdictional REDD+ program.

2.1.2 Audit History (VCS, 4.1)

Audit type	Period	Program	Validation/verification body name	Number of years
Validation/ Verification	01 December 2018 to 30 November 2023	VCS/CCB	SCS	Five years

This project has not undergone a previous validation or verification process. However, it is expected to start the validation and verification process this year in May/June of 2024, from December 01, 2018 to November 30, 2023.

2.1.3 Sectoral Scope and Project Type (VCS, 3.2)

Sectoral scope	14: Agriculture, forestry, and other land use
AFOLU project category [12]	Afforestation, Reforestation, and Revegetation
Project activity type	Establishing, increasing, or restoring vegetative cover through the planting, sowing, or human-assisted natural regeneration of woody vegetation

2.1.4 Project Eligibility (VCS, 3.1, 3.6, 3.8, 3.18, 4.1; CCB Program Rules, 4.2.4, 4.6.4)

The La Paz Afforestation/Reforestation Project in Colombia is focused on transforming degraded grasslands into productive forest systems, mainly planted with *Acacia mangium*. The project adheres to VCS Scope 14 for Afforestation/Reforestation projects and meets all related requirements.

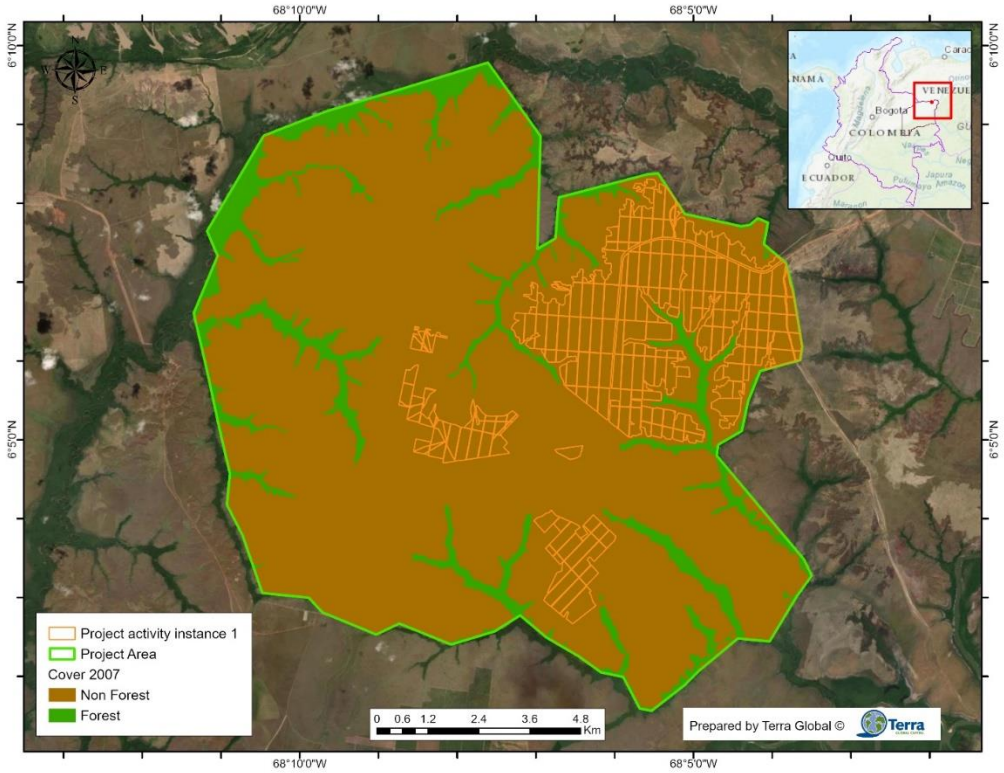
Most of Vichadas natural seasonal sabanas, have been long use by locals for livestock grazing, where practices of annual burns have caused degradation of the natural ecosystem (Map 6). The land use of the Project area was degraded grassland within a 10-year period before the project's start date, meeting the Non conversion of native ecosystems criteria. This was accomplished using Landsat 7 data (for the years 2007 to 2013) and Landsat 8 data (for the years 2014 to 2023). To mitigate artifacts, data were exclusively extracted between June and August. Additionally, to ensure consistency between the two sensors, the analysis focused on spectral bands that are common to both Landsat 7 and Landsat 8. (see section 3.1.5).

According to Colombia's Ministry of Environment and Territorial Development in resolutions 848 of 2008, 207 of 2010, and 654 of 2011, *Acacia mangium*, *Eucalyptus pellita*, and *Pinus caribaea* are not on the list of invasive alien species. Therefore, the introduction of these species in the Project Area does not have a significant negative impact on the ecosystem's health.

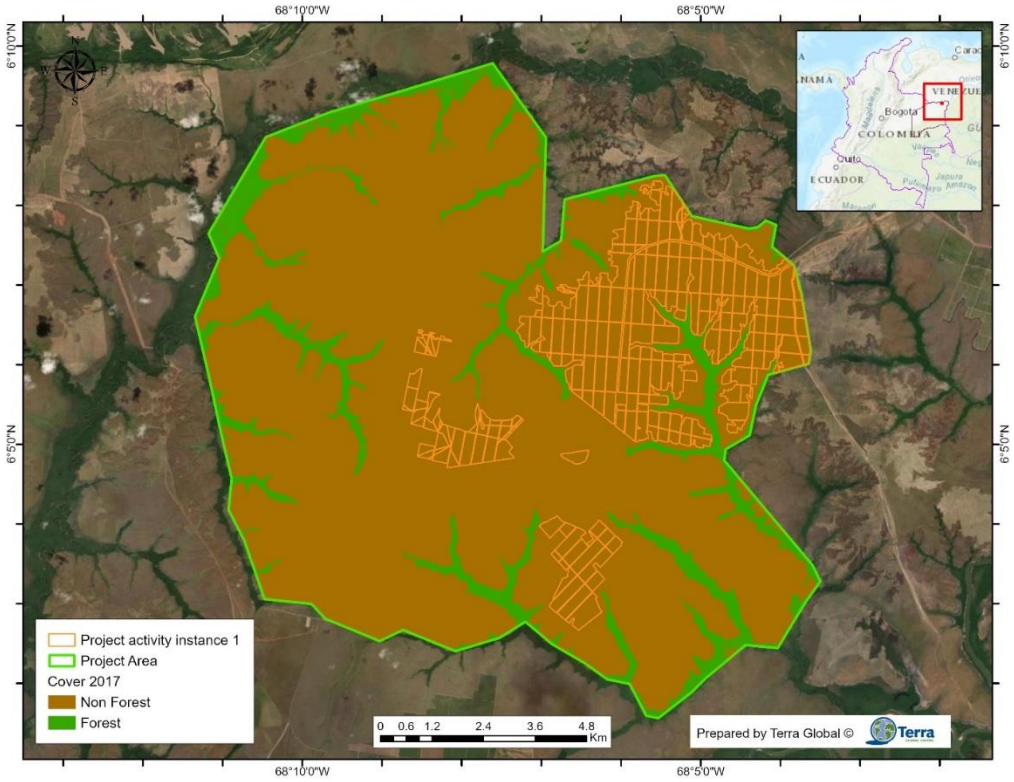
The project uses the VM0047 methodology eligible under the VCS Program and implements sustainable practices such as low agrochemical use and soil regeneration through the increase of vegetation cover. This includes planting tree species such as *Acacia mangium*. Social and environmental policies support workers and the local community, while also protecting and enhancing natural resources and biodiversity.

The Map 1 and Map 2 show the cover in two periods (2007 – 2017) where there is no difference in the project activity instance.

[12] See Appendix 1 of the VCS Standard



Map 1. Forest - Non-Forest Cover 2007



Map 2. Forest - Non-Forest Cover 2017

2.1.5 Transfer Project Eligibility (VCS, 3.23, Appendix 2)

This is not applicable for the project since it is not a transfer project and not a CPA seeking registration.

2.1.6 Project Design (VCS, 3.6)

Indicate if the project has been designed as:

☐ Single location or installation

☐ Multiple locations or project activity instances (but not a grouped project)

☒ Grouped project

2.1.6.1 Eligibility Criteria for Grouped Projects (VCS, 3.6; CCB, G1.14)

La Paz is a grouped project and will ensure that new instances will adhere and be consistent with the defined eligibility criteria. This will involve adopting the same activities, technologies, and measures, and meeting the methodology's applicability conditions. New instances will encounter the same community and biodiversitywithout projectt scenarios and adhere to the same baseline scenario. They will align with the additionality characteristics of the initial instances and comply with stakeholder engagement, including free, prior, and informed consent. Additionally, future instances will maintain similar monitoring elements for consistency in data collection, verification, and reporting, ensuring uniformity across all project instances.

2.1.7 Project Proponent (VCS, 3.7; CCB, G1.1)

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2.1.8 Other Entities Involved in the Project

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Email	info@terraglobalcapital.com

2.1.9 Project Ownership (VCS, 3.2, 3.7, 3.10; CCB, G5.8)

Project ownership is supported by laws that grant Col La Paz rights to manage the production area and natural resources that will be managed to generate emissions reductions and/or removals. Col La Paz has the legal right to operate the project activities, which is establishing a forest production system (under the baseline condition) and managing it (under the project). Col La Paz through their legal rights to carbon, demonstrate Project Proof of Right under a statutory, property or contractual right in the land, vegetation or management process that generates GHG emission reductions and/or removals.

2.1.10 Project Start Date (VCS, 3.8)

Project start date	01-December-2018
Justification	This project conforms with the VCS Program requirements by meeting key criteria such as eligibility requirements, methodology compliance,

	additionality, validation, and verification. See details of implementation schedule in Table 5. The project will adhere to deadlines, maintain accurate documentation and monitoring, engage stakeholders, comply with legal requirements, and ensure transparency in its operations. Tree planting on the first Project Activity Instance started with the addition of ~1,000 hectares of *Acacia mangium* plantation to the degraded grassland.

2.1.11 Benefits Assessment and Project Crediting Period (VCS, 3.9; CCB, G1.9)

Crediting period	01 December 2018 to 30 November 2071 The project will undergo a third-party validation process and will comply with the verification schedule as stipulated by the program.
Start date of first or fixed crediting period	01 December 2018 to 30 November 20*71*
CCB benefits assessment period	01 December 2018 to 30 November 2071 The CCB benefits assessment period from December 2018 to November 30, 2071, will monitor changes in climate change adaptive capacity, resilience, biodiversity, and community well-being by establishing a baseline, conducting regular monitoring, and collecting and analyzing data.

2.1.12 Differences in Assessment/Project Crediting Periods (CCB, G1.9)

There are no differences between these accounting periods.

2.1.13 Project Scale and Estimated Reductions or Removals (VCS, 3.10)

☒ < 300,000 tCO_2e/year (project)

☐ ≥ 300,000 tCO_2e/year (large project)

Table 3. Total Emission Reductions for the project

Calendar year of crediting period	Estimated reductions or removals (tCO_2e)
01 December 2018 to 30 November 2019	0
01 December 2019 to 30 November 2020	7,615
01 December 2020 to 30 November 2021	33,192
01 December 2021 to 30 November 2022	56,424
01 December 2022 to 30 November 2023	59,960

Calendar year of crediting period	Estimated reductions or removals (tCO_2e)
01 December 2023 to 30 November 2024	58,274
01 December 2024 to 30 November 2025	19,954
01 December 2025 to 30 November 2026	6,796
01 December 2026 to 30 November 2027	0
01 December 2027 to 30 November 2028	0
01 December 2028 to 30 November 2029	38,471
01 December 2029 to 30 November 2030	42,245
01 December 2030 to 30 November 2031	71,791
01 December 2031 to 30 November 2032	74,965
01 December 2032 to 30 November 2033	70,862
01 December 2033 to 30 November 2034	65,066
01 December 2034 to 30 November 2035	34,150
01 December 2035 to 30 November 2036	0
01 December 2036 to 30 November 2037	0
01 December 2037 to 30 November 2038	0
01 December 2038 to 30 November 2039	0
01 December 2039 to 30 November 2040	0
01 December 2040 to 30 November 2041	0
01 December 2041 to 30 November 2042	0
01 December 2042 to 30 November 2043	0
01 December 2043 to 30 November 2044	0
01 December 2044 to 30 November 2045	0
01 December 2045 to 30 November 2046	0
01 December 2046 to 30 November 2047	0
01 December 2047 to 30 November 2048	0
01 December 2048 to 30 November 2049	0
01 December 2049 to 30 November 2050	0
01 December 2050 to 30 November 2051	0
01 December 2051 to 30 November 2052	0
01 December 2052 to 30 November 2053	0
01 December 2053 to 30 November 2054	0
01 December 2054 to 30 November 2055	0
01 December 2055 to 30 November 2056	0
01 December 2056 to 30 November 2057	0
01 December 2057 to 30 November 2058	0
01 December 2058 to 30 November 2059	0
01 December 2059 to 30 November 2060	0
01 December 2060 to 30 November 2061	0
01 December 2061 to 30 November 2062	0
01 December 2062 to 30 November 2063	0
01 December 2063 to 30 November 2064	0

Calendar year of crediting period	Estimated reductions or removals (tCO_2e)
01 December 2064 to 30 November 2065	0
01 December 2065 to 30 November 2066	0
01 December 2066 to 30 November 2067	0
01 December 2067 to 30 November 2068	0
01 December 2068 to 30 November 2069	0
01 December 2069 to 30 November 2070	0
01 December 2070 to 30 November 2071	0
Total estimated ERRs during the fixed crediting period	**639,763**
Total number of years	**53**
Average annual ERRs	**12,071**

2.1.14 Physical Parameters (CCB, G1.3)

Topography and soils

The Project Area is in the northeast of Colombia in the department of Vichada and is part of the Llanos Orientales bordering Venezuela. This part of the department presents three very clearly defined geomorphological landscapes, the first being the island mountains in which there are reliefs of bare rock, without edaphic development; the second is the very gently undulating reliefs or highlands, with abundant low-lying plateau forms and a few isolated hills; lastly there is also a floodplain of variable width, with some complex borders (Galvis Vergara & Perilla, 2001).

The northeastern end of the Colombian Orinoquia and specifically the zone of influence of Puerto Carreño, are part of the northwestern peripheral portion of the Guyanese shield, which is composed of a basement of Precambrian igneous and metamorphic rocks, which specifically form the granitic batholith of Parguaza and constitute the oldest rocks in Colombia (Villareal, 2007).

Regarding the lithological units, the rapakivi texture granites are observed, which are composed of potassium feldspar, which occurs in spherical or ovoid forms with a pearly luster and colors that vary from pink to yellowish gray. These spherical shapes are surrounded by a halo of white albite. Potassium feldspar generally occurs perthitic and in some places the variety called amazonite of pale green color is observed; The second lithological unit present in this area are the pyroclastic volcanic-sedimentary rocks, which mainly comprise siltstones, sandstones, conglomerates, volcanic breccias, agglomerates and tuffs; In addition to the aforementioned units, it is worth noting that in the El Carajo hill there are indications of an intrusion, for which the volcanic-sedimentary rocks present contact metamorphism. Finally, the third lithological unit present in the northeast of the department of Vichada and the recent sediments, which occur after a very long hiatus, deposits of eolian sands, which constitute most of the surface cover in the savannah banks (Galvis Vergara & Perilla, 2001).

Hydrology

The project is located within the Orinoco River Macro basin, between the basins of the Meta river and the Bita river; Orinoco is one of the longest rivers in South America with a length of 2,150 km, the third worldwide in flow rate 31,061 m3/s and the fifth in sediment transport: 150 million ton/year Its waters flow through the Guayanés Massif, the eastern slope of the Northern Andes, the Coastal Range, the Amazon transition plain and the floodable and non-floodable savannahs of eastern Colombia, and the central-eastern area of Venezuela. From Venezuela, the Orinoco join the Atlantic Ocean through a deltaic system. (Rosales, Suarez, & Lasso, 2010).

The Meta River is one of the main tributaries of the Orinoco basin, it has a total length of 1,110 km from its source to its mouth in the municipality of Puerto Carreño. Its source originates in the Eastern Cordillera (also known as the Eastern Ranges), the most sizeable branch of the Colombian Andes. It travels right across the region of Orinoquia and Los Llanos Orientales (the Eastern Plains) where it forms the Meta River Plain and moves into southern Venezuela at Antioquia, where it begins to form the border between the two countries. It forms its confluence with the Orinoco River at Puerto Carreño. The waters eventually culminate at the Orinoco delta releasing vital nutrient-rich sediment into the Atlantic Ocean just south of Trinidad & Tobago (Vanhooren, 2017).

The Bita River is in the Department of Vichada, in the highlands. It is born in the municipality of La Primavera, in the lower area that is in the area of the herds of La Mariposa, El Tigre and El Conejo, characterized by being an area rich in lagoons, morichales, and long continuous forests. From there, the river flows down several paths: La Esmeralda, Pasoganado, San Rafael and ends its journey in the municipality of Puerto Carreño. It is fed by more than 5,000 streams and small channels that also originate in the basin and that when they come together make up the Bita, which runs 710 km from its extensive source until it flows into the Orinoco River, in the area of Cerro del Bita, ancient fragment of the Guiana Shield.

Climate

According to Lang's climatic classification, the Llanos Orientales region is a humid and semi-humid zone, where there is a monomodal rainfall regime, with a rainy season from April to November, with May being the month of most rainfall with amounts between 1,500 and 2,000 mm per year and a dry season from December to April, January is 2 the driest month where temperatures exceed 32 °C, coinciding with the presence and absence of the intertropical convergence zone, humidity that is strengthened by the proximity to the mountain range where very pronounced and remarkable orographic rain formation processes are generated (IDEAM, 2011).

The annual behavior of humidity is also monomodal. The lowest average values are the range of 60 to 65% and are recorded from January to March, coinciding with the long seasonal drought in the region. Then a pronounced rise is registered in April and May until reaching the maximum annual values during June and July; a slow decline begins in August until December, the month in which the transition to low values (IDEAM, 2017).

Due to the absence of topographic accidents, the movement of the intertropical convergence zone (ITCZ) is directly responsible for the appearance of rain in the region and its regime is the best demonstration of the latitudinal movement of the ITCZ. Towards the foothills of the Eastern Cordillera, this factor is reinforced and modified by mesoscale factors. Another system that affects the atmospheric circulation of the southeast of the country corresponds to the low-pressure system at low levels of the Amazon basin, known by the name of *Baja Amazónica,* and its origin is due to the latent heat of condensation and the complementary effect that the Andes mountain range by channeling the flow of the northeast trade winds. This semi-permanent system moves from northern Bolivia in January to the extreme southeast of Colombia in July. (IDEAM, 2014)

The winds in the northern part of the department of Vichada reach an average annual speed of 1.5 to 2 m/s at 2 meters high and 5 to 6 m/s at 10 meters high, reaching maximum speeds in the months of December to March, with Regarding the direction of the wind, it flows from the northern component in the semester between October and March, turning towards the southern component from May to August (MJJA). April and September present a transition towards the two behavior patterns, with some entry of easterly wind. (IDEAM, 2017)

In the Orinoquia, the regime of solar brightness is monomodal on the plains and slightly bimodal near the foothills of the mountain range. The maximum insolation is recorded in January-February-March, with average values of 8 hours of sun per day. From these months, the value decreases gradually until it reaches

about 4 sun-hours/day, in June-July-August. Near the mountain ranges these values are slightly lower. (IDEAM, 2017)

Types of vegetation

Gallery Forest

This type of forest is characterized by having a permanent availability of groundwater and a well-drained substrate throughout the year. They are located along the banks of rivers and pipes with permanent channels and are sustained by the river moisture filtered into the subsoil, with trees that reach heights of up to 40 meters. In these forests, the substrate along the channel is well drained throughout the year and presents a permanent availability of groundwater.

Morichales

Plant formations in the project zone characteristic of the ecosystems of the eastern plains, composed primarily of groups of individuals of the palm (Mauritia flexusa) which reach fronds greater than or equal to ten meters in height. These are palms without thorns or stingers that grow on both sides of bodies of water (spouts and lagoons). and in flooded or flooded sectors. It is found in sectors of pipes, lagoons or shallows that are swampy and in transition zones between sheets and gallery forests. The morichal grows in areas where the water currents are very calm, and they are nourished by clean waters that have been filtered in the sands of the soils of the sheets (Cuevas, 2007).

Grassland

This vegetation type is known for its relatively continuous layer of grasses and sedges and is often associated with a discontinuous layer of shrubs and low trees. It exhibits regularities of structure and floristic composition that correlates with the type of soil. The savannah vegetation makes up a high proportion of the vegetation in the department of Vichada and is made up of natural grasses that are highly resistant to dryness and humidity. With some variations due to flooding, the savannah vegetation is made up of grasses such as rabo de vaca, hairy straw (*Scleria bracteara*), guaratara straw *(Axonopus purpusii*), foxtail straw (*Andropogon bicornis*) and shrubs. such as the shorty (*Curatella americana*), among others. (Cuevas, 2007)

Mosaic of crops, pastures, and natural spaces

It includes the areas of the territory occupied mainly by covers of crops and pastures in combination with natural spaces. In this coverage, the pattern of distribution of the hedges cannot be represented individually, as plots larger than 25 hectares. The areas of crops and pastures occupy between 30% and 70% of the total surface of the unit.

Natural spaces are made up of areas occupied by relics of natural forest, shrubs, gallery or riparian forest, secondary or transition vegetation, swamps and other areas not intervened or little transformed, which due to limitations of use due to their biophysical characteristics remain in a natural or almost natural state. (Instituto Geografico de Colombia IGAC, 2010)

Pastures

This coverage includes lands occupied by pastures for bovine livestock with a coverage percentage greater than 70%; the performance of management practices (cleaning, liming and/or fertilization, etc.) and the technological level used prevent the presence or development of other vegetative types. Pastures typically include grasses that are adapted to flood prone areas, which allows for minimum amounts of drying, during the dry season, as these grasses readily hold water.

Forest Plantation

These are areas constituted by plantations of arboreal vegetation, carried out by the direct intervention of man for forest management purposes. In this process, forest stands are established, established through planting and/or sowing during the afforestation or reforestation process, to produce wood (commercial plantations) or environmental goods and services (protective plantations). (Instituto Geografico de

Colombia IGAC, 2010). In the project area, this coverage consists of private plantations with the following species Acacia *mangium, Eucalyptus pellita* and *Pinus caribaea.*

2.1.15 Social Parameters (VCS, 3.18; CCB, G1.3)

La Paz estate is located in the Vichada department, the eastern most region of Colombia, by the Venezuelan border. Vichada is a large department (10,032,324 hectares, 9% of the national total territory), remote, sparsely populated (77,276 inhabitants in 2018 (DANE, 2018), and an underdeveloped area compared to other Colombian regions. Indigenous people represent more than 44% of the population of the department (DANE, 2005).

The main economic branch of Vichada is that of communal, social, and personal services, which represents 45% of departmental production. The main revenues in the department come from public resources with which services of all kinds are contracted. The main activities that follow in order of importance are trade, restaurant and hotels (13%); mining and quarrying (11%); agricultural activities (livestock and agriculture), hunting and fishing (8%); and construction (7%). (Etnollano, 2013)The main town of the Vichada department and nearest town to La Paz estate is Puerto Carreño, a small city with 13,595 inhabitants. Job opportunities in Vichada are limited to:

- Government jobs.
- Reforestation, agriculture, cattle, and fish farming.
- Tourism: mainly national tourists from January to September (9,459 visits in 2011 which represents an increase of almost 20% compared to the arrivals that were recorded in 2010) (Ministry of Commerce, Industry and Tourism, 2012). Vichada is an internationally recognized tourist destination for sport fishing and for the national park of Tuparro.

Informal transboundary trade is still very active, and the collapse of the Venezuela's economy affected the livelihood of residents. Gasoline, meat, and some other food supplies continue to be traded illegally across the border. It is such an important issue for the area that in February 2018, the Governorate of Vichada opened the Departmental Coordination Bureau of Foreign Trade (MCDCE) which purpose is the search for tangible solutions to the economic and social crisis experienced by the Department of Vichada.

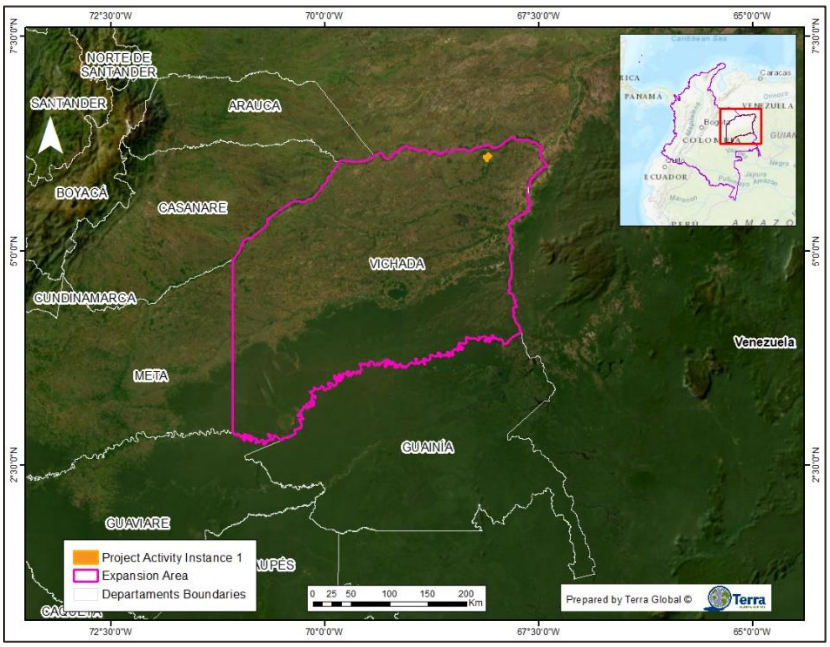
Agriculture is not developed fully in Puerto Carreño, due to the dependence of inputs and supplies coming from other departments, often by airplane, which translates in high prices and production cost. In Vichada, the main commercial crops planted in 2014 were soy (43%), oil palm (11%), cashew (9%) and sugar cane (1%). The following agricultural production represent crops planted for subsistence: cassava (29%), traditional corn (15%), rice (6%), banana (3%), tomato (2%), cocoa (1%) and others (1.7%), (by surface for a total of 15,422 hectares according to the Ministry of Agriculture).

The Puerto Carreño population's educational level is low, only 35.8% of the population has reached the basic primary level; 30% have attained secondary education and 7.7% have advanced and postgraduate degrees. The illiteracy rate is high with 11.7% of the population of 15 years and more of Puerto Carreño cannot read and write (SENA, 2005), compared to the national literacy rate of 95% (UNESCO, 2020).

In Vichada, 9 indigenous ethnic groups are identified: Sikuani, Piapoco, Puinave, Piaroa, Curripaco, Sáliva, Cubeo, Cuiba and Amorúa, located in 46 indigenous reserves (Secretariat of Indigenous Affairs of Vichada 2008). 22.9% of the city dwellers of Puerto Carreño recognize themself as indigenous (SENA, 2005). In the Vichada department, 0.1% of the population self-identifies as belonging to the Guahibo ethnic group among black people, while the corresponding percentage is 74% among indigenous people (DANE, 2005).The main economic activities of the indigenous communities of Vichada are characterized as subsistence. Among these are hunting, fishing, and farming products such as cassava, sweet potato, yam, peppers, and various fruit trees. Other productive activities are also carried out, such as the commercialization of sub-products derived from cassava and handicrafts (Etnollano, 2013).

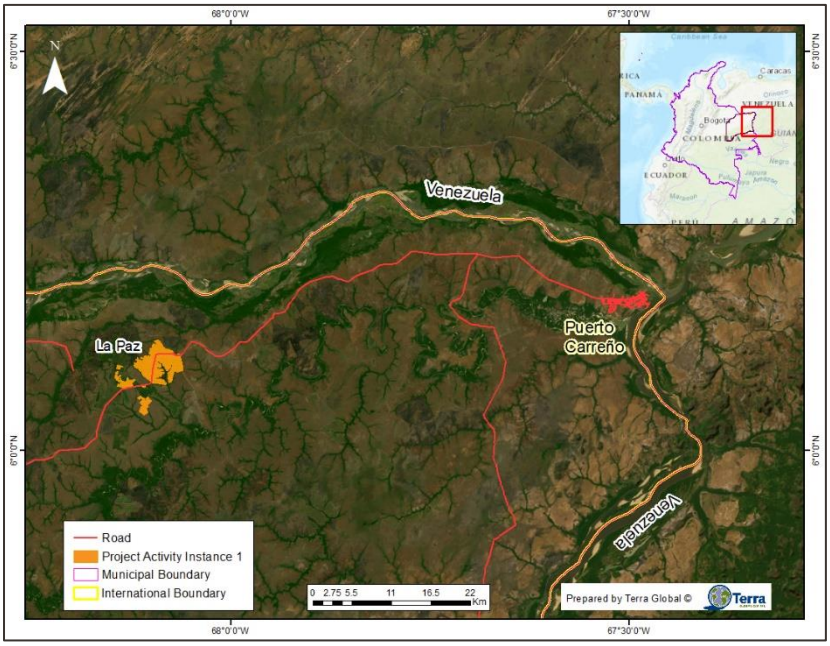
2.1.16 Project Zone Map and Project Location (VCS, 3.11, 3.18; CCB, G1.4-7, G1.13, CM1.2, B1.2)

As a grouped project, the project boundary includes any area in the department of Vichada in Colombia as shown in Map 3, where a new Project Activity Instance that meets the requirements can be added in the future.



Map 3. Geographic Project boundary for potential future expansion.

Col La Paz is an afforestation project located in Puerto Carreño, Vichada. Map 4 shows that the farm is located on road 40th (direction to Villavicencio), 50 kilometers west of the urban area of Puerto Carreño. is located at a height of 170 meters above sea level. The initial Project Activity Instance encompasses a total area of 2,378 hectares.

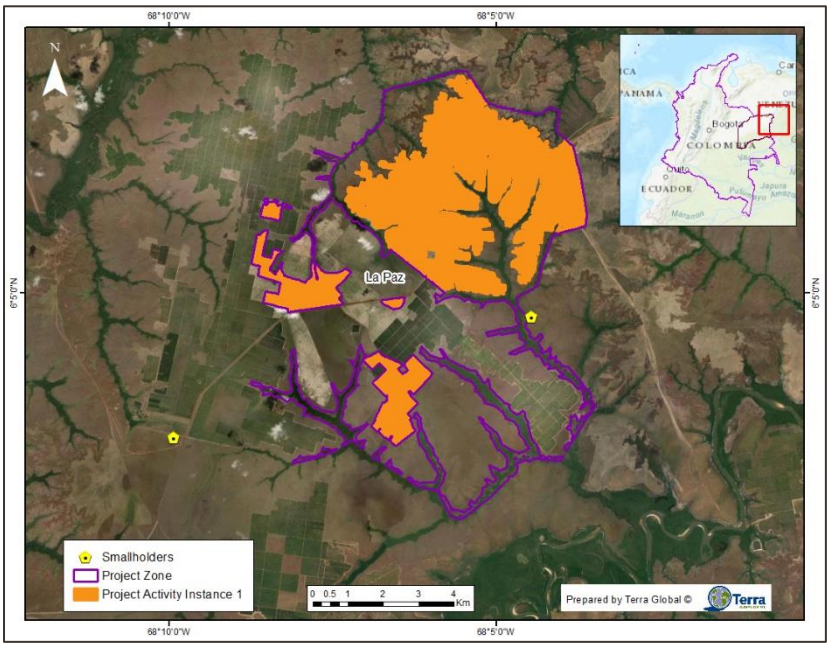


Map 4. Project Activity Instance 1 Location

The project activity instances are defined as the area in which activities are implemented that generate GHG emission reductions or removals, which has met the applicability criteria and is being monitored and verified to generate VCUs.

Map 5 shows the project zone is defined as the area encompassing the project areas in which project activities directly affect land and associated resources, including activities related to provision of alternate livelihoods and community development. To delimit the project zone of Finca La Paz, the Gallery Forest and (Morichales are defined as areas of high conservation value, the project activity instances and the nearby areas where 2 small stakeholders were identified that benefit from the implementation of firebreaks were incorporated.

The project zone low human population due to the presence of privately owned with afforestation firms and some smallholders' cattle farms, which limits available land for settlement. Most of the farm workers come from the urban areas of Puerto Carreño city. Puerto Carreño has a total population of 20,294 inhabitants (Departamento Nacional de Planeacion (DNP), 2021) that live mainly in the urban area of the municipality (77,4%). It is a culturally diverse city with more than 4,500 indigenous inhabitants from multiple indigenous communities like Sikuani, Sáliba, Amorúa, Piapoco, Piaroa, Puinabe, Curripaco, and Cubeo.



Map 5. Project Zone Instance 1.

2.1.17 Project Activities and Theory of Change (VCS, 3.6; CCB, G1.8)

> *outcomes, if appropriate. Delete the table in the appendix if not used. A results chain may also be developed explaining how multiple activities are expected to lead to multiple outputs and outcomes to lead to specific project objectives.* [13]

Col La Paz long-term goal is to establish a permanent cover forest with various tree species. To reach this objective Col La Paz will establish a forestry plantation with various rotations. Starting with a 10-year rotation of *Acacia mangium* for the first activity instance. *Acacia* represents a good option as it fixates nitrogen in the soil, improves soil quality, and is a fast- growing tree. It is very productive for biomass and round wood, which will be the primary revenue source for the farm.

On the second rotation, a gradual thinning process will happen in lines/belts/rows incrementally, starting with 30% where the acacia will be replaced with other fast-growing species such as eucalyptus and pine to maximize climate benefits and minimize the impact on the long-term average of live carbon stock. Later on, the second thinning of 50% the remaining plantation will be replaced, and the final harvest will be 100% of the remaining plantation.
Species planted as part of the forestry system:

- *Acacia mangium*
- *Pinus caribaea*
- *Eucalyptus pellita*

Silviculture/Management to be employed:
Acacia

- 1,003 hectares planted in 2018, 1,304 hectares planted in 2019 and 71 hectares planted in 2020
- Planting density. 1,333 trees per hectare
- Periodic Maintenance. Weed control, pruning of branches up to a height of 2 meters

Pine

- Percentage of area to be re-established 58%
- Planting density 1,111 trees per hectare
- Periodic Maintenance. Weed control, pruning of branches up to a height of 2 meters

Eucalyptus

- Percentage of area to be re-established 58%
- Planting density 1,667 trees per hectare
- Maintenance. Weed controls. The species has self-pruning of branches.

End Use/Applications.

- Pine – During the life cycle of the plantation, rosin is obtained, a resin that the tree offers and has commercial use in various industrial sectors, especially in cosmetics.
- Eucalyptus. Especially used in the hardwood industry for the production of flooring and similar applications.

Research and Innovation
To sustain the enrichment of the area, 2% of the project area (excluding the initial 2,378 hectaresa) will be designated for the establishment of new plantations featuring native species. The initial proposed species include Mahogany (*Swietenia macrophylla) and* Drum or bean *(Schizolobium parahyba).* The intention is to gain more specific knowledge and experience with these and other potential native species, with the aim of incorporating them into subsequent rotations at La Paz (Image 1).

Upon replacing the plantation lines with the new species, the plantation's density is preserved, and the impact on CO_2 fixation/LTA is expected to be less pronounced compared to clear-cutting every 10 years. For a clearer understanding of this approach, please refer to the images below. These depict the thinning of existing plantations in a distinct section of Ref La Paz, where a pilot trial is being conducted to establish new rotations of eucalyptus within an existing Acacia plantation.

The plantation's most relevant agricultural practices related to the emissions reductions are:

- Soil testing and nutrient mapping: La Paz Project will apply the use of precision agriculture techniques, such as soil testing and nutrient mapping, to determine the exact nutrient requirements of the crops being grown. These techniques are expected to prevent over-fertilization, reducing excess nutrient runoff and the associated carbon emissions from the production and transportation of fertilizers. Moreover, by avoiding excessive fertilizer application, the unused nutrients that could lead to emissions of greenhouse gases like nitrous oxide are limited. Fertilization involves the application of compound or simple chemical nutrients during the establishment and maintenance stages. These nutrients are composed of the physical or chemical mixture of various elements necessary for the development of planted trees. Chemical nutrients, based on their type and composition, should be applied through incorporation or broadcasting, depending on the size of the tree (larger trees require a greater application distance). This will be subject to proper weed control within the plantation and the type of chemical compounds that make up the fertilizer mixture to be used.
- Establishment or base fertilization: This will be done at the time of planting, usually 8-15 days after sowing. The fertilizer will always be incorporated into the soil, along the planting line or furrow, in four opposite holes, and at a distance of 20 centimetres. For this purpose, the dose should be divided into equal parts.
- Maintenance or cover fertilization: In the 2nd, 3rd, and 4th years of maintenance for each plantation, fertilization will be carried out with NPK compound fertilizer, increasing the fertilizer dose each year depending on the plantation's requirements. This is distributed as follows: the first fertilization at the beginning of winter (May to July), applying half of the total fertilizer quantity for the year. The second fertilization occurs five months after the previous application (October to November), concluding the winter season when the per-hectare application quantity justifies it.
- Mechanization over weed control: The farm will apply herbicide once a year between years one and two. Then (in year three), the canopy is expected to close and create a natural weed control mechanism. Using mechanical weed control methods like tilling and mowing to physically remove weeds can efficiently reduce reliance on chemical herbicides and their associated carbon related emissions.
- Early-stage pruning: At the initial phases of tree development, Col La farm recognizes the advantages of early-stage pruning in enhancing tree growth and depositing leaf and branch residues on the ground for carbon integration. The Project acknowledges that engaging in pruning activities can be advantageous for trees, especially during their early growth stages, as it fosters proper structural development, overall growth, and has the potential to enhance their ability to remove carbon from the atmosphere. Healthy trees, facilitated by effective pruning, are better

equipped to engage in photosynthesis, allocate resources efficiently, and sequester carbon effectively. Additionally, the proposed pruning activities in La Paz will promote a robust canopy, ensuring proper sunlight exposure and air circulation, thereby optimizing photosynthetic processes.

The farm's team is organized into three groups: two responsible for the forestry component (pruning, weed control, fertilization, harvest, etc.) and one responsible for beekeeping. The first two are composed of 35 workers (20 and 15) deployed at any part of the farm to take care of the plantation and ensure that the general forestry plan is implemented. On the other hand, as this kind of plantation tends to attract bees, the farm deploys a team of two beekeepers (and a supervisor) to take control of the wild beehives of the farm, retiring them from the field and depositing them in a secured place where bees are put into production. All workers stay at the estate's camp and have multiple services like meals, comfortable and free accommodation, and recreational spaces, such as volleyball and soccer fields.

The farm has three central policies with regards to its intended social impact approach:

- Since 2018, the "Social Policy" of the company, where the farm adopts the good neighbour approach to lead its social work. This policy aims to engage the company in a positive process regarding local development, prioritizing impact activities through a participative approach aiming to improve social, cultural, and environmental conditions.
- Gender equality and local workforce prioritization document. Some agreements have been signed with local authorities to promote equal gender pay and prioritize local people within the company's hiring process.
- Peaceful resolution of conflicts policy. According to the management team, La Paz has an attention phone number/hotline if any neighbour or critical stakeholders complain about the farm operation. According to the farm team, this number has been used to ask the farm for donations for children and local events. Also, there is a suggestion box that the farm supervisors review periodically.

Besides these policies, the farm has also advanced in independent activities regarding social impact. Some of the activities are:

- Raise awareness about environmental challenges with the Omacha foundation.
- Tree donations to local authorities (local government, police, and army) to support reforestation activities with children.
- Develop a socio-cultural survey to identify the social needs of local communities.
- Activities to support workers and their families affected by the COVID pandemic (i.e., cleaning kits, food donations).

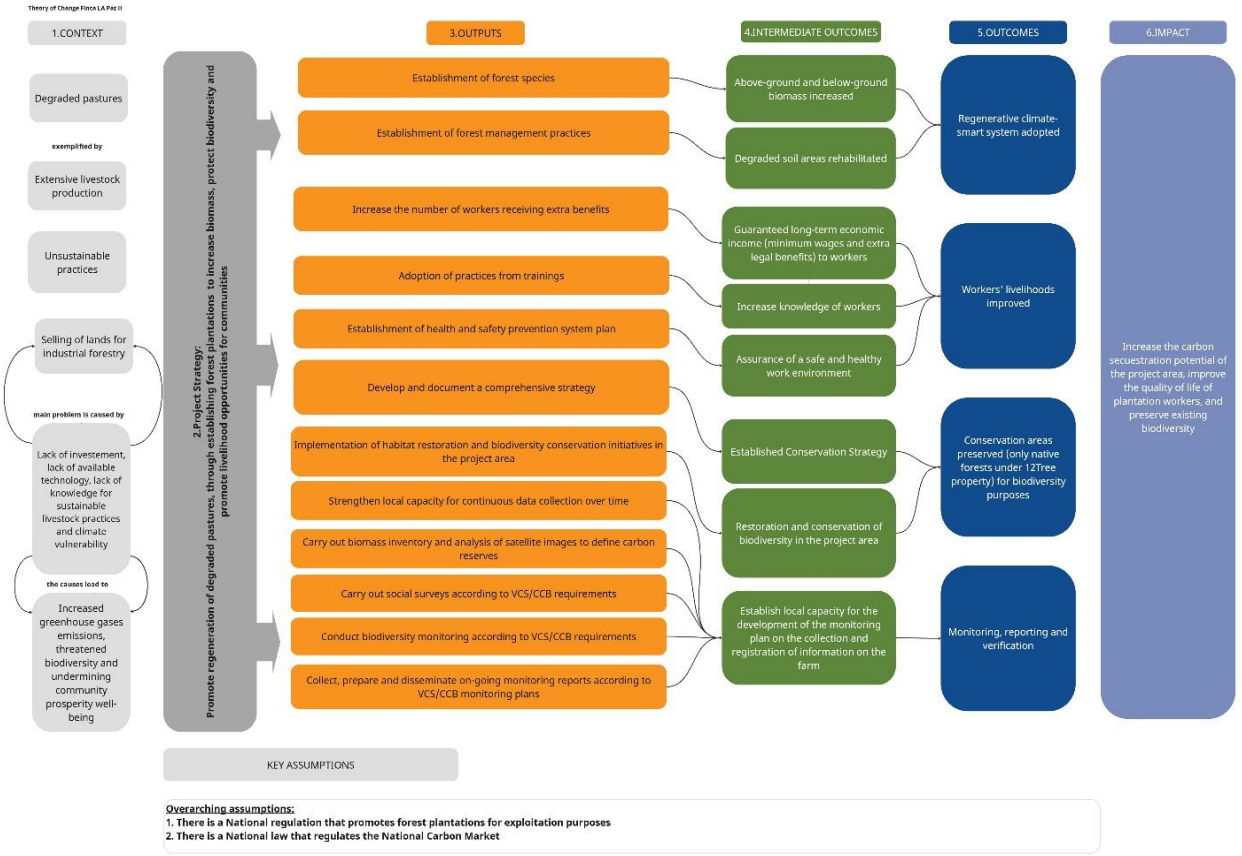


Figure 1. Project's Theory of Change (ToC)

2.1.18 Sustainable Development Contributions (VCS, 3.17)

The La Paz project aligns with Colombia's commitment to sustainable development and contributes to the country's efforts to meet its National Determined Contributions (NDCs) and the 2030 Agenda for Sustainable Development. The project focuses on restoring degraded grasslands in the Vichada Department while enhancing biodiversity, community well-being, and carbon sequestration.

The project involves implementing afforestation and reforestation measures in an area that has been subject to unsustainable grazing. It includes soil regeneration, regenerative agriculture, and the establishment of extensive forestry plantations. These activities not only improve the quality of the land but also create a productive ecosystem capable of producing timber products for construction materials and charcoal.

Through soil regeneration and low agrochemical use, the project enhances climate resilience and adaptive capacity. It aims to improve livelihoods and social policies by providing long-term contracts, free meals, and comfortable accommodation to its employees. The project also serves as a biodiversity corridor, creating optimal habitats for various wildlife species and contributing to the protection of wildlife, springs, and streams.

The La Paz project supports the government of Colombia's (GoC) goal of achieving a 51% reduction in emissions (AFD, 2022) by 2030 and carbon neutrality by 2050. It aligns with the country's Long-Term Climate Strategy 2050, aiming to foster carbon-neutral development and heightened adaptability.

Additionally, the project supports Colombia's focus on sustainable management of its natural capital and its commitment to reduce net deforestation of natural forests to zero hectares per year by 2030.

By aligning with the "Plan Nacional de Desarrollo 2018-2022" (Departamento Nacional de Planeacion, 2019), the project contributes to the GoC's regional strategies, addressing social, economic, and environmental challenges specific to the Vichada Department. In doing so, it helps advance the government's goal of transforming the region into a "sustainable pantry" for national and global needs.

La Paz project plays a pivotal role in Colombia's broader sustainable development strategy by fostering ecological restoration, promoting community well-being, and contributing to the nation's long-term climate goals. Through careful monitoring and reporting, the project ensures that its activities continue to support Colombia's progress towards achieving the SDGs.

Regarding the Sustainable Development Goals (SDGs), Colombia has committed to fulfilling the 2030 Agenda. The SDGs (Table 4) that the project will contribute through the implementation of activities are the following:

Table 4. Sustainable Developement Goals and Project Targets

UN SDG	Description of how the Project fulfills the Sustainable Development Goal
	The project will contribute to this target by focusing on complying on minimum wage.
	The project will contribute by supporting improved nutrition to field employees providing 3 meals per day.
	The project will guarantee 100% social insurance and access to healthcare for employees.
	The project will pay wages that allow decent living conditions for workers. In terms of achieving specific targets. Target 8.3. Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity, and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services. The project will provide decent job opportunities and trainings that will provide employees with additional skills and knowledge about sustainable agricultural production.

UN SDG	Description of how the Project fulfills the Sustainable Development Goal
	The project will implement sustainable practices such as efficient use of water through irrigation systems, and efficient use of fertilizers. Additionally, the project will provide training about health, work safety and environmental management.
	The project will increase carbon sequestration by boosting biomass production and organic carbon in the soil through the implementation of sustainable agroforestry systems. Additionally, the project will be establishing firebreaks and preventing fires in the project area, also the project will establish environmental policies to prevent hunting, fishing and illegal activities in the area of operation for the project.

2.1.19 Implementation Schedule (CCB, G1.9)

A comprehensive implementation workplan has been developed and is included in Table 5 provides the timeline for the key milestones for initial implementation.

Table 5. Timeline for project development and implementation

Date	Milestone(s) in the project's development and implementation
2018	12Tree Investment-Col La Paz, national Company was established to manage the plantation
May, 2018	Delegated Administration Contract-La Paz Reforestation
2018	Social Impact Baseline done
2018	Soil preparation and planting of third phase of agroforestry system (1,003 ha)
2019	Soil preparation and planting of fourth phase of agroforestry system (1,303 ha)
2020	Soil preparation and planting of fifth phase of agroforestry system (71 ha)
Aug, 2022	VCS/CCB Project start-Contract Terra Global
Sep, 2022	Confirm VCS project eligibility and proper methodology to be used
Oct, 2022	Define and review long term implementation plan
April-May 2023	Gather field data (Biodiversity, Biomass and Social assessments)
December 2023	Establish procedures for on-going monitoring responsibilities
Sep 2023	Develop 1st VCS/CCB monitoring report
January 2023	Project Dissemination
Feb-Mar 2023	Conduct and finalize VVB audit
May 2024	Issue VCUs

Date	Milestone(s) in the project's development and implementation
On-going	Monitor and report performance and impact

2.1.20 Risks to the Project (CCB, G1.10)

As the project is enrolled in the VCS, an extensive evaluation of potential risks has been conducted to establish the VCS risk buffer. This assessment outlines both natural and human-induced risks, and you can find the detailed documentation in the Risk Report provided in Appendix 6.3. Furthermore, project participants have identified additional risks, and the corresponding measures to alleviate these risks are outlined in

Identified Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
Inadequate safety conditions for executing project activities.	Concerns regarding the safety of personnel and the production processes in the plantation.	Col La Paz will implement protocols and provide training to foster safe working conditions.
Natural risks caused by fire or pests and disease	If the plantations experience fire, pest infestation, or diseases, it would impact the establishment, growth, and productivity of the trees.	Col La Paz will implement activities to mitigate natural risks, such as fire breaks and both holistic and direct disease/pest management measures.

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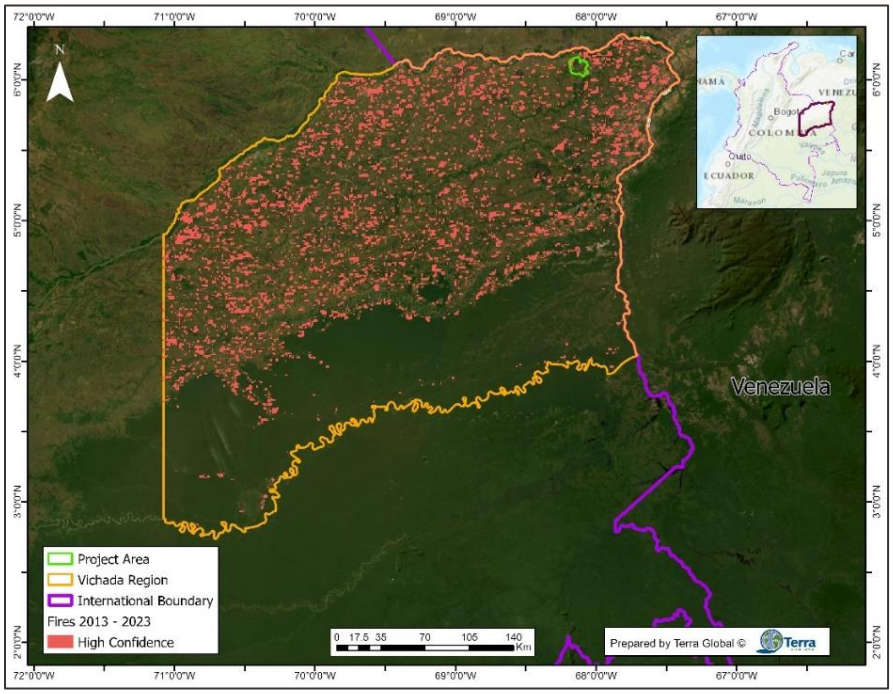
Table 6. Risk to the project and actions for mitigation

Identified Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
Inadequate safety conditions for executing project activities.	Concerns regarding the safety of personnel and the production processes in the plantation.	Col La Paz will implement protocols and provide training to foster safe working conditions.
Natural risks caused by fire or pests and disease	If the plantations experience fire, pest infestation, or diseases, it would impact the establishment, growth, and productivity of the trees.	Col La Paz will implement activities to mitigate natural risks, such as fire breaks and both holistic and direct disease/pest management measures.



Map 6. Fires Incidence in Vichada (2013-2023)

Map 6 shows the fires incidence in the region of Vichada in the period of 2013-2023. It shows the events with high confidence, that is, all the events shown had a high probability of being fires. It is a common practice in the region to use burning to renew grass for livestock grazing.

2.1.21 Benefit Permanence (CCB, G1.11)

The project lifetime is that of 53 years; however, the project is designed to create benefits and impacts that are expected to last beyond this time frame.

The efforts to institute reforestation practices in Colombia are part of a larger, longer-term effort to effectively break the cycle of unstainable land management that has caused the continued degradation of these lands. The restoration of the soil, the increase in above and below ground biomass, the maintenance and conservation of remaining forested areas, and the efficient use and management of available resources, all constitute practices that we hope will be adopted and maintained well after the crediting period of the project, and as part of a larger movement to revolutionize the way agriculture and food and fiber production are practiced in the region to finally bring about a much needed long-term sustainable natural resource management approach.

Comparing forestry and agricultural practices focused on maximizing short-term yields to the adoption of long- term carbon positive reforestation is beginning to show that the latter has lower costs, lower risks, and higher productivity, even without the added value of carbon revenue. The integrative sustainable forestry and carbon positive systems to be implemented and promoted in this landscape focus on critical components, such as soil health and fertility, which are prioritized to then build and maintain the long- term productivity of the land. Local employees will be afforded the practical and accessible knowledge and technologies needed to measure, monitor, and observe the changes of carbon in the soil, helping them to better understand the possible effects. Through the continued adoption of these sustainable carbon positive practices, future stakeholders in the region will be able to increase their long-yield and crop revenue while lowering their costs and reducing their risk.

These long-term practices and benefits are also all achieved by creating a more inclusive, modern, and sustainable supply chain where human rights are respected, existing biodiversity is protected and improved upon, and where local employees and farmers are given the opportunity to continue to improve upon their livelihoods. Achieving this goes beyond ensuring proper incomes and premiums are in place, and also involves supporting workers to increase their long-term productivity by helping them develop alternative farm models where communities can continue to find decent job opportunities and wages, and by building local capacity and providing on-going technical guidance and training for everyday farming decisions that will continue to reap benefits long after the project's crediting period is over. Through these longer-term capacity building and employment opportunities, local communities and stakeholders will continually be able to reduce their vulnerability through improved management and productivity approaches, will have more and better opportunities to access markets and commercialization systems, and will have access to more inclusive and beneficial sustainable development models for their hopes and aspirations.

2.1.22 Financial Sustainability (CCB, G1.12)

The project's finances are largely dependent on the establishment of new forest plantations and incremental carbon revenue. There is no pre-purchased Verified Emissions Reductions and Removals in this project. The costs in the project's early years will be covered by Col La Paz / 12Tree until carbon revenue is available. Col La Paz and 12Tree can finance the negative cashflows in the project's early years. The majority of the project's projected costs are related to plantation costs, including nurseries, plantation establishment, and maintenance activities. Over the project's first thirty years, the project is projected to generate nearly USD 12 million in revenue from the sale of carbon credits.

2.2 Without-project Land Use Scenario and Additionality

2.2.1 Conditions Prior to Project Initiation and Land Use Scenarios without the Project (VCS, 3.13; CCB, G2.1)

The most extensive ecosystem in the project area before its operation is the high and low natural savannahs which are characterized by scarce shrubs and native grasses.
The baseline scenario in the project zone would correspond to degraded pastures by extensive cattle ranching and periodic burning. Extensive cattle grazing has been common in the project zone since the 1960s-70s,. This land use has been accompanied by a practice of deliberately setting fires, more often in an uncontrolled manner, and up to 2-3 times a year, to make the regenerating grass more palatable to livestock.
The Department of Vichada, where the project is located, has 2,500,000 hectares intervened with extensively reared cattle, these areas are considered poor soils in terms of minerals and pastures unsuitable for livestock, in this department there is incipient management, low infrastructure, a livestock culture consisting of extensive grazing, extractive production and free will management.
Soils poor in minerals represent a disadvantage for the development of livestock activities, as well as the low fertility, the high degree of runoff make these soils fragile to erosion and with a low retention of adequate moisture in the soil; Within the native vegetation of the savannah, approximately 60 species of grasses and 20 leguminous plants have been identified. These species contribute to livestock feed, and although they are considered to have low nutritional value, they are the main source of food for all of Vichada's livestock activities.

All the management of the native savannah is done in the plains is done through periodic burns, this method is a feasible economic and biological strategy to eliminate large areas of savannah with mature forage that is no longer digestible for livestock. However, very often these fires get out of control affecting much more area than the one destined for livestock and generating loss of biodiversity, soil erosion and desertification (Moreno, 2022).

Burnings have become more frequent and extensive and for this reason, they also increasingly affect the balance of natural ecosystems, decreasing their resilience, annual burnings increase the productivity of grasslands and savannahs in the short term, however, applied with this frequency for long periods, it has negative impacts on the organic matter content in the soil, because it decreases the contributions of carbon and nitrogen.

Among the effects produced by burning that promote soil deterioration, alterations in the structure and properties of the soil can be highlighted: thermolysis of organic matter, oxidation and volatilization of free mineral components, decrease and redistribution of water content, death or damage to a large part of the organisms that inhabit the soil environment: macro, micro and mesofauna, fungi (mycorrhizae), bacteria, bulbs and seeds among them (Ojeda, 2015).

This common practice in the baseline scenario can be generally categorized as a degraded grassland, without input or management practices, such as fertilizer addition, improved grass species, and/or irrigation practices; conditions which can be expected to continue in the area in the absence of the *project.*

It is assumed that the physical parameters do not present considerable variations during the project period and in previous years, these parameters are described in the section 2.1.14.

2.2.2 Most-Likely Scenario Justification (CCB, G2.1)

For this project, the baseline scenario is assumed to be the same as the conditions described in 2.1.1 and 3.1.4

The Project Area and Zone will also experience the same conditions prior to the project initiation. In absence of the project, it is likely that factors that lead to a degradation of natural pastures and intensive grazing would continue. Drivers of land-use change will increase and the pressure on pastures and forest will remain steadfast.

2.2.3 Community and Biodiversity Additionality (CCB, G2.2)

The wildlife found in rural areas of the Neotropics holds immense importance for the survival, ecological continuity, and cultural heritage of local communities. Unfortunately, the loss of natural habitats, especially in jungle regions, and the regulated capture of animals for commercial purposes pose significant threats to the stability of Neotropical wildlife populations (Baptiste, L. G., Polanco, R., Hernández, S. & Quiceno, M. P., 2002). This phenomenon is a part of the global issue known as wildlife trafficking, which primarily occurs in developing countries due to the demand from developed nations (Broad, S., Mulliken, T. & Roe, D., 2001). Wildlife trafficking, ranking as the third largest illicit trade after drugs and arms, generates substantial annual revenue, estimated at nearly $300 billion in 2005, with a tendency to increase. However, the specific patterns of illegal activities vary across ecosystems, cultural contexts, and economic systems based on the availability of wildlife.

The department of Vichada, the second largest department in Colombia, is strategically important for the economy of the country's eastern border due to its location in the Orinoco River basin. Despite socio-environmental conflicts, Vichada is known for its enduring biological and cultural diversity, showcasing resilience. The region also holds significant value for exploration and scientific study of its plant and animal life, as well as driving initiatives for territorial understanding, environmental interpretation, and community-based ecotourism. However, the growing presence of extractive activities has resulted in overexploitation, unsustainable practices, and habitat degradation (Buitrago G. et al., 2019).

We have identified a set of notable obstacles concerning the community and biodiversity that would hinder the execution of the proposed project.

In terms of biodiversity, the department of Vichada host flora and fauna species that are under the threatened categories of the IUCN Red List. For instance, the flora species such *as Oxandra espintana* and *Sloanea eichleri* are critically endangered. Some fauna especies include *Podocnemis unifilis* and *Crocodylus intermedius* that are vulnerable and critically endangered respectively. Additionally, *Panthera onca* and *Tayasu pecari* are in vulnerable condition. The primary threat to most of these species arises

from habitat loss and fragmentation caused by escalating deforestation and degradation. These destructive activities lead to the destruction of their natural habitats, posing a significant danger to their survival. By implementing the forestry system, the project will enhance tree coverage, creating corridors that offer shelter and improved movement for local species within the area. This will facilitate their mobility between different forested regions.

In terms of community additionality, the Project has been implementing activities associated with knowledge transfer, capacity building, and the engagement of project workers cohort in farm decision making. Community additionality in a forestry project signifies the unique positive impacts it brings to the local community, going beyond environmental conservation to address social, economic, cultural, and educational aspects. By prioritizing community involvement, capacity building, and inclusive decision-making, Col La Paz aims to enhance the overall well-being and resilience of the community while promoting sustainable forest management practices.

In this perspective, Col La Paz has been providing training on sustainable forestry methods and encouraging the participation of Project participant farmers in decision-making processes as such empowerment can foster self-reliance while strengthening social cohesion amongst various stakeholders, from ground operations staff to those holding managerial roles.

In the risen of poverty levels and influx of migrants from neighbouring Venezuela, which are creating social tensions in the area regarding land tenure and local communities' capacity to maintain their livelihoods, the Project has been supporting the development of local stakeholders by providing employment opportunities and income generation. To materialize it, Col La Paz is implementing sustainable forestry practices that can promote the responsible use of forest resources, enabling communities to derive long-term livelihood benefits from the forest ecosystem.

2.2.4 Benefits to be used as Offsets (CCB, G2.2)

The Project aims to undergo validation and verification processes under the Verified Carbon Standard (VCS) and Climate, Community, and Biodiversity (CCB) standards. This will result in the generation of Verified Carbon Units (VCUs) that are specifically labeled with CCB to indicate the positive impacts on community, biodiversity, and adaptation, in addition to climate mitigation benefits. Currently, there is a limited market for distinct community and biodiversity credits, so there are no immediate plans to exclusively utilize them for offsetting purposes. However, the program maintains the right and flexibility to potentially use the biodiversity and community benefits in the future if it deems them valuable for achieving program objectives. If such a decision is made, the program will provide justification during the next verification process to demonstrate the additional value of utilizing unique biodiversity and/or community benefits as offsets, alongside the VCUs labeled with CCB.

2.3 Safeguards and Stakeholder Engagement

2.3.1 Stakeholder Identification (VCS, 3.18, 3.19; CCB G1.5)

Effectively identifying stakeholders is essential for fostering collaboration and engagement throughout the entire project lifecycle. Col La Paz is surrounded by various stakeholders, each impacted by farm development in distinct ways. Given the farm's significant isolation (90km from Puerto Carreño), it operates with a high degree of autonomy. Interactions occur with neighboring entities, including small estates, other reforestation projects, and a few villages/hamlets.

In the process of identifying and analyzing stakeholders, the Col La Paz Project collected valuable information, pinpointing shared objectives and lines of action. The initial stakeholder identification study took place in June 2016, followed by subsequent studies in 2018, 2022, and 2023. Throughout these analyses, individual interviews and focus groups were conducted with Col La Paz staff, alongside interviews with select members of the Puerto Carreño community.

The outcomes of these efforts led to the categorization of critical stakeholders into three distinct groups:

Internal stakeholders: Those directly contributing to Col La Paz's activities, such as investors, 12Tree employees, and field workers.

Connected stakeholders: Individuals or entities participating indirectly in the operation of La Paz, including suppliers, banks, buyers, legal services, and communities.

External stakeholders: Those contributing to the establishment of Col La Paz's framework, encompassing end-users, government entities, landowners, and development actors such as NGOs and social services.

2.3.2 Stakeholder Descriptions (VCS, 3.18, 3.19; CCB, G1.6, G1.13)

The Project initiated early engagement with stakeholders in project activities, aiming to cultivate relationships, garner support, and encourage participation. This proactive approach contributes to improved project outcomes and facilitates enhanced resource allocation. By comprehending the diverse needs and priorities of stakeholders, project managers in Col La Paz allocate resources judiciously, identifying those heavily dependent on local natural resources and prioritizing conservation measures. Due to territorial isolation, La Paz places priority on stakeholders based on their influence and impact levels. The Project actively involves stakeholders through regular consultations and consistent communication channels, ensuring their concerns are acknowledged and addressed. This ensures an inclusive and transparent process, involving all relevant stakeholders in ongoing information sharing and analysis.

In this sense, an external consultant has been hired to address external communication with local communities. The consultant has advanced in approaching local authorities and key stakeholders like UMATA (the public institution that brings technical assistance to smallholders), Omacha Foundation (environmental NGO), and GEO (private sector association). Also, interviewing an indigenous woman who is the leader of Puerto Carreño indigenous and is gaining notoriety as an influential activist in the area.

In this perspective, the Project operates within an environment surrounded by numerous stakeholders influencing and being influenced by farm operation development. Social studies conducted by a hired contractor in 2016, 2018, 2022, and 2023 have identified crucial stakeholders for the Project (Table 7) pinpointed their locations on the regional map and categorized them into three distinct groups.

- Internals: stakeholders who contribute directly to Col La Paz's activities, e.g., investors, 12Tree employees, field workers
- Connected: stakeholders who participate indirectly in the operation of La Paz: suppliers, banks, buyers, legal services, communities, etc.
- External: stakeholders who contribute to building Col La Paz's framework: end-users, government, landowners, and development actors (NGOs, social services, etc.).

Table 7. La Paz Stakeholders

Key Stakeholders					
#	Stakeholder	Type of organization	Scope (local, national, international)	Link with La Paz Project	Role
1	Field workers	Private sector	Local	Internal	Provide services and skills to the farm
2	Management Team	Private sector	Local	Internal	Farm's operation
3	12Tree Investors	Private sector	International	Internal	Project finance
4	12Tree Management	Private sector	National/International	Internal	General management of all projects

Key Stakeholders					
#	Stakeholder	Type of organization	Scope (local, national, international)	Link with La Paz Project	Role
5	External consultants	Private sector	National/International	Connected	Consulting and supporting activities
6	Local Community of Puerto Carreno (field workers)	Civil society	Local	Connected	Provide local workforce
7	Familia Garcia	Civil society	Local	Connected	Panela and meat supplier for the farm
8	Familia Ramirez	Civil society	Local	Connected	Commerce and internet services
9	Aceitico	Civil society	Local	External	Village nearby
10	Afforestation company 'Tierradentro'	Private sector	Local	Connected	Afforestation company of the region. Has participated in some projects as La Paz partner (Nature Conservancy 2015 project for instance)
11	Afforestation company Aldea Forestal	Private sector	Local	Connected	Afforestation company of the region. It has participated in some projects as La Paz partner (Forliance project for instance)
12	Afforestation company Inverbosques	Private sector	Local	Connected	Afforestation company of the region. It has participated in some projects as La Paz partner (Forliance project for instance)
13	Refoenergia Bita	Private sector	Local	Connected	Energy production/biomass buyer
14	Omacha ONG	Civil society	Local/National	Connected	Environmental conservation
15	Vichada Regional Gorvernment	Public institution	Local	Connected	Local authority – Region

Key Stakeholders					
#	Stakeholder	Type of organization	Scope (local, national, international)	Link with La Paz Project	Role
16	Puerto carreno City Hall	Public institution	Local	Connected	Local authority – District government
17	ICA	Public institution	Local/National	Connected	Reinforce agricultural practices of stakeholders
18	San Juan de Dios Hospital	Public institution	Local	Connected	Public Health Service
19	SENA	Public institution	Local/National	External	Technical education service (including some agriculture-related programs)
20	AGAF	Private sector	Local	Connected	Represent the forestry industry of the region (After the pandemic in 2020 this stakeholder was no longer active)
21	Wildlife Conservation Society	Civil society/NGO	Local/National/International	External	Environmental conservation/coordination of multiple stakeholders. Coordinator of several initiatives to protect the morichales and the dantas

2.3.3 Stakeholder Access to Project Documents (VCS, 3.18, 3.19; CCB, G3.1)

All stakeholders will have access to the project document to ensure that they are fully informed of the project's design and the activities that are relevant to them. Finca La Paz will ensure that the documents are fully accessible to the various stakeholders in printed format, in Spanish and that the level of detail (full document, summary) is appropriate. Table 8 provides a summary of how project documents will be shared with different stakeholders.

Table 8. Stakeholders access to information and project documents

Stakeholders	Information Sharing, Document Dissemination (G3.1: 2.3.1, 2.3.2, 2.3.5)
Internal-Employees	• Project summary presented in informational meeting. Summary materials distributed directly or upon request (print) • Validation and Verification process explained in person meeting.
Connected: stakeholders who participate indirectly in the operation of La Paz: suppliers, banks,	• Project summary upon request: print or digital • Summary of monitoring results shared upon request (relevant aspects)

Stakeholders	Information Sharing, Document Dissemination (G3.1: 2.3.1, 2.3.2, 2.3.5)
buyers, legal services, communities, etc.	
External: stakeholders: government, landowners, and development actors (NGOs, social services, etc.).	• Project summary should be shared (print or digital) • Validation and Verification process and progress summary shared in informational meeting (relevant aspects) • Monitoring results shared in informational meetings (relevant aspects)

2.3.4 Dissemination of Summary Project Documents (VCS, 3.18, 3.19; CCB, G3.1)

The summary of the Project Document will be translated into Spanish and shared with employees in in-person meetings. The document will be readily available in print (in a central and accessible location) or in digital format it will be publicly available on the public website www.verra.org, if and when interest is expressed in seeing them. All stakeholders will be asked to comment on the project document along with the summarized translated version.

Participants	Purpose	Date
Workers	Informational meeting, socialize PD summary and process for comments and feedback	February 2024-

2.3.5 Informational Meetings with Stakeholders (VCS, 3.18, 3.19; CCB, G3.1)

The project will ensure that all stakeholders have access to necessary information conveyed in an appropriate and accessible manner. Along with access to project documentation, informational meetings with stakeholders will be a very important means of achieving this. Informational meetings will take three main forms: periodic, reoccurring meetings; topic-specific meetings; and meetings incorporated into existing programs (training program).

The periodic meetings will happen at least twice a year for the employees and other stakeholders. The reoccurring meeting will happen every 3 months and the topic specific meetings will occur when necessary.

2.3.6 Risks from the Project and No Net Harm (VCS, 3.18, 3.19)

Project activities may pose certain risks, including natural and human-induced hazards, which must be managed to ensure no net harm and uphold stakeholder safety. These risks are listed and described in Table 9.

Table 9. Natural and Human induced risk mitigation measures

Identified risk	Potential impact of risk	Mitigation or preventative measure(s)
Inadequate safety conditions for implementing project activities- Human -induced risk	Threaten safety conditions for employees	To mitigate this risk, it is important to prioritize safety measures such as provide personal protective equipment, establish safety protocols, provide ongoing training to employees, and monitoring and of working conditions.
Natural risks caused by fire,	Threaten the project's success and impact local biodiversity,	To mitigate these risks, the project will develop and adopt fire management strategies

Identified risk	Potential impact of risk	Mitigation or preventative measure(s)
pests and/or diseases	potentially hindering soil regeneration and the growth of forest species.	(installing fire breaks) and conduct pest monitoring controls to protect the growing trees and ecosystems.

2.3.7 Community Costs, Risks, and Benefits (CCB, G3.2)

Several methods will be used to assess possible risks or costs that the project could pose to the community, including employees and their families. While no significant risks or costs associated with the project have been identified, safeguards, procedures, and monitoring have been put in place to ensure that any emerging risks are identified and addressed. In terms of benefits, the project is expected to provide a range of benefits for employees, which are described in detail below.

Employees

Project Activity Instance is largely addressed by operational and human resource management assessments and safeguards. These are conveyed to workers though their contracts, on-boarding, internal procedures, and on-going training.

Occupational Health and Safety Risk Assessment, Safeguards: In so far as the potential impact of the Project on employees can be considered in terms of Occupational Health and Safety, a detailed risk analysis was carried out by a qualified team according to IFC standards and national legislation, and appropriate measures to properly manage and reduce risks were determined and adopted. Workers receive regular training so that they are aware of the risks and the ways to prevent accidents, and if they happen, the reporting protocol has been established and implemented.
labor rights, procedures are in place to uphold national laws and standards, and workers are informed and trained on those topics.

Benefits: Workers are guaranteed a minimum wage and all the legal benefits, plus an additional bonus structure and benefits. These benefits are communicated to workers at the time of employment and in on-going communications and training. Current benefits, which may be augmented and adapted over time, include:
- Meals and beverages
- Life insurance contributions

2.3.8 Information to Stakeholders on Validation and Verification Process (VCS, 3.18.6, 3.19; CCB, G3.3)

Informational meetings will be held with workers to inform them about the validation and verification process. Group discussions will be held to review the VCS/CCB Project Document; stakeholders will be informed that a VVB will be coming to visit the Project Activity Instance at the validation time. At this time, stakeholders will be free to communicate openly and directly to the VVB about their experience.

2.3.9 Site Visit Information and Opportunities to Communicate with Auditor (VCS, 3.18.6; CCB, G3.3)

All stakeholders, including employees and community stakeholders, will be informed, and prepared in meetings six weeks prior to the auditor's visit, as well as a follow-up meeting two weeks prior to the visit. Stakeholders will be informed that the VVB is a neutral party and that they should feel free to communicate openly about their experience with the project. They are informed that they are welcome to communicate directly to the VVB.

2.3.10 Stakeholder Consultations (VCS, 3.18; CCB, G3.4)

Different methods for engaging with and consulting stakeholders will be used in the design and implementation phases of the project.

Employees

Date of stakeholder consultation	2018
Stakeholder engagement process	All involvement possibilities will be communicated through local channels, utilizing either written or verbal notifications in the local language, Spanish.
Consultation outcome	a. Project design: Employees will participate actively in assessments and activities carried out in preparation of the project, every 3 years. The assessment includes: - Household Surveys - Participatory Rural Appraisals b. Implementation phase: As activities are implemented and monitored, employees will be consulted to provide feedback and offer insights for their continuous improvement and adjustment. Consultations will mostly be done through focus groups and meetings every 3 years.
Stakeholder input	The socio-economic baseline assessment furnished pertinent details concerning the income streams and substitute options available to the workers, as well as their fundamental understanding and proficiency related to forestry production. This data was utilized to ascertain that the primary advantage for workers would entail financial stability through consistent employment, remunerated at the minimum wage rate and complemented with benefits, alongside the opportunity to gain insights into the production system.

Summary of comment received	When comment was received	Actions taken
Socioeconomic study- The study will provide information on the skills and knowledge of the workers, their income streams, and the age of the population	May 2023	La Paz will develop a well-structured HR structure with dedicated staff to work with employees to create a good and stable working environment
Household Surveys for workers- Learning the cost of living (food, housing, clothing, education,	May 2023	Consider the gap between minimum wage to living wage to guarantee a decent income for workers.

medical needs, others), income streams of workers.		

2.3.11 Continued Consultation and Adaptive Management (VCS, 3.18; CCB, G3.4)

Adaptive management is necessary in any project where activities need to consider a changing set of social dynamics and climate factors that can greatly impact the outcomes. Stakeholder needs will change over time as we are all affected by climate change. Communities and those on the ground are best situated to address these issues. Workers will be asked during the Participatory Rural Appraisal (PRA) to identify new and effective activities overtime and also describe the risk of implementing each activity. Risks are considered during implementation.

During the implementation of the Project, stakeholders (especially workers) will aid in the design through comprehensive consultations, assessments, and activities. The PRA process will be updated at every verification event. This process also involves annual reviews of the implementation workplan reviewed alongside the monitoring data.

These consultations will solicit meaningful contributions and input on the status of the project and the impact it is having on livelihoods, agricultural management, and other factors that affect the communities' well-being objectives related to the Project.

TGC has experience of working with communities in a participatory manner to gather knowledge in a culturally appropriate manner. TGC will seek to understand the Project as it relates to the stakeholders to bring meaningful, real change, and is collaboratively followed by a reflection.

2.3.12 Stakeholder Consultation Channels (CCB, G3.5)

The approaches and process developed for stakeholder communication and consultation in the project design phase are intended to serve as long term, on-going consultation channels. The communication and consultation channels developed with the various stakeholders are tailored to their level of involvement in the project based on the identified risks and benefits that the project confers to them. The most consulted stakeholders include employees, for whom multiple channels of frequent consultation are developed. Although less directly involved and impacted, other stakeholders will be included in aspects of the project that are relevant to them through appropriate communication channels. All stakeholders -both identified and as of yet unidentified- will have access to important summary documents upon request or on publicly available websites and have access to direct communication with the company through established questions and grievance mechanisms.

2.3.13 Stakeholder Participation in Decision-Making and Implementation (VCS, 3.18, 3.19; CCB, G3.6)

To ensure the participation of stakeholders in the decision-making process, it will be necessary to set up an interdisciplinary committee, that will support implementation to help keep them on track, providing technical assistance, and overseeing the spending process, among others. This committee will be led by Col La Paz, which includes the manager of Reforestadora Col La Paz.a worker's delegate, and representatives from Puerto Carreno community. Other members of this committee will be ICA (to confirm that areas are adequate). SENA and Mayor's office will be itinerant according to the topics needed to be discussed. It will be useful to keep written records of the agreements made with the different participants, ensuring that all parties have the same understanding of the decisions made. With this, we will seek to maintain clear expectations and maintain a committed and responsible process, as well as guidelines for monitoring by the committee mentioned above.

This committee will be structured with educated representatives that with broad vision and knowledge can support the decision-making process to recognize possible limitations and opportunities to develop each

proposed objective. If this purpose is achieved, there could be bases to maintain spaces for regular discussions and/or communication, as well as to have future collaboration between the participants.

2.3.14 Anti-Discrimination Assurance (VCS 3.19; CCB, G3.7)

The Project established a Gender Equity policy, which manifests the company's commitment to preventing any type of discrimination and assumes the responsibility of treating all personnel under criteria of equality and equity in order to promote diversity and equal opportunities. COL LA PAZ S.A.S. has a delegated administration contract with Reforestadora La Paz S.A.S., for all plantation management issues, including the FSC certification process and everything derived for compliance with national regulations, as well as those required by FSC, for the above there is a document called Forest Management Plan -PMF- where the aforementioned policy is included. All decisions regarding job performance are based on the results and potential shown by the workers (Reforestadora La Paz, 2021).

The hiring managers of this project recognize their role in the defense and promotion of fair work in Colombia and the principles of equality and non-discrimination expressed in national legislation. Thus, the adoption of this policy to promote gender equality, as a mechanism to promote equal opportunities for men and women in access to employment, working conditions, professional development, training, and participation in decision-making processes has been instituted.

The employment policy at La Paz falls under the following guidelines:

- Promote a healthy and safe work environment, which ensures appropriate measures to prevent accidents and reduce risk.
- Include equal opportunities for men and women in recruitment procedures and processes for all staff.
- Ensure that under working conditions of equal value, women and men receive equal pay and the same social benefits.
- Offer equal opportunities in the promotion and development of professional, technical, and operational skills according to the job position, without gender discrimination.
- Reject any type of discrimination or violence and establish mechanisms for the prevention and care of the different forms of harassment within the organization.
- Guarantee the prioritization of local labor without distinction of gender, in the hiring of collaborators for activities in the area.

2.3.15 Feedback and Grievance Redress Procedure (VCS, 3.18.4; CCB, G3.8)

Development process	The Conflict Resolution Mechanism is a tool within the Social Policy that facilitates the development of forestry operations. It is an initiative by Reforestadora La Paz aimed at fostering a culture of establishing and maintaining good relations with neighbors through organized and peaceful intervention in situations that may lead to conflicts. It also serves as a guide to address conflicts amicably, swiftly, and effectively in cases where negative impacts arise from the company to its neighbors or vice versa. The objectives of the mechanism are: - Promote a culture of peace and reconciliation between the Company and its neighbors.

	- Facilitate a clear and streamlined process to address and resolve any reconcilable conflicts that may arise between the Company and its neighbors.
Grievance redress procedure	The mechanism is implemented with steps for prevention, early identification, and amicable resolution of conflicts, seeking a satisfactory outcome. A clear flow is presented for reporting negative impacts, suggesting avenues such as surveys, phone calls, or communication with employees. It emphasizes that illegal activities must be reported directly to the authorities. Next, the approach and initial agreement are addressed, where contact is established, information is validated, and an action plan is proposed to mitigate the impact. If the counterpart does not accept, mediation is sought. Subsequently, the follow-up to the initial agreement is detailed, and the stages of conciliation are outlined, where the conciliator is notified, a formalized agreement with an action plan is reached, and monitoring is carried out. Finally, the judicial or administrative process and litigation are considered in case of non-compliance with the conciliation agreement. The instruments to complement the neighborhood conflict resolution mechanism are: - Communication and Information Mechanism with Communities and Authorities: Designed by Reforestadora La Paz for a fluent dialogue with neighbors, social organizations, and local authorities near the company's properties. - Periodic Sociocultural Survey for Impact Identification: Instrument to investigate negative and positive impacts generated by the company's forest operation in the area. - Helpline: Telephone line available to address neighbors' PQRSF, directly managed by Social Coordination. - Social Management Department: Directly and indirectly manages the Company's Social Policy, handling the reception, analysis, management, monitoring, and disclosure of conflicts caused by the Company to its neighbors or vice versa. - Employees: Human resources responsible for the comprehensive operation of activities on the company's properties. - Conciliator: Regional authority considered impartial and qualified by both parties to guide and propose solutions to conflicts, including entities like the Community Action Board, Municipal Ombudsman, Police Inspector, School Principal, People's Defender, Peace Judge, etc. - Sensitization on Conflict Resolution: Opportunity to promote a culture of peaceful and amicable conflict resolution among neighboring communities through workshops on the topic.

2.3.16 Accessibility of the Feedback and Grievance Redress Procedure (VCS, 3.19; CCB, G3.8)

Employees have the freedom to submit requests, complaints, or claims (PQR) confidentially through the designated communication channel. Col La Paz Social Area is in charge of communicating all information

related to the farm to all stakeholders The PQR can be submitted through the Feedback Grievance Redress Mechanism Policy and Procedure at the Terra Global Capital website (https://www.terraglobalcapital.com/feedback-and-grievances), where it encompasses any type of issues related to gender, religion, race, culture etc. This information is transparently communicated to them when they sign their employment contract or initiate a legal document. Following the established procedure, an impartial person in charge forwards the PQR to the relevant department for follow-up, monitoring, and resolution within a specified timeframe. The department head has 5 days to respond and communicate the answer, copying the concerned area. If no agreement is reached, a plan will be devised, outlining responsibilities, activities, and timelines for conflict resolution follow-up.

2.3.17 Worker Training (VCS, 3.19; CCB, G3.9)

A Training Program is designed to ensure that all project employees have the skills and technical knowledge to carry out activities safely, with quality and efficiency, preventing any possible risk. Col La Paz has a delegated administration contract with the La Paz reforestation plant, for all plantation management issues, including the FSC certification process and everything derived from compliance with national regulations, as well as those required by FSC. The plantation has developed a document called Occupational Health and Safety Management System-Roles and Responsibilities-SG-SST (Occupational Health and Safety Management System-Roles and Responsibilities-01-SG-SST, 2019).

The Occupational Health and Safety Management System SG-SST is under the responsibility of management with the support of:

- Designated Workplace Health and Safety Manager.
- Heads of areas or processes
- Joint Committee on Safety and Health at Work (COPASST)

2.3.18 Community Employment Opportunities (VCS, 3.19.13; CCB, G3.10)

Col La Paz, under the delegated management contract with Reforestadora La Paz, encouraged the latter to engage with the nearby community, particularly those situated in the urban area of Puerto Carreño. The aim was to communicate employment opportunities arising from the project's development, considering the significant labor requirements. To facilitate outreach to the community, Reforestadora La Paz collaborated with the municipal government of Puerto Carreño as a key mediator. Consequently, an agreement was formalized to prioritize employment opportunities for the local community (See in Appendix 4: Commercially Sensitive Information - *Convenio Priorizacion de Empleo Comunidad* document).

In this document Col La Paz prioritize the following aspects:

a. Give preference to employing individuals from the community or the local region for the different tasks needed in the forestry project.

b. Provide the individual delegated by the Municipal Administration with information on the essential requirements and other conditions for hiring personnel in the forestry project.

c. Share with the person appointed by the Municipal Administration the necessary criteria and other terms for employing individuals in the forestry project.

d. Inform the person delegated by the Municipal Administration about the representatives from La Paz or the contracting firms responsible for receiving and handling the job applications of those interested in working on the forestry project.

2.3.19 Occupational Safety Assessment (VCS, 3.19; CCB, G3.12)

In order to implement a safety and health program at work, through Reforestadora la Paz, an analysis of the risks that arise in the development of forestry activities and other activities within the facilities was carried out. The risk matrix and the training program can be made available upon request.

2.4 Management Capacity

2.4.1 Project Governance Structures (CCB, G4.1)

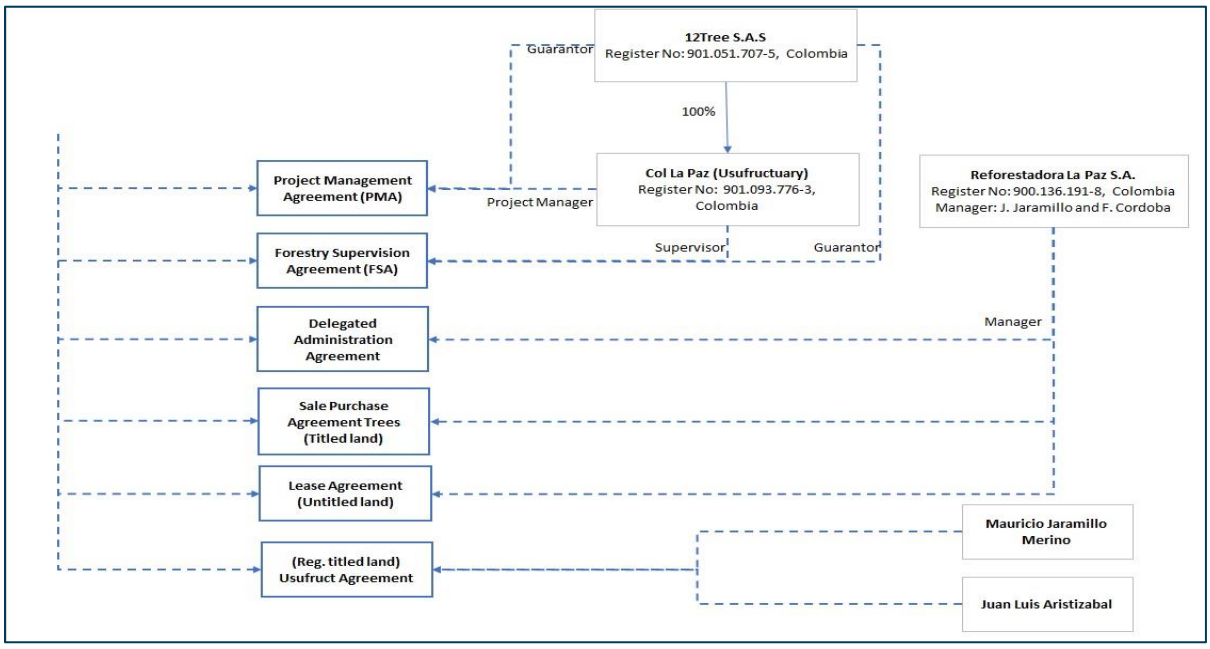


Figure 2. Governance Structure for the project.

COL La Paz S.A.S. (referred to as The Company) is a company incorporated in accordance with the laws of the republic of Colombia established on June 23,2017 and domiciled in Colombia. The Company's tax ID is 901093776 DV 3.
The Company is primarily involved in:
i. Forestry farms purchase and sale.
ii. Forestry farms management, operation, and administration, including cacao, teak, acacia plantations and other productive species.
iii. Other activities related to management, operation, and administration for forestry derivatives.
iv. Requesting and giving loans with or without guarantee.
v. Preparing, extending, fulfilling, and carrying out contracts of all kinds, destined to the forestry and agroforestry activities.

The Company has acacia plantations in Puerto Carreño-Vichada. The plantation management is carried out by the company Reforestadora la Paz S.A. (The Operator). The Company and the Operator entered into a Delegated Administration Contract on 05.02.2018, which is valid for at least 10 years and after that is renewed annually, unless any of the parties give a written notice of termination.

Col La Paz is a Colombian subsidiary of 12Tree S.A.S., which holds 100% ownership of Col La Paz shares.

2.4.2 Required Technical Skills (VCS, 3.19; CCB, G4.2)

The required technical skills are listed below in Table 10:

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Table 10. Required skills to implement and monitor the project.

Core Project Component	Col La Paz	Terra Global
Project authorization, design oversight and financing	√	
Project design and planning	√	√
Community engagement and support for implementation of community program	√	
Field data collection and on-going monitoring	√	√
VCS/CCB program development and GHG quantification	√	√
Design and oversight of program's institutional arrangements (fiscal, legal and contractual)	√	√
Coordination with National GHG accounting and other government agencies		√

2.4.3 Management Team Experience (VCS, 3.19; CCB, G4.2)

2.4.3.1 12Tree and Col La Paz

2.4.3.1.1 Johana Perez - Project Control (Col La Paz)

Professional in finance and International Relations with an MBA from Universidad San Antonio de Murcia-Spain. She has worked as administrative and financial director and controller for several companies in Latin America.

2.4.3.1.2 Pablo Reed – Senior Adviser (12Tree)

Pablo is a senior adviser on all matters related to nature-based solutions, forest carbon, and sustainable development project design, implementation, and certification. He holds a B.S. in Forest and Ecological Engineering as well as a minor in Latin American Studies from the University of Washington in Seattle. He also obtained a Master of Environmental Management degree at the Yale School of Forestry & Environmental Studies. Prior to his return to graduate school, he spent the preceding six years working with conservation and development projects in various countries in Latin America. He served as country director for a joint USAID/Idaho State University community conservation project in the Alta Verapaz region of Guatemala and also spent time in Panama working as an environmental and GIS consultant. His also worked for the Peace Corps in Ecuador, where he served as program manager for the posts' natural resource conservation program. While at Yale, his program of studies centered on social and political ecology as well as natural resource management policy. His research and subsequent thesis centered on the development of REDD (Reducing Emissions from Deforestation and Degradation) policy frameworks, especially as they pertain to the inclusion of communal Indigenous territories and lands. Pablo is a Certified Validator/Verifier for land use change and forest carbon offset projects and forestry methodologies (ARB, CAR, ACR, VCS/Verra, CCBA, and Gold Standard). His most recent work efforts involve pioneering the development of market-based approaches to carbon Insets / Scope 3 removals within the food and agriculture sector via the incorporation of regenerative and climate smart practices.

2.4.3.1.3 Diego Norato - Project Supervisor (Col La Paz)

Agricultural Engineer, master's degree in business administration (MBA), with more than 18 years of experience in managing, evaluating, and starting up agro-industrial enterprises. His expertise covers a diverse range of crops including avocado, coffee, citrus, coconut cocoa, agroforestry, plantain, potato, oil palm, and commercial social business. In his professional career, he has been involved in managing, operating, and evaluating various agro-industrial projects. He also led technical and administrative teams with a systemic approach to production chains, organizational and strategic development.

2.4.3.1.4 Jennifer Monroy - Forest Engineer (Col La Paz)

Bringing 2 years of experience as a Forestry Engineer to Col La Paz, she leverages her engineering background to enhance proficiency in forestry, logging, and Forest Stewardship Council (FSC) certification. At Col La Paz, she contributes to the GHG Quantification team, overseeing the assessment of carbon eligibility and the quantification of greenhouse gas (GHG) reductions and removals in accordance with market standards.

2.4.3.1.5 Juan Miguel Jaramillo – Manager (Reforestadora La Paz)

He specializes in Investment Management, holding a degree in the same field and a minor in International Business from Lynn University, where he maintained a GPA of 3.8/4.0. During his academic journey, he earned recognition, including placement on the Dean's List and invitations to esteemed honor societies like Sigma Beta Delta and Golden Key International.

In his current role as the General Manager at Crop Management SAS, based in Medellin, Colombia, Juan is responsible for executing projects related to crop technification, overseeing 1,830 hectares spanning projects in Colombia and Ecuador. His daily duties encompass budget management, project coordination, logistics, and the supervision of various operational aspects. Prior to this, he gained valuable experience as a Project Manager at 12Tree SAS, where he contributed to project acquisitions, managed finances, and handled reporting.

2.4.3.1.6 Paola Archila – Human Resources Manager Latam (12Tree and Col La Paz)

Psychologist, specialist in Human Talent Management, specialist in Occupational Health and Safety Management and Master in People Management, with training as an auditor in integrated management systems. She has more than 15 years of experience in management positions of human talent, safety, and health at work in different leading companies in the Agroforestry Sector, Health, transportation, and services.

2.4.3.2 Terra Global Capital

Founded in 2006, Terra Global is a woman-run, women-owned for-profit social enterprise, and small business. Terra Global's mission is to facilitate financially, socially, and environmentally sustainable forestry and agricultural land management practices. Terra Global is the leader in sustainable forest and agriculture program development, land-use greenhouse gas quantification and finance, providing technical expertise and investment capital to their global client base in a collaborative and innovative manner. Having worked in more than 28 countries, Terra Global has deep global experience generating positive social and environmental outcomes from sustainable landscape management, working with its community and government partners. Terra Global has extensive experience in developing countries and in the U.S. as a leading developer of quantification and monitoring protocols of the environmental outcomes from a full range of agricultural and forest management practices.

Terra's approach employs transparency, accountability, and collaboration to deliver on our three key principles; delivering practical solutions that are responsive, pragmatic, and innovative; committed to bringing insight and innovation to catalyze the intersection between concessional and commercial approaches and bringing a "one team" culture when working with a diverse pool of talent across multiple geographies, cultures, and technical disciplines.

2.4.3.2.1 Leslie L. Durschinger - Founder, CEO, Conservation Finance, Sustainable Landscape Program Development

Leveraging 20 years of experience and a proven track record in the financial services industry, Ms. Durschinger founded Terra Global Capital in 2006 to promote results-based approaches to sustainable

agriculture and forestry management. Ms. Durschinger is recognized as a pioneer and innovator in alignment of development values and financially viable approaches to sustainable landscape management. Terra is now the leader in emerging market climate smart agriculture and reduced deforestation program development, greenhouse gas quantification and business model development, providing technical expertise their global client base of governments, NGOs, and private companies in a collaborative and participatory manner. Under Durschinger's leadership Terra has structured risk mitigation instruments, trust funds and private equity funds to drive investment capital to sustainable agricultural production and forest management. Prior to Terra, Ms. Durschinger held senior management positions in the areas of derivatives trading, investment management, algorithmic trading, risk management, and securities lending. She is on the Board of ACDI-VOCA, Chair of the International Emission Trading Associations REDD+ Working Group and is a member of the Verra VCS Program Advisory Group, REDD+ Social & Environmental Standards Committee, VCS JNR Expert Working Group, and Coalition on Agricultural Greenhouse (C-AGG) Advisory Committee. Ms. Durschinger and her family make small production olive oil on their farm in Mendocino County. Among her previous employers are JP Morgan, Merrill Lynch, Barclays Global Investors and Charles Schwab.

2.4.3.2.2 Holver Arango , GHG Quantification

Holver Arango has more than 10 years experience as a forestry engineer and is skilled in project formulation and management. At Terra Global, Holver is focused on GHG quantification for conservation and sustainable forest management projects. He has experience working with rural communities and environmental and agrarian institutions. Holver also has experience in multiple Colombian government entities (research institutes, environmental institutes, municipalities), international cooperation projects, and private companies in Colombia. He is knowledgeable in forest community management, land use planning, environmental and agrarian law, and official institutions. His work has focused on projects that aim to improve rural people's life, especially those that focus on human rights and sustainability as the anchor of forest conservation and restoration initiatives. Holver has a Bachelor of Science in Forest Engineering from the National University of Colombia.

2.4.3.2.3 Angelica Garcia, Natural Resource Management, Biodiversity

Angelica Garcia brings 15 years of experience in academic and non-academic settings related to natural resources management and applied research. At Terra Global, Angelica manages projects and supports the development of biodiversity benefits and quantification, as well as monitoring and other co-benefits. Angelica's extensive background includes holding key positions at renowned biological stations in the Peruvian Amazon, where she served as a resident manager and researcher. Her hands-on experience in these positions, along with her expertise as a wildlife supervisor and environmental consultant, has allowed her to bring her knowledge of biodiversity to her work at Terra. Angelica holds a Bachelor of Science degree in Biology, specializing in Ecology, which laid the foundation for her academic journey. She was awarded a Fulbright Scholarship, leading her to pursue a Master of Science degree in Forest Resources and Conservation, as well as a Ph.D. in Interdisciplinary Ecology from the University of Florida. During her doctoral studies, Angelica conducted in-depth research on the ecological and socioeconomic factors influencing palm management and its sustainability among indigenous people and local communities in the Peruvian Amazon.

2.4.3.2.4 David Montoya González, Remote Sensing Analysis and GIS

Mr. Montoya has wide experience in remote sensing and GIS. He holds a bachelor's degree in Forest Engineer from the National University of Colombia (UNAL) and a master's degree in remote sensing from Federal University of Rio Grande do Sul (UFRGS) – Brazil. Mr. Montoya has worked with Colombian government entities, such as the national department of statistics (DANE), supporting the 3rd National Agricultural Census, and the National University of Colombia in research projects in the Andean Region, focused in geomorphometry, and in the Sibundoy Valley with the indigenous communities Inga and Kamentsá analyzing the land cover changes and natural resources sustainability. Also, he worked in the private sector developing GHG assessments and quantification.

2.4.4 Project Management Partnerships and Team Development (VCS, 3.19; CCB, G4.2)

The Project Proponents have very strong capacity for implementation for project activities. As the Project adds new Project Activity Instances (new plantations), it will be determined whether other partners are

needed. The Project will, however, use short-term technical experts as needed to supplement the core team and bring specialized expertise.

2.4.5 Financial Health of Implementing Organization(s) (CCB, G4.3)

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The project's implementing organizations are 12Tree and Col La Paz, which is a subsidiary of 12Tree. 12Tree is a financially stable company with significant field experience managing sustainable forestry and agroforestry systems. The financial health of Col La Paz is supported by 12Tree.

2.4.6 Avoidance of Corruption and Other Unethical Behavior (VCS, 3.19; CCB, G4.3)

Col La Paz has established measures and strategies, as detailed in the manual, to ensure that the project proponent and other entities involved in project design and implementation are not engaged in corruption. These measures are specifically designed to prevent various forms of corruption such as bribery, embezzlement, fraud, favoritism, cronyism, nepotism, extortion, and collusion. The manual, therefore, acts as a key component in providing assurance that the project and its stakeholders adhere to anti-corruption standards (See Appendix 4: Commercially Sensitive Information: *Manual de Politicas y Procedimientos Sagrilaft Col La Paz S.A.S.* Document)

2.4.7 Commercially Sensitive Information (VCS, 3.5.2 – 3.5.4; CCB Rules, 3.5.13 – 3.5.14)

The Commercially Sensitive Information, created and submitted to the VVB, is outlined in Appendix 4: Commercially Sensitive Information.

2.5 Legal Status and Property Rights

2.5.1 National and Local Laws (VCS, 3.1, 3.6. 3.7, 3.14, 3.18, 3.19; CCB, G5.6)

Some of the most relevant laws concerning the agricultural and forestry sectors are the following:

- Law 1753 of 2015, in its strategy of "transformation of the countryside" states as one of the objectives the "ordering of rural territory and access to land by settlers rural Law 99 of 1993, Environmental Policy of Colombia
- Decree 1076 of 2015, through which the Sole Regulatory Decree of the Environment and Sustainable Development Sector is issued."
- Law 1776 of 2016 in article 4 establishes that "the Ministry of Agriculture and Rural Development will be responsible for leading and coordinating the formulation of the policy of rural development, based on criteria of productive and social ordering that allow to determine the priority areas of rural development". Also, it points out that "The Ministry of Agriculture and Rural Development will define the agricultural frontier taking into account the definitions of the environmental reserve zones and other restrictions on the use of land imposed by any governmental authority".
- Law 99 of 1993 in article 5 numeral 1, establishes that it corresponds to the Ministry of Environment and Sustainable Development, among other functions, that of "Formulating the policy in relation to the environment and renewable natural resources, and establish the rules and criteria of environmental ordinance for the use of the territory and the adjacent seas, to ensure the sustainable use of resources renewable natural resources and the environment.
- Law 99 of 1993 in article 5 numeral 1, establishes that it corresponds to the Ministry of Environment and Sustainable Development, among other functions, that of "Formulating the policy in relation to the environment and renewable natural resources, and establish the rules and criteria

of environmental ordinance for the use of the territory and the adjacent seas, to ensure the sustainable use of resources renewable natural resources and the environment.

2.5.2 Relevant Laws and Regulations Related to Worker's Rights (VCS, 3.18.2; CCB, G3.11)

The project complies with national labor laws regarding wages, social benefits included in the general pension, health, occupational risk, family allowance, and complementary social services defined by law. The most relevant legal norms that apply to the project are the following:

- Decree Law 2663/1950 that regulates the Substantive Labor Code.
- Decree 1072/2015 by which the Sole Regulatory Decree of the Labor Sector is issued.

Law 1010/2016 by which measures are adopted to prevent, correct, and punish workplace harassment and other harassment in the framework of labour relations. For the project it is important that all workers know their rights, duties, and responsibilities within the legal framework, for this reason it is stipulated that the first day of work a complete induction is carried out to explain everything related to salary compliance. payments, social security, legal and extra-legal benefits, as well as communication channels.

2.5.3 Human Rights (VCS, 3.19)

Project activities will be implemented on private land, no LPs, LCs or customary right holders' rights were involved in the transaction.

2.5.4 Indigenous Peoples and Cultural Heritage (VCS, 3.18, 3.19)

The project area is not in IP territory and no heritage will be affected by project activities.

2.5.5 Statutory and Customary Property Rights (VCS, 3.18, 3.19; CCB, G5.1)

As per the data recorded in the 2009 land census, covering 86 million hectares of the country's total surface area of 114 million hectares, land distribution is classified into four primary categories: government land (20.5%), protected areas (3.7%), private land (44.7%), and collective land (29%). Additional minor ownership types include black and indigenous communities. While private property holds the largest share, collective property also bears significant weight. In Colombia, land ownership falls into three categories: public, private, and communal. Private property, as defined by the Political Constitution (Article 58), pertains to individuals or legal entities who have the right to manage and enjoy their property, provided it complies with the law and respects the rights of others (Unidad de Planificacion Rural Agropecuaria (UPRA), n.d.).Through the certificates of tradition and freedom that the owner Reforestadora La Paz has.

2.5.6 Recognition of Property Rights (VCS, 3.7, 3.18, 3.19; CCB, G5.1)

The proprietary information, created and submitted to the VVB, is outlined in Appendix 4.

2.5.7 Free, Prior and Informed Consent (VCS, 3.18; CCB, G5.2)

Description of process for obtaining consent	Project activities will be implemented on private land, this land was purchased from a single owner, no LPs.LCs or customary right holder rights were involved, thus no FPIC consent process was conducted.
Outcome of FPIC process	The Project will not encroach uninvited on private property, community property, or any other government property. The Project is operated on private land that was leased by Col La Paz who has all the legal permits and authorizations for use of land and water. The Project will follow the agreed guidelines for land use in all future Project Activity Instances and the Project Zone Instances without encroaching into any other properties.

	The Project Proponent has explicit and uncontested legal tenure and rights over the land, including the rights to benefit from income generating activities including carbon finance, and to oversee the benefits sharing available from the carbon finance.

2.5.8 Benefit Sharing Mechanisms (VCS, 3.18, 3.19;)

The project is private land, there will not be impacts on property rights.

2.5.9 Property Rights Protection (VCS, 3.18, 3.19; CCB, G5.3)

The Project has not and will not involve the resettlement of any communities or households, since there are no communities living in the Project Activity Instance. Resettlement is not a component of the Project design, nor would it be acceptable under Colombian Law.

None of the Project Activities require relocation, either voluntary or involuntary.

2.5.10 Illegal Activity Identification (VCS, 3.19; CCB, G5.4)

Col La Paz, under delegated administration, has established a continuous monitoring plan for the area to proactively prevent and identify any form of alteration, with a particular emphasis on environmental and social considerations. To facilitate these responsibilities, internal reporting processes are in place. Additionally, if needed, any detected illegal activities are reported to the relevant legal authorities."

2.5.11 Ongoing Disputes (VCS, 3.18, 3.19; CCB, G5.5)

No conflicts or disputes remain unresolved, and there haven't been any issues in this regard throughout the project's development.

2.5.12 Approvals (CCB, G5.7)

The project operates on privately-owned land leased by Col La Paz S.A.S, which possesses all the necessary legal authorizations and permissions for land and water usage. Article 58 of the Political Constitution of 1991, while safeguarding private property and other rights established by civil law, also mandates that private property carries inherent social and ecological responsibilities.

2.5.13 Double Counting and Participation under Other GHG Programs (VCS, 3.23; CCB G5.9)

The current project excludes any areas that have been validated under international or national standards to ensure there is no duplication of efforts. Additionally, the project will be registered in the RENARE (National Registry of Greenhouse Gas Emissions Reductions).

To prevent the double counting of mitigation results at the national level, particularly for credits sold in the voluntary market and those generated for commercialization in the Colombian domestic market, the project proponent will take necessary actions to register and update the initiative's information in the National Registry of GHG Emission Reduction (RENARE), within three months of its operation by MADS. This action is in accordance with the guidelines of Art. 54 of Resolution 1447 of 2018. By registering the project in RENARE, overlaps incompatible with future programs or projects in the same Project Activity Instance will be avoided, thus eliminating the possibility of double counting.

2.5.13.1 No Double Issuance

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program, or any other form of community, social, or biodiversity unit or credit?

☐ Yes ☒ No

2.5.13.2 Registration in Other GHG Programs

Is the project registered or seeking registration under any other GHG programs?

☐ Yes ☒ No

2.5.13.3 Projects Rejected by Other GHG Programs

Has the project been rejected by any other GHG programs?

☐ Yes ☒ No

2.5.14 Double Claiming, Other Forms of Credit, and Scope 3 Emissions (VCS, 3.24)

2.5.14.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit? See the *VCS Program Definitions* for definitions of emissions trading program and binding emission limit.

☐ Yes ☒ No

2.5.14.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system? See the *VCS Program Definitions* for definition of GHG-related environmental credit system.

☐ Yes ☒ No

2.5.14.3 Supply Chain (Scope 3) Emissions

Do the project activities affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No

Is the project proponent(s) or authorized representative a buyer or seller of the product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No

If yes:

Has the project proponent(s) or authorized representative posted a public statement on their website saying, "Carbon credits may be issued through Verified Carbon Standard project [project ID] for the greenhouse gas emission reductions or removals associated with [project proponent or authorized representative organization name(s)] [name of product(s) whose emissions footprint is changed by the project activities]."?

☐ Yes ☒ No

2.6 Additional Information Relevant to the Project

2.6.1 Leakage Management (VCS, 3.11, 3.15)

Given the negligible emissions from leakage, the project does not require a management plan.Further Information

No additional relevant legislative, technical, economic, sectoral, social, environmental, geographic, site-specific and/or temporal information will be included.

3 CLIMATE

3.1 Application of Methodology

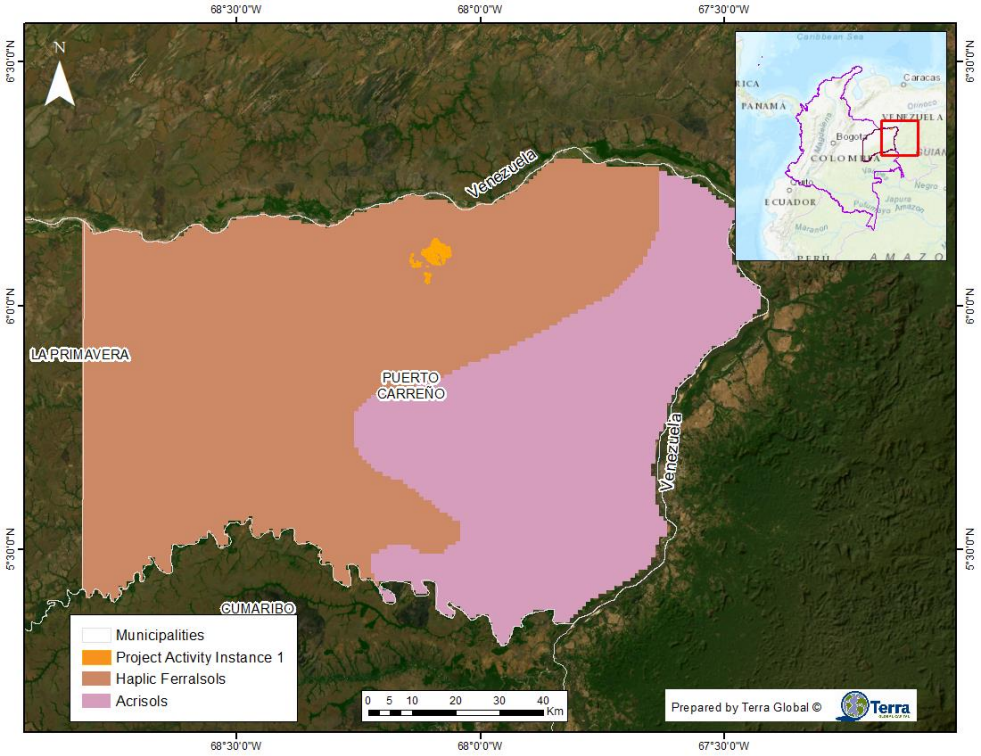
3.1.1 Title and Reference of Methodology (VCS, 3.1)

Type (methodology, tool, module)	Reference ID (if applicable)	Title	Version
Methodology	*VM0047*	VM0047 Afforestation, Reforestation, and Revegetation	*V1.0*
Module	*VMD0054*	*Module for estimating leakage from ARR activities*	*V1.0*
Tool	AR-AM-TOOL16	Estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities	*01.1.0*
Tool	AR-AM-TOOL14	Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities	*04.1*
Tool	AR-TOOL12	Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities	*03.0*

3.1.2 Applicability of Methodology (VCS, 3.1)

Reference ID/Title	Applicability condition	Justification of conformance
VM0047	Project activities increase vegetative cover	As this is an ARR project, the project activities involve the planting of woody biomass on land that had originally been degraded grasslands, thereby increasing the vegetative cover. See sections 2.1.4 and for more information.
...	Area based, census based, or a combination of the two quantification approaches may be used provided approach-specific conditions are met. Approaches must be selected at the project start date and used for the entire project crediting period.	The approach that has been selected is the area-based approach. This approach has two additional applicability conditions, both of which have been met and are described in Section 2.1.4: • Project activities produce continuous tree and/or shrub cover on any contiguous area exceeding one hectare. • Projects may include direct and indirect activities. • Project activities do not involve mechanical removal offsite or burning of significant stocks of pre-existing dead wood (e.g., for site preparation) As the land use of the project area prior to Project Start was degraded grassland, there were no significant stocks of pre-existing dead wood that could have been removed offsite or burned.
	Project activities may not take place in tidal wetlands (e.g., mangroves, salt marshes);	The total Project Activity Instance Area is not occurring on wetlands follows the definition of wetlands according to the 2003 IPCC GPG LULUCF guidance – where a wetland category includes land that is covered or saturated by water for all or part of the year (e.g. peatland) and that does not fall into cropland, grassland, or settlements categories (Map 7).
	Project activities do not occur on organic soils or in wetlands and result in a manipulation of the water table.	To map the major IPCC soil classes was used to determine whether the Project Activity Instance falls into wetland or organic soil class (Map 7). The soil type classification used was derived from the Harmonized World Soil Database - HWSD

		(Fischer, 2008) which is the result of a collaboration between the FAO with IIASA, ISRIC-World Soil Information, Institute of Soil Science, Chinese Academy of Sciences (ISSCAS), and the Joint Research Centre of the European Commission (JRC). The soils in the entire Project Activity Instance belong to the IPCC soil classes of Low Activity Clay Soils (LAC). None of the Project Activity Instance belongs to the category of IPCC classes of organic soils (ORG) or wetlands (WET).



Map 7. Dominant soil using the Harmonized World Soil Database v 1.2 showing Project Activity Instance 1.

In addition to the above applicability conditions, the conditions contained in the procedures, tools, guidelines, and guidance shall apply when these are used along with the methodology. Module VMD0054 was the only additional module used for the project. This module was mandatory and was used to estimate the leakage caused from ARR activities in the project area. There were no additional applicability conditions required by the module.

3.1.3 Project Boundary (VCS, 3.12)

The carbon pools included in the project for carbon stock changes are shown in Table 11. These carbon pools will be significantly affected by project activities and are monitored over time. Emission sources and associated GHGs selected for accounting are shown in Table 11 and Table 12.

Table 11. Carbon pools included in the project

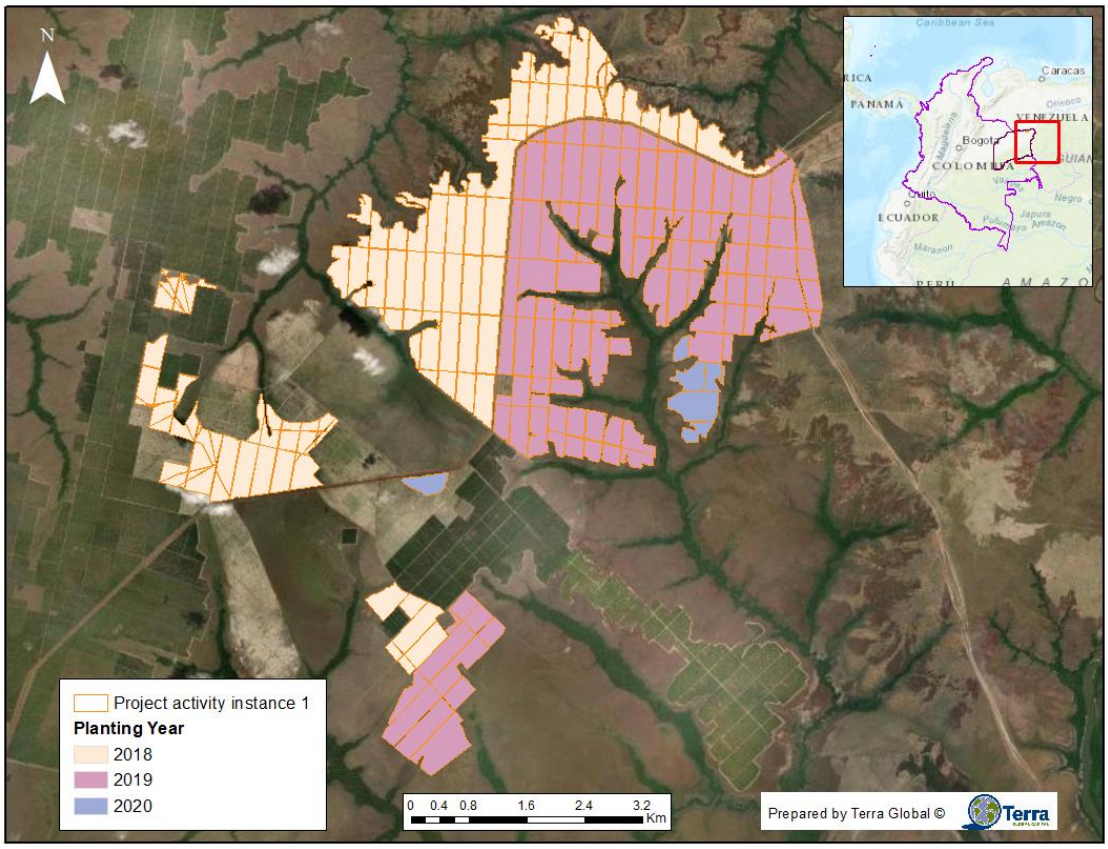
Carbon pools	Included?	Justification/Explanation
Above-ground biomass	Yes	This is the major carbon pool subjected to project activity
Below-ground biomass	Yes	Carbon stock in this pool is expected to increase due to the implementation of the project activity
Dead wood	Yes/Optional	Carbon stock in these pools will increase due to the implementation of the project activity. Significance of this pool will be evaluated ex-post.
Litter	Yes/Optional	Carbon stock in these pools will increase due to the implementation of the project activity. Significance of this pool will be evaluated ex-post.
Soil organic carbon	Yes/Optional	Carbon stock in these pools will increase due to the implementation of the project activity. Significance of this pool will be evaluated ex-post.

Table 12. Emission sources for the project

Source		Gas	Included?	Justification/explanation
Baseline	*Burning of biomass*	*CO2*	*No*	*There is no burning of woody biomass in baseline scenario*
		CH4	*No*	*There is no burning of woody biomass in baseline scenario*
		N2O	*No*	*There is no burning of woody biomass in baseline scenario*
	Emissions from nitrogen fertilizer	*CO2*	*No*	*Fertilizer application in baseline scenario is deemed insignificant.*
		CH4	*No*	*Fertilizer application in baseline scenario is deemed insignificant.*
		N2O	*No*	*Fertilizer application in baseline scenario is deemed insignificant.*
	Burning of fossil fuels	*CO2*	*No*	*Use of fossil fuels in baseline scenario is deemed insignificant.*
		CH4	*No*	*Use of fossil fuels in baseline scenario is deemed insignificant.*
		N2O	*No*	*Use of fossil fuels in baseline scenario is deemed insignificant.*
Project	*Burning of biomass*	*CO2*	*No*	*There will be no burning of woody biomass during the site preparation or project activities*
		CH4	*No*	*There will be no burning of woody biomass during the site preparation or project activities*
		N2O	*No*	*There will be no burning of woody biomass during the site preparation or project activities*
	Emissions from nitrogen fertilizer	*CO2*	*No*	*Fertilizer application in project scenario is deemed insignificant.*
		CH4	*No*	*Fertilizer application in project scenario is deemed insignificant.*
		N2O	*Yes*	*Fertilizer application in project scenario is deemed insignificant.*

Source		Gas	Included?	Justification/explanation
	Burning of fossil fuels	*CO2*	*No*	*Use of fossil fuels in project scenario is deemed insignificant.*
		CH4	*No*	*Use of fossil fuels in project scenario is deemed insignificant*
		N2O	*No*	*Use of fossil fuels in project scenario is deemed insignificant*

For the Project Activities Instances included in this PD, Map 8 provides the boundaries, showing the various planting areas for the Project Activity Instances. As the project expands, additional Project Activity Instances may be added.



Map 8. Project Activity Instances by planting year.

Table 13. Year and size of plantation of Project Activity Instances

Year Planted (date)	Area planted in Finca La Paz (ha)
2018	1002
2019	1304
2020	70
Total	**2,378**

3.1.4 Baseline Scenario (VCS, 3.13)

As it is shown in Section 3.1.5, the baseline scenario was stablished using the performance benchmark method. This baseline is represented by the business-as-usual growth of carbon stocks, monitored through remote sensing on control plots outside the project area.

The business-as-usual changes in vegetation cover were represented by the performance benchmark, which is equal to the ratio of average change in stocking index, *SI*, of control plots to project plots. The control plots were selected to match the project area's biophysical and management conditions, along with historical stock trends.

In this case, trends of changes of *SI* in the control area resulted to be non-significant (p-value =0.18), while the significance of the difference between control and project area since the establishment of project activities was significant (z-score >1.96). Consequently, the baseline scenario was established at zero.

3.1.5 Additionality (VCS, 3.14)

According to the VM0047, projects must apply a performance method (area-based approach) or a project method (census-based approach) for the demonstration of additionality. This project uses the area-based approach and therefore applies the following steps to demonstrate additionality.

3.1.5.1 Regulatory Surplus (VCS, 3.14)

Is the project located in an UNFCCC Annex 1 or Non-Annex 1 country?

☐ Annex 1 country ☒ Non-Annex 1 country

Are the project activities mandated by any law, statute, or other regulatory framework?

☒ Yes ☐ No

If the project is located inside a Non-Annex 1 country and the project activities are mandated by a law, statute, or other regulatory framework, are such laws, statutes, or regulatory frameworks systematically enforced?

☒ Yes ☐ No

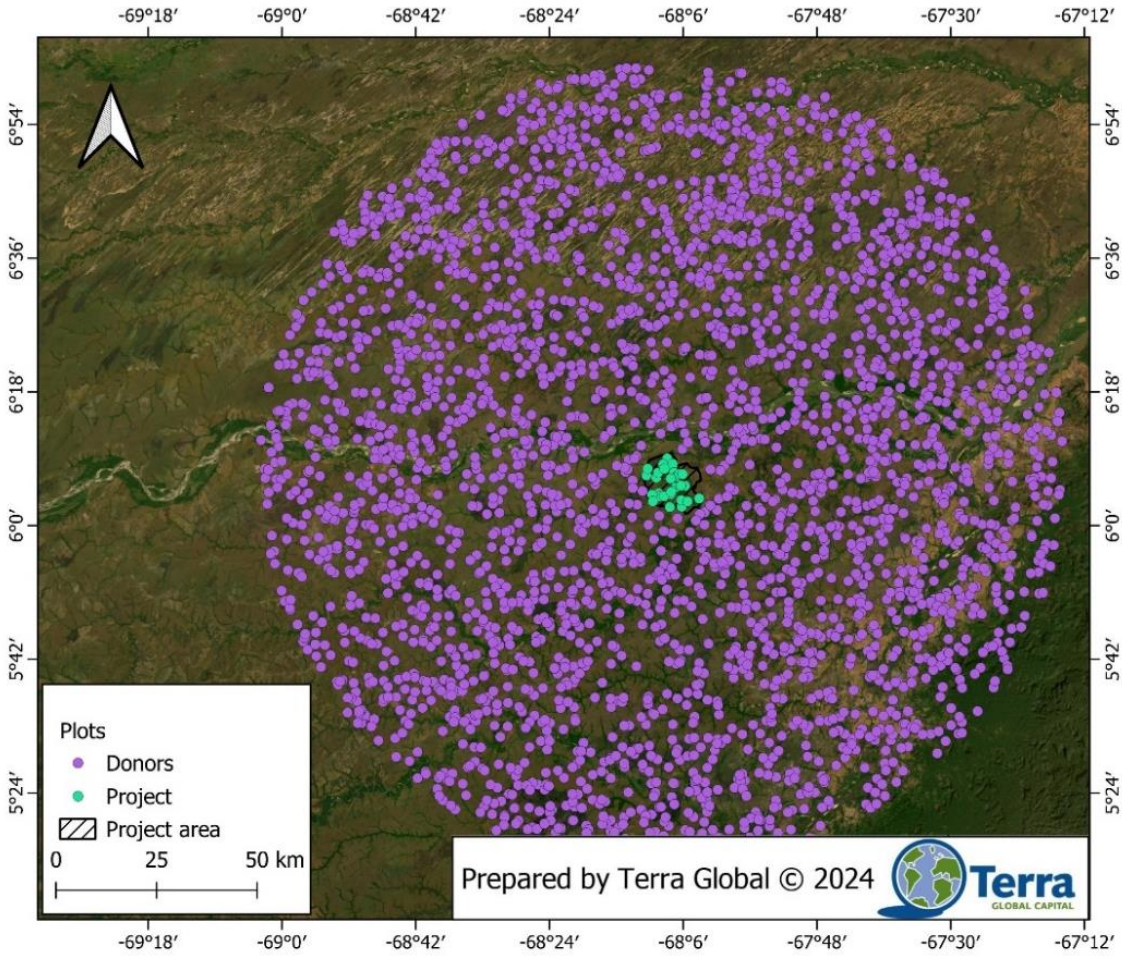
3.1.5.2 Step 2: Performance Benchmark (VCS, 3.14)

The baseline scenario was established using the performance benchmark method, representing the business-as-usual growth of carbon stocks monitored via remote sensing on control plots outside the project area. Business-as-usual changes in vegetation cover were quantified by the performance benchmark, calculated as the ratio of average change in Stocking Index (*SI*) of control plots to project plots. Control plots were selected to align with the project area's biophysical and management conditions, as well as historical stock trends. For the calculation of the performance benchmark the following steps were taken:

- A pool of 45 points in project area (project plots) were randomly selected.
- From a region within a ~100km radius around the centroid of the project area, a broader pool of 3000 points located outside the project area were randomly selected (referred to as donor plots). Subsequently, control plots were chosen by excluding donor plots with land use classifications that differed from any land use classification within the project area.
- The reflectance of each plot was extracted from a time series covering the 10 years prior to the project's initiation up to the latest monitoring year. This was accomplished using Landsat 7 data (for the years 2007 to 2013) and Landsat 8 data (for the years 2014 to 2023). To mitigate artifacts,

data were exclusively extracted between May and August. We chose this temporal window because it includes the main growing season in many regions of Colombia. Additionally, to ensure consistency between the two sensors, the analysis focused on spectral bands that are common to both Landsat 7 and Landsat 8.

- The *SI* for each plot for each year was derived by using linear unmixing by nonnegative matrix factorization (NMF) to automatically decompose the reflectance into 3 end members and used the combination that better correlated with ESA-CCB annual aboveground biomass estimated for the 2017-2020 time period.
- To match each project plots to a set of 4 unique, non-repeated, control plots a combination of nearest neighbourhood and iterative optimization was used. Assignment of control plots to project plots was achieved by using Hungarian algorithm for minimizing overall Manhattan distance across plot pairs, based on their reflectance, *SI*, and other ancillary data (e.g. elevation, landuse), from t-10 (i.e. 2008) to t-1 (i.e. 2018).
- A timeseries was constructed from year t=0 to t=n. Since the project start date was December 2018, 2019 was used as year t=0. For each series, the delta *SI* control and delta *SI* project were estimated as the slope of the linear regression between *SI* and time. From each regression, the significance of the slope (p-value), the divergence between control and project plots (z-scores), and the performance benchmark (PB) were calculated.



Map 9. Distribution of project plots (45) and donor projects (candidates for being control plots, 3000)

Map 9 shows the comparison of *SI* for control and project plots before and after the project start date. The analysis shows that trends of changes of *SI* in the control area resulted to be non-significant (p-value =0.18), while the significance of the difference between control and project area since the establishment of project activities was significant (z-score >1.96).

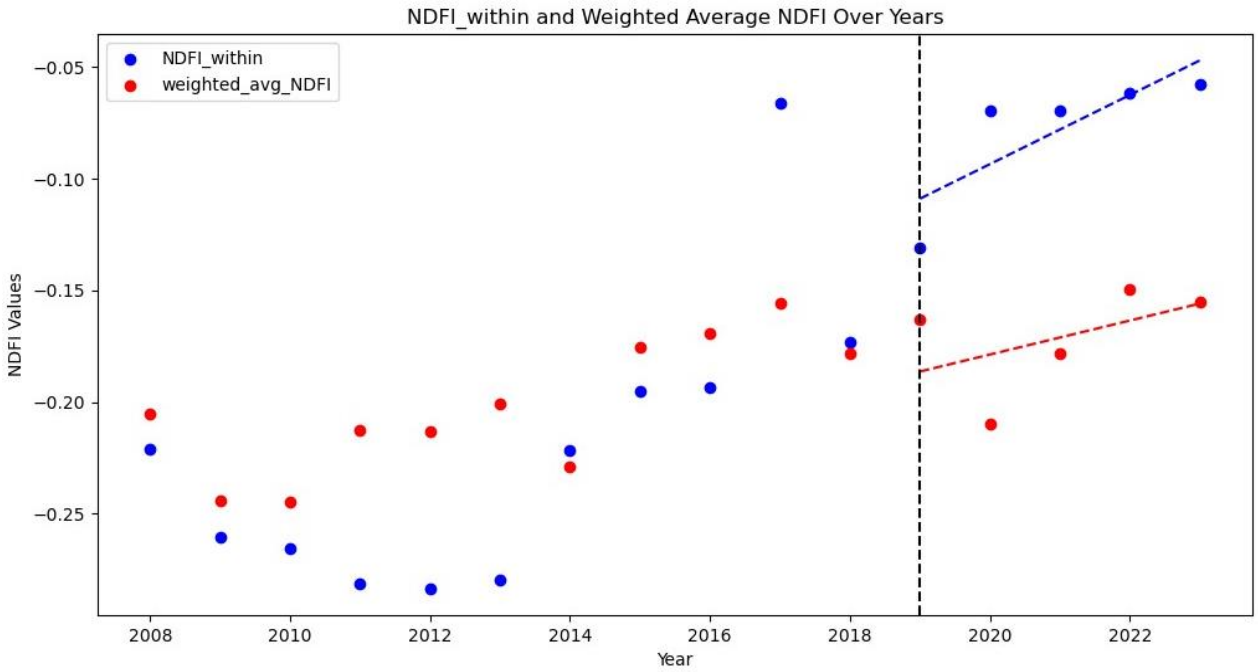


Figure 3. Pairing of SI for control (blue) and project plots (red) before and after of the and project start date. Trendlines from represent the dSI (i.e. the slope) of the regression from t=0 to t=5 for control (blue) and project (red) plots.

Calculations of performance benchmark after the project start date are presented in Table 14. The performance benchmark from year 0 to 4 is equal to zero.

Table 14. Estimation of SI from project (SI project) and control (SI control) plots for each year from t=0 (2019) to t=4 (2023).

Year	t	*SI* project	*SI* control	*dSI* project	*dSI* control	Z slopes	p-value control	PB calculated	PB selected
2019	0	-0.13							0.00
2020	1	-0.07	-0.21	0.05	-0.02	3.60	0.54	-0.31	0.00
2021	2	-0.07	-0.18	0.04	0.00	3.10	0.69	-0.13	0.00
2022	3	-0.06	-0.15	0.03	0.00	2.29	0.63	0.15	0.00
2023	4	-0.06	-0.16	0.02	0.01	2.19	0.36	0.24	0.00

3.1.5.3 Step 3: Investment Barrier

For the Investment Barrier Analysis, the investment comparison analysis was applied in order to assess additionality as the project scenario includes timber harvest. The investment comparison analysis includes

the following scenarios: 1) remain as degraded pasture for cattle production, and 2) forestation without being registry as a ARR VCS project.

The investment comparison analysis includes all related investment costs, including all operational and maintenance costs related to the implementation of the project activities, and all related investment revenues, such as incomes from timber sales or cattle production. For the forestry scenario, investment costs and revenues were provided by Col La Paz and GmbH-1.2.TREE. For the cattle production scenario, the investment costs and revenues were found through literature review. An average per hectare profit was assumed to be the average of cow-calf only and both cow-calf and backgrounding production, i.e. USD 22.55 per hectare per year (Ernesto Reyes, 2020).

The financial indicator selected was the net present value (NPV). An NPV rate of 12% was selected because it is consistent with timber. The resulting NPV for timber is USD 141,048 and the NPV for cattle is USD 441,692, which on a per hectare basis is USD 59 for timber and USD 186 for cattle. The detailed financial model will be provided to the validator.

From an additionality standpoint, it is important to recognise that there is little or no upfront cost to continue cattle production on degraded pasture to land, whereas conversion to forestry requires significant upfront capital expenditure. Furthermore, continued cattle production produces a linear income stream from Year 1.

The investment comparison analysis confirms that the project and its planned operations would not be financially feasible without climate finance. Therefore, the project is considered to be additional.

3.1.5.4 Step 4: Common Practice

This project uses an Area-based approach, which does not require common practice.

3.1.6 Methodology Deviations (VCS, 3.20)

There are no methodological deviations at this time.

3.2 Quantification of Estimated GHG Emission Reductions and Removals

3.2.1 Baseline Emissions (VCS, 3.15)

As described in Section 3.1.5, the baseline scenario was represented using the performance benchmark. In this case, trends of changes of SI in the control area resulted to be non-significant, while the significance of the difference between control and project area since the establishment of project activities was significant. As such, the performance benchmark and the baseline emissions are assumed equal to 0.

3.2.2 Project Emissions (VCS, 3.15)

The project carbon stock change in year t is calculated as follows:

$$\Delta C_{WP,t} = \left(\Delta C_{WP-biomass,t} - \Delta GHG_{WP-SOC,t}\right) * \frac{44}{12}$$

Where:

$\Delta C_{WP,t}$	=	Project carbon stock change in year t (t CO_2e)
$\Delta C_{WP-Biomass,t}$	=	Change in carbon stock in biomass carbon pools in the project scenario through year t (t C)
$\Delta C_{WP-SOC,t}$	=	Change in carbon stock in SOC in the project scenario through year t (t C)

$44/12$	=	Ratio of molecular weight of carbon dioxide to carbon (unitless)
t	=	1, 2, 3, …, t years elapsed since the project start date

$\Delta C_{WP-biomass,t}$ is calculated as follows:

$$\Delta C_{WP-biomass,t} = \Delta C_{WP-woody,t} + \Delta C_{WP-herb,t} + \Delta C_{WP-DW,t} + \Delta C_{WP-LI,t}$$

Where:

$\Delta C_{WP-biomass,t}$	=	Change in carbon stock in biomass carbon pools in the project scenario through year t (t C)
$\Delta C_{WP-woody,t}$	=	Change in carbon stock in woody biomass in the project scenario through year t (t C)
$\Delta C_{WP-herb,t}$	=	Change in carbon stock in non-woody biomass in the project scenario through year t (t C)
$\Delta C_{WP-DW,t}$	=	Change in carbon stock in dead wood in the project scenario through year t (t C)
$\Delta C_{WP-LI,t}$	=	Change in carbon stock in litter in the project scenario through year t (t C)
t	=	1, 2, 3, …, t years elapsed since the project start date

3.2.2.1 Woody and Herbaceous Carbon

For estimation of carbon stock in living biomass of trees and non-trees, ex-ante (projected) estimation of tree biomass applies tree growth and stand development models.

Under this method, the change in carbon stock in trees are estimated as follows:

$$\Delta C_{WP-woody,t} = A - \left(C_{WP-woody,t} - C_{WP-woody,t=0}\right)$$

$$C_{WP-woody,t} = C_{WP-woody-AB,t} * (1 + R)$$

Where:

$\Delta C_{WP-woody,t}$	=	Change in carbon stock in woody biomass in the project scenario through year t (t C)
A	=	Area (ha)
$C_{WP-woody,t}$	=	Average carbon stock in woody biomass in the project scenario in year t (t C/ha)
$C_{WP-woody-AB,t}$	=	Average carbon stock in woody biomass in the project scenario in year t (t C/ha)
R	=	Root to shoot ratio (t root d.m./t shoot d.m.)
t	=	1, 2, 3, …, t years elapsed since the project start date

Under this method, the change in carbon stock in herbaceous biomass are estimated as follows:

$$\Delta C_{WP-herb,t} = A * \left(C_{WP-herb,t} - C_{WP-herb,t=0}\right)$$

$$C_{WP-herb,t} = DM_{WP-herb,t} * CF$$

Where:

$\Delta C_{WP-herb,t}$	=	Change in carbon stock in non-woody biomass in the project scenario through year t (t C)
A	=	Area (ha)
$C_{WP-herb,t}$	=	Average carbon stock in non-woody biomass in the project scenario in year t (t C/ha)
$DM_{WP-herb,t}$	=	Average non-woody biomass in the project scenario in year t (t d.m./ha)
CF	=	Carbon fraction of dry biomass (t C/t d.m.)
t	=	1, 2, 3, …, t years elapsed since the project start date

3.2.2.2 Deadwood and Litter Carbon

The net carbon stock change in dead wood is estimated as follows:

$$\Delta C_{WP-DW,t} = A * \left(C_{WP-DW,t} - C_{WP-DW,t=0}\right)$$

Where:

$\Delta C_{WP-DW,t}$	=	Change in carbon stock in dead wood in the project scenario through year t (t C)
A	=	Area (ha)
$C_{WP-DW,t}$	=	Average carbon stock in dead wood in year t (t C/ha)
t	=	1, 2, 3, … t years elapsed since the project start date

Deadwood is comprised of both standing and lying deadwood. This is calculated as follows:

$$C_{WP-DW,t} = \left(B_{SDW,t} + B_{LDW,t}\right) * CF$$

Where:

$C_{WP-DW,t}$	=	Average carbon stock of dead wood in year t (t C/ha)
$B_{SDW,t}$	=	Average biomass of standing dead wood in year t (t d.m./ha)
$B_{LDW,t}$	=	Average biomass of lying dead wood in year t (t d.m./ha)
CF	=	Carbon fraction of dry biomass (t C/t d.m.)
t	=	1, 2, 3, … t years elapsed since the project start date

Deadwood biomass in standing dead trees of species i is calculated using the conservative default-factor based method as follows:

$$B_{SDW,i,t} = B_{TREE,i,t} * DF_{DW}$$

Where:

$B_{SDW,i,t}$	=	Average biomass of standing dead wood in year t, in stratum i (t d.m./ha)

$B_{TREE,i,t}$	=	Tree biomass in stratum i at a point of time in year t, as calculated above (t d.m./ha)
DF_{DW}	=	Conservative default factor expressing carbon stock in dead wood as a percentage of carbon stock in tree biomass; percent
i	=	1, 2, 3, … biomass estimation strata within the project boundary
t	=	1, 2, 3, … t years elapsed since the project start date

The net carbon stock change in litter is estimated as follows:

$$\Delta C_{WP-LI,t} = A * \left(C_{WP-LI,t} - C_{WP-LI,t=0}\right)$$

Where:

$\Delta C_{WP-LI,t}$	=	Change in carbon stock in litter in the project scenario through year t (t C)
A	=	Area (ha)
$C_{WP-LI,t}$	=	Average carbon stock in litter in the project scenario in year t (t C/ha)
t	=	1, 2, 3, … t years elapsed since the project start date

The carbon stock in litter is calculated as follows:

$$C_{WP-LI,t} = DM_{WP-LI,t} * CF$$

Where:

$C_{WP-LI,t}$	=	Average carbon stock in litter in the project scenario in year t (t C/ha)
$DM_{WP-LI,t}$	=	Average litter dry mass per hectare in the project scenario in year t (t d.m./ha)
CF	=	Carbon fraction of dry biomass (t C/t d.m.)
t	=	1, 2, 3, … t years elapsed since the project start date

The litter biomass stock is calculated using the conservative default-factor based method as follows:

$$DM_{WP-LI,t} = B_{TREE,i,t} * DF_{LI}$$

Where:

$DM_{WP-LI,t}$	=	Average litter dry mass per hectare in the project scenario in year t (t d.m./ha)
$B_{TREE,i,t}$	=	Tree biomass in stratum i at a point of time in year t, as calculated above (t d.m./ha)
DF_{LI}	=	Conservative default factor expressing carbon stock in litter as a percentage of carbon stock in tree biomass; percent
i	=	1, 2, 3, … biomass estimation strata within the project boundary
t	=	1, 2, 3, … t years elapsed since the project start date

3.2.2.3 Soil Carbon

The initial SOC stock at start of the project is estimated as follows:

$$SOC_{INITIAL,i} = SOC_{REF,i} * f_{LU,i} * f_{MG,i} * f_{IN,i}$$

Where:

$SOC_{INITIAL,i}$ = SOC stock at the beginning of the A/R CDM project activity in stratum i of the areas of land; t C ha-1.

$SOC_{REF,i}$ = Reference SOC stock corresponding to the reference condition in native lands (i.e. non-degraded, unimproved lands under native vegetation. normally forest) by climate region and soil type applicable to stratum i of the areas of land; t C ha-1.

$f_{LU,i}$ = Relative stock change factor for baseline land-use in stratum i of the areas of land; dimensionless.

$f_{MG,i}$ = Relative stock change factor for baseline management regime in stratum i of the areas of land; dimensionless.

$f_{IN,i}$ = Relative stock change factor for baseline input regime (e.g. crop residue returns, manure) in stratum i of the areas of land; dimensionless.

i = 1, 2, 3, . strata of areas of land; dimensionless

3.2.3 Leakage Emissions (VCS 2.5, 3.2, 3.6, 3.15, 4.3)

Step 1: Determine Foregone Production in Project Area

Baseline production in the project area is calculated as follows:

$$BP_{j,t} = \frac{\sum_{h=1}^{H} p_{j,h}}{H} * \left(1 + r_j\right)^t$$

Where:

$BP_{j,t}$ = Baseline production in the project area for commodity *j* in year *t* (units of production)

$p_{j,h}$ = Production in the project area for commodity *j* in year *h* of the historical reference period (units of production)

H = Duration of historical reference period (years)

r_j = Annual growth rate of yield for commodity *j* (percent)

t = 1, 2, 3, …, t years elapsed since the project start date

Forgone production of cattle in project area is the difference between baseline production for each commodity produced in the project area and the monitored production of that same commodity in the project area:

$$FP_{j,t} = BP_{j,t} - MP_{j,t}$$

Where:

$FP_{j,t}$ = Forgone production in the project area for commodity *j* in year *t* (units of production)

$BP_{j,t}$ = Baseline production in the project area for commodity *j* in year *t* (units of production)

$MP_{j,t}$ = Monitored production in the project area for commodity *j* in year *t* (units of production)

t = 1, 2, 3, …, t years elapsed since the project start date

As the baseline scenario corresponds to livestock pastures where there is no crop rotation period per se, a historical period (H) of 3 years was chosen. On the other hand, according to Colombian Department of

Statistics (DANE, 2020)[14], cattle production ($p_{j,h}$) in Vichada department was 3.18 cattle/ha in 2016, 2.03 cattle/ha in 2017, and 1.36 cattle ha in 2019. Based on these data and employing an exponential regression, cattle production for 2018 was estimated at 1.76 cattle/ha (see Table 15).

Table 15. Production of cattle over the historical period in Vichada

Year	Total production $p_{j,h}$ (cattle/ha)
2016	3.18
2017	2.03
2018*	1.76
2019	1.36

*Estimated by an exponential regression model

To estimate Baseline production in project area an annual growth rate for yield (r_j) of -23% calculated from the data of cattle production over the historical period was used. On the other hand, there is no production of cattle after the project start date, so Monitored production is zero. Forgone production is calculated for the first five years after the project start date as it is shown in Table 16.

Table 16. Forgone production of cattle in project area

Year	Forgone production $FP_{j,t}$ (cattle/ha)
2018	2.36
2019	1.82
2020	1.40
2021	1.08
2022	0.83

Step 2: Determine the Impact of Leakage Mitigation Activities

The project proponent may implement activities outside the project area that reduce the amount leakage. The amount of foregone production that may result in leakage is calculated as follows:

$$l_{j,t} = MAX\left(FP_{j,t} - LM_{j,t}; 0\right)$$

Where:

$l_{j,t}$ = Amount of foregone production subject to leakage for commodity j in year t (units of production)

$FP_{j,t}$ = Forgone production in the project area for commodity j in year t (units of production)

$LM_{j,t}$ = Leakage mitigation of commodity j in year t (units of production)

t = 1, 2, 3, …, t years elapsed since the project start date)

Since no leakage mitigation areas were considered for this project, the amount of displaced production of cattle that may result in leakage (l) is equivalent to the Forgone production in the project area (FP) which is presented in Table 16.

[14] https://www.dane.gov.co/index.php/en/statistics-by-topic-1/agricultural-sector/national-agricultural-survey-ena

Step 3: Determine Amount of New Land Brought into Production

Where the amount of displaced production that may result in leakage (*l*) for commodity j in year *t* is greater than zero, the amount of new land that is brought into production outside the project area in year t is calculated as follows:

$$INL_{j,t} = \frac{l_{j,t} * IS * NL_j}{y_{j,t}}$$

Where:

$INL_{j,t}$	=	Area of new land brought into production in year *t* (ha)
$l_{j,t}$	=	Amount of foregone production subject to leakage for commodity *j* in year *t* (units of production)
IS	=	Share of leakage resulting in increased supply outside the project area, or default value of 0.75 (75 percent) for agricultural commodities or 1.00 (100 percent) for fuelwood
NL_j	=	Share of increased supply from new land brought into production for commodity *j*, or default value of 0.40 (40 percent) for agricultural commodities or 1.00 (100 percent) for fuelwood
$y_{j,t}$	=	Yield on new land brought into production for commodity *j* in year *t* (units of production/ha)
t	=	1, 2, 3, …, t years elapsed since the project start date

The area of new land brought into production ($INL_{j,t}$) must be summed across all commodities produced in the project area during the historical reference period to determine the total area generating leakage emissions. The area generating leakage emissions is calculated as follows:

$$AL_t = \sum_{j=1}^{T} INL_{j,t}$$

Where:

AL_t	=	Area generating leakage emissions in year *t* (ha)
$INL_{j,t}$	=	Area of new land brought into production in year *t* (ha)
T	=	Total number of commodities produced in historical reference period
t	=	1, 2, 3, …, t years elapsed since the project start date

Yield on new land brought into production for cattle (y) is assumed as 1.52 cattle/ha according to data from Gonzalez et al. (2022)[15] and Vera & Ramírez (2022)[16] in the project region. Total area generating leakage emissions for the only commodity considered (cattle) is presented in Table 17.

Table 17. Total area generating leakage emissions.

15 https://www.researchgate.net/publication/365866525_Carbon_Sink_Project_Regenerative_Radial_Soil_System_for_Livestock_in_the_Native_Savanna_of_Vichada_Colombia

16 https://www.researchgate.net/publication/362289660_Modelling_the_reproductive_performance_of_tropical_beef_herds_using_long-term_experimental_grazing_data_on_Urochloa_humidicola_pastures_in_the_Llanos_of_Colombia

Year	Total area AL_t (ha)
2018	0.46
2019	0.36
2020	0.28
2021	0.21
2022	0.16

Step 4: Determine Change in Carbon Stocks in New Lands Brought into Production

The module assumes that new land brought into production is forested land. The change in carbon stocks in the new land that is brought into production is calculated as follows:

$$CS = \Delta C_{biomass} + \Delta SOC$$

Where:

CS	=	Change in carbon stocks on new lands brought into production (t C/ha)
$\Delta C_{biomass}$	=	Change in forest biomass carbon stocks equal to the in the regional average stock in which the project is located (t C/ha)
ΔSOC	=	Change in soil organic carbon (SOC) stocks in the region in which the project is located (t C/ha)

The change in forest biomass carbon stocks in the area generating leakage emissions assumes the loss of above-ground biomass. A value of 71.5 Mg DM/ha equivalent to 33.6 t C/ha was assumed for Tropical shrublands according to Table 4.12 from *Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories* (IPCC, 2019).

The change in SOC stock is calculated as the difference between initial reference stocks and estimated future, steady-state stocks at the end of 20 years.

$$\Delta SOC = \Delta SOC_{REF} + (1.00 - f_{LU} * f_{MG} * f_{IN})$$

Where:

ΔSOC	=	Change in soil organic carbon (SOC) stocks in the region in which the project is located (t C/ha)
ΔSOC_{REF}	=	SOC stock corresponding to the reference condition in native ecosystems by climate region and soil type applicable to the land receiving the displaced activity (t C/ha)
$f_{LU}, f_{MG,} f_{IN}$	=	Relative SOC stock change factors over 20 years for land use, management practices and inputs respectively, applicable to the displaced production (dimensionless)

The change in SOC stock was calculated as 18.0 t C/ha based on the reference values of $\Delta SOC_{REF}, f_{LU}, f_{MG,} f_{IN}$ equivalents to 60.0 t C/ha, 1.0, 0.7, and 1.0 respectively for the land use and management over the previous 20 years in the project area. These calculations were based on mineral soils and degraded grassland without additional management inputs, according to the AR CDM Tool 14.

Step 5: Determine Leakage Emissions

The leakage emissions from new land that is brought into production and where *t* does not exceed 5 years beyond the last project instance start date are calculated as follows:

$$LK_t = AL_t * CS * 44/12$$

Where:

LK_t	=	Cumulative leakage up to year t (t CO2e)
AL_t	=	Area generating leakage emissions in year t (ha)
CS	=	Change in carbon stocks on new lands brought into production (t C/ha)
t	=	1, 2, 3, …, t years elapsed since the project start date, t must not exceed five years beyond the last project instance start date
$44/12$	=	Conversion factor from C to CO2e

Leakage emissions for the displacement of the baseline activities in the project area are shown in Table 18.

Table 18. Leakage emissions.

Year	Leakage emissions LK_t (tCO2e)
2018	87.95
2019	67.72
2020	52.15
2021	40.16
Total	**278.89**

The total leakage amount is less than 5% of the project's carbon removals. Therefore, in accordance with Appendix 2 of the VM0047 Methodology, it can be deemed negligible.

3.2.4 Uncertainty (VCS, 2.5, 3.2, 3.6, 3.15, 4.3)

Uncertainty is calculated by propagating errors associated with estimates of included pools as:

$$UNC_t = MIN\left(100\%,\ MAX\left(0,\left(\sum_{p=1}^{n}\left(U_{p,t=0} * C_{p,t=0}\right)^2 + \sum_{p=1}^{n}\left(U_{p,t} * C_{p,t}\right)^2\right)^{1/2} * \left(\frac{1}{\Delta C_{WP-biomass,t} * \Delta C_{WP-SOC,t}}\right) - 10\%\right)\right)$$

Where:

UNC_t	=	Uncertainty in cumulative removals through year t (percent)
$U_{p,t}$	=	Percentage uncertainty (expressed as 90 percent confidence interval as a percentage of the mean) in carbon stock estimate of pool p (representing woody biomass, non-woody biomass, dead wood, litter, and SOC) in the project scenario in year t (percent)
$C_{p,t}$	=	Carbon stock estimate of pool p (representing woody biomass, non-woody biomass, dead wood, litter and SOC) in the project scenario in year t (t CO2e)
$\Delta C_{WP-biomass,t}$	=	Change in carbon stock in biomass carbon pools in the project scenario through year t (t C)

$\Delta C_{WP-SOC,t}$	=	Change in carbon stock in SOC in the project scenario through year t (t C)
t	=	1, 2, 3, ..., t years elapsed since the project start date

For *ex-ante* calculations, uncertainty was conservatively assumed at 10% following the VM0047 methodology.

3.2.5 Estimated GHG Emission Reductions and Carbon Dioxide Removals (VCS, 3.15, 4.1)

State the non-permanence risk rating (%)	27%
Has the non-permanence risk report been attached as either an appendix or a separate document?	☒ Yes ☐ No
For ARR and IFM projects with harvesting, state, in tCO2e, the Long-term Average (LTA).	639,763
Has the LTA been updated based on monitored data, if applicable?	☐ Yes ☒ No Since this is the first monitoring report, it is not necessary update the LTA
State, in tCO2e, the expected total GHG benefit to date.	639,763
If a loss occurred (including a loss event or reversal), state the amount of tCO2e lost:	NA

The net anthropogenic GHG removals by sinks is calculated as follows:

$$CR_t = \left(\left(\Delta C_{WP,t} * (1 - PB_t) * (1 - UNC_t)\right) - LK_t\right) - PE_t$$

Where:

CR_t	=	Carbon dioxide removals from the project activity in year *t* (t CO_2e)
$\Delta C_{WP.t}$	=	Project carbon stock change in year *t*; t CO_2e
PB_t	=	Performance benchmark for the monitoring interval ending in year *t* (percent)
LK_t	=	Leakage through year *t* (t CO_2e)
PE_t	=	Project emissions from biomass burning and fertilizer in year *t* (t CO_2e)
UNC_t	=	Uncertainty in cumulative removals through year *t* (percent)
t	=	1, 2, 3, ..., *t* years elapsed since the project start date

Table 19 shows the Net GHG emissions and reductions of the project for the crediting period.

Table 19. Estimated GHG emissions reductions and removals

Vintage period	Estimated baseline emissions (tCO2e)	Estimated project emissions (tCO2e)	Estimated leakage emissions (tCO2e)	Estimated reductions (tCO2e)	Estimated removals (tCO2e)	Estimated buffer pool allocation (tCO2e)	Estimated total VCU issuance (tCO2e)
01 December 2018 to 30 November 2019	0	0	0	0	0	0	0
01 December 2019 to 30 November 2020	0	0	0	0	7,615	-2,056	5,559
01 December 2020 to 30 November 2021	0	0	0	0	33,192	-8,962	24,230
01 December 2021 to 30 November 2022	0	0	0	0	56,424	-15,234	41,189
01 December 2022 to 30 November 2023	0	0	0	0	59,960	-16,189	43,771
01 December 2023 to 30 November 2024	0	0	0	0	58,274	-15,734	42,540
01 December 2024 to 30 November 2025	0	0	0	0	19,954	-5,387	14,566
01 December 2025 to 30 November 2026	0	0	0	0	6,796	-1,835	4,961
01 December 2026 to 30 November 2027	0	0	0	0	0	0	0
01 December 2027 to 30 November 2028	0	0	0	0	0	0	0
01 December 2028 to 30 November 2029	0	0	0	0	38,471	-10,387	28,084
01 December 2029 to 30 November 2030	0	0	0	0	42,245	-11,406	30,839
01 December 2030 to 30 November 2031	0	0	0	0	71,791	-19,384	52,407
01 December 2031 to 30 November 2032	0	0	0	0	74,965	-20,241	54,725
01 December 2032 to 30 November 2033	0	0	0	0	70,862	-19,133	51,729
01 December 2033 to 30 November 2034	0	0	0	0	65,066	-17,568	47,498

Vintage period	Estimated baseline emissions (tCO2e)	Estimated project emissions (tCO2e)	Estimated leakage emissions (tCO2e)	Estimated reductions (tCO2e)	Estimated removals (tCO2e)	Estimated buffer pool allocation (tCO2e)	Estimated total VCU issuance (tCO2e)
01 December 2034 to 30 November 2035	0	0	0	0	34,150	-9,220	24,929
01 December 2035 to 30 November 2036	0	0	0	0	0	0	0
01 December 2036 to 30 November 2037	0	0	0	0	0	0	0
01 December 2037 to 30 November 2038	0	0	0	0	0	0	0
01 December 2038 to 30 November 2039	0	0	0	0	0	0	0
01 December 2039 to 30 November 2040	0	0	0	0	0	0	0
01 December 2040 to 30 November 2041	0	0	0	0	0	0	0
01 December 2041 to 30 November 2042	0	0	0	0	0	0	0
01 December 2042 to 30 November 2043	0	0	0	0	0	0	0
01 December 2043 to 30 November 2044	0	0	0	0	0	0	0
01 December 2044 to 30 November 2045	0	0	0	0	0	0	0
01 December 2045 to 30 November 2046	0	0	0	0	0	0	0
01 December 2046 to 30 November 2047	0	0	0	0	0	0	0
01 December 2047 to 30 November 2048	0	0	0	0	0	0	0
01 December 2048 to 30 November 2049	0	0	0	0	0	0	0
01 December 2049 to 30 November 2050	0	0	0	0	0	0	0
01 December 2050 to 30 November 2051	0	0	0	0	0	0	0
01 December 2051 to 30 November 2052	0	0	0	0	0	0	0
01 December 2052 to 30 November 2053	0	0	0	0	0	0	0
01 December 2053 to 30 November 2054	0	0	0	0	0	0	0
01 December 2054 to 30 November 2055	0	0	0	0	0	0	0

Vintage period	Estimated baseline emissions (tCO2e)	Estimated project emissions (tCO2e)	Estimated leakage emissions (tCO2e)	Estimated reductions (tCO2e)	Estimated removals (tCO2e)	Estimated buffer pool allocation (tCO2e)	Estimated total VCU issuance (tCO2e)
01 December 2055 to 30 November 2056	0	0	0	0	0	0	0
01 December 2056 to 30 November 2057	0	0	0	0	0	0	0
01 December 2057 to 30 November 2058	0	0	0	0	0	0	0
01 December 2058 to 30 November 2059	0	0	0	0	0	0	0
01 December 2059 to 30 November 2060	0	0	0	0	0	0	0
01 December 2060 to 30 November 2061	0	0	0	0	0	0	0
01 December 2061 to 30 November 2062	0	0	0	0	0	0	0
01 December 2062 to 30 November 2063	0	0	0	0	0	0	0
01 December 2063 to 30 November 2064	0	0	0	0	0	0	0
01 December 2064 to 30 November 2065	0	0	0	0	0	0	0
01 December 2065 to 30 November 2066	0	0	0	0	0	0	0
01 December 2066 to 30 November 2067	0	0	0	0	0	0	0
01 December 2067 to 30 November 2068	0	0	0	0	0	0	0
01 December 2068 to 30 November 2069	0	0	0	0	0	0	0
01 December 2069 to 30 November 2070	0	0	0	0	0	0	0
01 December 2070 to 30 November 2071	0	0	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**639,763**	**-172,736**	**467,027**

3.3 Monitoring

3.3.1 Data and Parameters Available at Validation (VCS, 3.16)

Data / Parameter	Project verification area (A)
Data unit	ha
Description	Project verification area for this monitoring period.
Source of data	Calculated from GIS data.
Value applied	2,378
Justification of choice of data or description of measurement methods and procedures applied	The project area was delineated using GIS coverages, ground survey data with GPS, and remote imagery.
Purpose of data	Calculation of project emissions.
Comments	None.

Data / Parameter	Root to shoot ratio (R)
Data unit	dimensionless
Description	Ratio of belowground (root) biomass to aboveground biomass, per unit area or per stem.
Source of data	Levan, C., Buimanh, H., Oluwasanmi Tope, B.-O., Xu, X., Nguyenminh, T., Lak, C., Nebiyou, L., Wang, J., & Buivan, T. (2020). Biomass and carbon storage in an age-sequence of Acacia mangium plantation forests in Southeastern region, Vietnam. Forest Systems, 29(2), e009. https://doi.org/10.5424/fs/2020292-16685
Value applied	0.27
Justification of choice of data or description of measurement methods and procedures applied	Value specific to the species.

Purpose of data	Calculation of project emissions.
Comments	None.

Data / Parameter	Carbon fraction (CF)
Data unit	tC/t d.m.
Description	Carbon fraction of dry biomass.
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories.
Value applied	0.47
Justification of choice of data or description of measurement methods and procedures applied	IPCC is a reputable source approved under the VCS.
Purpose of data	Calculation of project emissions.
Comments	None.

Data / Parameter	CO_2 fraction
Data unit	tCO_2/t C.
Description	Total CO_2 in weight per ton of C
Source of data	IPCC 2003 Guidelines for National Greenhouse Gas Inventories.
Value applied	44/12
Justification of choice of data or description of measurement methods and procedures applied	IPCC is a reputable source approved under the VCS.
Purpose of data	Calculation of project emissions.
Comments	None.

3.3.2 Data and Parameters Monitored (VCS, 3.16)

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Data / parameter	Aboveground woody biomass ($B_{WP\text{-}woody\text{-}AB,t}$)
Data unit	t C/ha
Description	Average aboveground woody biomass stocks in the project scenario in year *t*.
Source of data	Field measurements.
Description of measurement methods and procedures to be applied	See Section 3.3.3
Frequency of monitoring/recording	At each monitoring event
Value applied	Results of calculation from field measurements.
Monitoring equipment	See Section 3.3.3
QA/QC procedures to be applied	Data is cross-checked in the field by Terra Global Capital during each visit and by other Entities' technical teams
Purpose of data	Calculation of project emissions.
Calculation method	Allometric biomass equation supplied with measurements of tree diameter at breast height (DBH). ***Acacia mangium*** **Equation:** AGB= 0.034388*DBH^2.93-((0.034388*DBH^2.93)*D24) Source: *Torres Vélez, D.A., Del Valle, J.I. Growth and yield modelling of* Acacia mangium *in Colombia.* New Forests *34, 293–305 (2007). https://doi.org/10.1007/s11056-007-9056-5* ***Eucaliptus pellita*** Equation: AGB = (0.005*DBH^3.576)+(0.005*DBH^2.799) +(0.631*DBH^0.918)+(0.135*DBH^1.560) Source: Inail, M.A.; Hardiyanto, E.B.; Mendham, D.S. Growth Responses of Eucalyptus pellita F. Muell Plantations in South

	Sumatra to Macronutrient Fertilisers Following Several Rotations of Acacia mangium Willd. *Forests* **2019**, *10*, 1054. https://doi.org/10.3390/f10121054 ***Pinus caribea*** Equation: AGB = 0.1602*DBH^(2.1937) Source: D. Arias, J. Calvo-Alvarado, D. de B. Richter, A. Dohrenbusch. Productivity, aboveground biomass, nutrient uptake and carbon content in fast-growing tree plantations of native and introduced species in the Southern Region of Costa Rica. Biomass and Bioenergy, Volume 35, Issue 5, 2011. Pages 1779-1788. ISSN 0961-9534. https://doi.org/10.1016/j.biombioe.2011.01.009.
Comments	None

Data / parameter	Average non-woody biomass ($DM_{WP\text{-}herb,t}$)
Data unit	t d.m./ha
Description	Average non-woody biomass in the project scenario in year *t*.
Source of data	Field measurements.
Description of measurement methods and procedures to be applied	See Section 3.3.3
Frequency of monitoring/recording	At each monitoring event
Value applied	Results of calculation from field measurements.
Monitoring equipment	See Section 3.3.3
QA/QC procedures to be applied	Data is cross-checked in the field by Terra Global Capital during each visit and by other Entities' technical teams
Purpose of data	Calculation of project emissions.
Calculation method	See Section 3.3.3
Comments	None

Data / parameter	Uncertainty in carbon stock estimate ($U_{p,t}$)
Data unit	Percentage
Description	Percentage uncertainty (expressed as 90 percent confidence interval as a percentage of the mean) in carbon stock estimate of pool *p* in the project scenario in year *t*
Source of data	Calculations from field measurements.
Description of measurement methods and procedures to be applied	See Section 3.3.3
Frequency of monitoring/recording	At each monitoring event
Value applied	Results of calculation from field measurements.
Monitoring equipment	See Section 3.3.3
QA/QC procedures to be applied	Data is cross-checked in the field by Terra Global Capital during each visit and by other Entities' technical teams
Purpose of data	Calculation of project emissions.
Calculation method	It is calculated as the standard error of the averaged plot Measurement multiplied by the t value for the 90 percent confidence level.
Comments	None

Data / parameter	Average biomass of standing dead wood ($B_{SDW,t}$)
Data unit	t d.m./ha
Description	Average biomass of standing dead wood in year *t*.
Source of data	Field measurements.
Description of measurement methods	Standing dead wood is measured via plot-based sampling. For each standing dead tree, biomass is estimated using the

and procedures to be applied	allometric equation by Chave et al. (2005) and density reduction factors recommended by VM0047 (See Section 3.3.3) Chave J, Andalo C, Brown S, Cairns MA, Chambers JQ, Eamus D, Fölster H, Fromard F, Higuchi N, Kira T, Lescure JP, Nelson BW, Ogawa H, Puig H, Riéra B, Yamakura T. Tree allometry and improved estimation of carbon stocks and balance in tropical forests. Oecologia. 2005 Aug;145(1):87-99. doi: 10.1007/s00442-005-0100-x. Epub 2005 Jun 22. PMID: 15971085.
Frequency of monitoring/recording	At each monitoring event
Value applied	Results of calculation from field measurements.
Monitoring equipment	See Section 3.3.3
QA/QC procedures to be applied	Data is cross-checked in the field by Terra Global Capital during each visit and by other Entities' technical teams
Purpose of data	Calculation of project emissions.
Calculation method	Standing dead wood is measured via plot-based sampling. For each standing dead tree, biomass is estimated using the allometric equation by Chave et al. (2005) and density reduction factors recommended by VM0047. Chave J, Andalo C, Brown S, Cairns MA, Chambers JQ, Eamus D, Fölster H, Fromard F, Higuchi N, Kira T, Lescure JP, Nelson BW, Ogawa H, Puig H, Riéra B, Yamakura T. Tree allometry and improved estimation of carbon stocks and balance in tropical forests. Oecologia. 2005 Aug;145(1):87-99. doi: 10.1007/s00442-005-0100-x. Epub 2005 Jun 22. PMID: 15971085.
Comments	None

Data / parameter	Average biomass of lying dead wood ($B_{LDW,t}$)
Data unit	t d.m./ha
Description	Average biomass of lying dead wood in year *t*.
Source of data	Field measurements.

Description of measurement methods and procedures to be applied	Lying dead wood is measured via line intersect sampling. Biomass of lying dead is estimated using the allometric equation by Van Wagner (1968) and density reduction factors recommended by VM0047. (See Section 3.3.3)
Frequency of monitoring/recording	At each monitoring event
Value applied	Results of calculation from field measurements.
Monitoring equipment	See Section 3.3.3
QA/QC procedures to be applied	Data is cross-checked in the field by Terra Global Capital during each visit and by other Entities' technical teams
Purpose of data	Calculation of project emissions.
Calculation method	Lying dead wood is measured via line intersect sampling. Biomass of lying dead is estimated using the allometric equation by Van Wagner (1968) and density reduction factors recommended by VM0047
Comments	None

Data / parameter	Average litter dry mass ($DM_{WP\text{-}LI,t}$)
Data unit	t d.m./ha
Description	Average litter dry mass in the project scenario in year *t*.
Source of data	Field measurements.
Description of measurement methods and procedures to be applied	Litter (dead organic surface material of less than 10 cm diameter) is collected from within fixed-area sampling frames, harvested at ground level and dried at 70 ºC to a constant weight to determine dry weight biomass. (See Section 3.3.3)
Frequency of monitoring/recording	At each monitoring event
Value applied	Results of calculation from field measurements.
Monitoring equipment	See Section 3.3.3
QA/QC procedures to be applied	Data is cross-checked in the field by Terra Global Capital during each visit and by other Entities' technical teams

Purpose of data	Calculation of project emissions.
Calculation method	Litter (dead organic surface material of less than 10 cm diameter) is collected from within fixed-area sampling frames, harvested at ground level and dried at 70 ºC to a constant weight to determine dry weight biomass. (See Section 3.3.3)
Comments	None

Data / parameter	Average soil organic carbon (SOC) stock ($C_{WP\text{-}SOC,t}$).
Data unit	t C/ha
Description	Average soil organic carbon (SOC) stock in year *t*.
Source of data	Field measurements.
Description of measurement methods and procedures to be applied	Measured SOC is determined from samples collected from sample plots located within the project area. SOC stocks are estimated from measurements of both SOC content and bulk density taken at the same tim (See Section 3.3.3)
Frequency of monitoring/recording	At each monitoring event
Value applied	Results of calculation from field measurements.
Monitoring equipment	See Section 3.3.3
QA/QC procedures to be applied	Data is cross-checked in the field by Terra Global Capital during each visit and by other Entities' technical teams
Purpose of data	Calculation of project emissions.
Calculation method	Measured SOC is determined from samples collected from sample plots located within the project area. SOC stocks are estimated from measurements of both SOC content and bulk density taken at the same tim (See Section 3.3.3)
Comments	None

Data / parameter	Tree diameter at breast height (DBH).
Data unit	cm

Description	Diameter of trees planted measured at 1.3m height.
Source of data	Field measurements.
Description of measurement methods and procedures to be applied	Diameter is measured at 1.30m height by technicians from the project team, for all trees planted in designated sample plots (see Section 3.3.3)
Frequency of monitoring/recording	At each monitoring event
Value applied	Results of calculation from field measurements.
Monitoring equipment	See Section 3.3.3
QA/QC procedures to be applied	Data is cross-checked in the field by Terra Global Capital during each visit and by other Entities' technical teams
Purpose of data	Calculation of project emissions.
Calculation method	Diameter is measured at 1.30m height by technicians from the project team, for all trees planted in designated sample plots (see Section 3.3.3)
Comments	None

Data / parameter	Tree height (h).
Data unit	m
Description	Height of the trees planted.
Source of data	Field measurements.
Description of measurement methods and procedures to be applied	Tree height is measured by technicians from the project team, for all trees planted in designated sample plots. (see Section 3.3.3)
Frequency of monitoring/recording	At each monitoring event
Value applied	Results of calculation from field measurements.
Monitoring equipment	See Section 3.3.3

QA/QC procedures to be applied	Data is cross-checked in the field by Terra Global Capital during each visit and by other Entities' technical teams
Purpose of data	Calculation of project emissions.
Calculation method	Tree height is measured by technicians from the project team, for all trees planted in designated sample plots. (see Section 3.3.3)
Comments	None

3.3.3 Monitoring Plan (VCS, 3.16, 3.20)

Carbon stocks are monitored at each verification event through biomass inventories paired with remote sensing and spatial data. Biomass inventories are carried out in plantation parcels inside the first Project Activity Instance, as well as at some points outside the project area to monitor the baseline land use (degraded grasslands). Data and procedures for estimating biomass include:

1) Field measurements
   a) Aboveground live tree
   b) Aboveground non-tree vegetation
   c) Standing deadwood
   d) Lying deadwood
   e) Litter
   f) Soil organic carbon
2) Allometric equations are used to estimate carbon in the following:
   a) Aboveground and below tree biomass
   b) Aboveground deadwood biomass
3) Destructive samples are taken from the following to determine their carbon content:
   a) Non-tree vegetation and litter
   b) Soil
4) Other measurements
   a) Description and location of the plot

3.3.3.1 Equipment checklist

The equipment required for conducting biomass monitoring in the field is listed below:

- First aid kit.
- Compass with internal clinometer.
- 30m tape measure
- Five ropes of 10 m each; these ropes should be transported on a reel (for the temporary demarcation of the limits and the establishment of the transects).
- 1 GPS to register point 1 of each of the parcels. The GPS will be fixed in the UTM19N coordinate projection system and should be adjusted on the averaged waypoints until the sample confidence is 100%.
- Smartphone with camera to take geolocated photos.

- Extra batteries for all electronic instruments (at least 8 AA batteries, preferably NiMH lithium)
- 2 meter tapes.
- Form packets (printed on waterproof paper, if possible).
    - Parcel survey cover sheet listing the coordinates supplied for point 1 (1 leaf per plot).
    - Litter biomass (1 leaf per plot)
    - Living tree biomass leaf (3 leaves per plot)
    - Sheet for non-tree aboveground biomass and soil (2 sheets per plot)
- Hand pruners (and saws if necessary).
- Sample bags (with zip-lock, or closure) for collections of non-woody biomass, litter and soil samples.
- Brightly colored paint to mark the trees around point 1.
- Machetes.
- PVC cylinder of 100 cm3 for soil samples.
- Permanent markers.
- Bucket of resistant fabric (rope, agave, or a large tarp) to collect, mix, and weigh non-woody biomass.
- 1000 g table scale
- Support table.
- Radio (if necessary)

3.3.3.2 Field work personnel

The biomass inventories are conducted by a field work team consisting of the following personnel:

- 1 forest team leader.
- 1 forest assistant.
- 1 field assistant.

Each crew member has received training prior to field measurements to ensure the quality of measurements and the personnel safety. The main functions of the personnel are described below:

Forest team leader:

- Manage the field work team.
- Explain roles and responsibilities to other team members.
- Locate plot and subplots correctly.
- Verify plot boundaries.
- Identify tree species.
- Ensure the quality of measurements.
- Take notes and fill out forms.
- Collect, store, and manage information.

Forest assistant:

- Support the identification of plot boundaries.
- Outline the plot boundaries using a rope.
- Take measurements and report them to the team leader for recording.

Field assistant:

- Assist in taking measurements according to the leader's instructions.
- Outline the plot boundaries using a rope.
- Take measurements and report them to the team leader for recording.

3.3.3.3 Desing of biomass plots

Biomass plots include the measurement of trees, non-woody biomass, soil organic carbon, litter, each measured with different procedures.

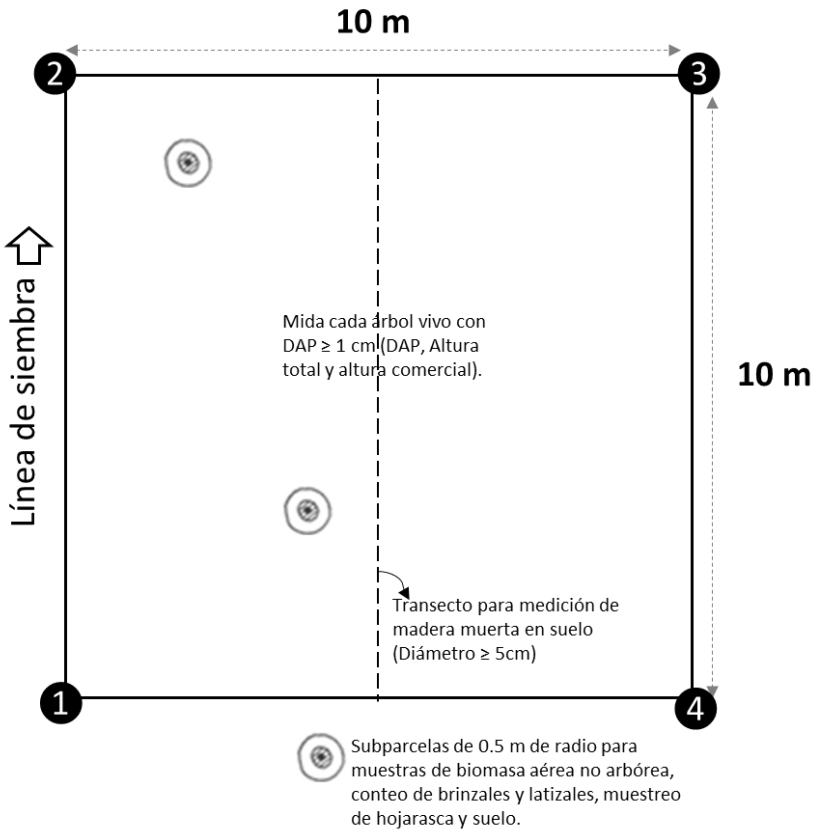


Figure 4. Biomass plots design

3.3.3.4 Creating a new biomass plot

The given coordinate for point 1 is provided on the map and should be noted in the forms folder. The crew leader will use the GPS, maps, and compass to locate that point as precisely as possible.

Sometimes it will be necessary to relocate the sample plot, if the GPS coordinates contain a road or other non-forest areas. The relocation must follow the following steps:

Note why the point should be relocated (for example, the parcel is located on a body of water, road, or drainage).

Move to coverage equal to that of the inaccessible parcel. The new position must be as close as possible to the original position required and follow the plot design requirements defined previously.

3.3.3.5 Establishment of plot boundaries

1) Once the leader locates the southwest corner of the biomass plot using GPS, it must register properly like point 1.

2) The crew leader will place the GPS at point 1 and will wait until the GPS has averaged a reading with 100% confidence. This takes between 1 and 5 minutes.

3) Mark the correct coordinates of the point 1 recording a waypoint in the GPS. Record three separate waypoints for point 1, averaging up to a 100% confidence level reading each time. Having the correct coordinates is crucial for field inventories.

4) Use the compass to locate the northerly direction, following the planting lines, the western side of the plot will be along the tree line that best correlates with the northerly direction. The western limit of the parcel will be point 1 to the point 2. If north points in a direction that is not accessible, follow the procedure in step 2 of previous section for the relocation of the plot. Walk along the west side of the plot for 10 m and place the string on the ground outlining the west side of the plot.

5) Place a ribbon in a conspicuous location (on a tree or permanent spot such as a rock) in the southwest corner (point 1) as a permanent marker so the plot can be located in the future. You should try to place the bar exactly at the corner point of point 1 where the GPS coordinates were measured. Spray paint 4 nearby trees or rocks to point 1.

6) Place a temporary stake to mark point 2. Walk 10 m at an angle of 90 degrees in the east direction and place another temporary stake indicating point 3. Lay the string on the ground between the point 2 and 3, delimiting the south side of the plot.

7) The forest leader returns to point 1 and walks 10m at a 90-degree angle to the east and places another temporary stake to mark point 4. Place the string between points 1 and 4 delimiting the southern part of the plot.

8) Walk between points 3 and 4 delimiting the south side of the plot. Check that the east side is 10m and adjust if necessary.

9) There may be an error in the distance between points. The biggest mistake will be on point 3 and must move to compensate for the error. If the rope between points 2 and 3, and the rope between points 4 and 3 are not at point 3, this should be moved. Follow the steps below to account for distance corrections to be made:
    a) If the error at point 3 is less than 1 meter, the ropes can be extended or cut to compensate for the error, or obstacles do not allow the ropes to be tightened.
    b) If the error at point 3 is greater than 1 meter, adjust the location of point 3 moving the ropes in or out to complete the square.

10) Once the plot has been delineated, the field team leader uses the GPS to correctly record the points 2,3 and 4 and waits until the GPS unit has averaged a reading with a sample confidence of 100%. This can take between 1 and 5 minutes each.

11) Please note that it is important that the plot is not larger than 10m x 10m, which could overestimate the biomass.

3.3.3.5.1 Establishment of subplot points within the biomass plots

Inside the plot, two subplots are established to measure leaf litter, non-tree aboveground biomass and collect soil samples. Because the subplots must be representative of the area, each one will be established in two different places in the plot, and the location of the samples must be random. Process is described below:

1) Randomize the location of the two subplot points by walking a random number of steps north and a random number of steps east. Use Table 20 to select the row of numbers not yet used. When you use a row, cross it off the list. Each row of random numbers must only be used once. If necessary, make a new list of random numbers when all the numbers in the list have been used.

Table 20. Randomized distances for biomass subplots establishment

Randomized North distance (m)	Randomized East distance (m)
5	3
2	2
4	7
3	9
4	2
2	7
2	2
4	2
9	3
2	9
7	8
2	3
7	3
7	9
4	4
8	8
3	2
1	7
7	3
6	3
8	5
8	7
8	2
7	9

Randomized North distance (m)	Randomized East distance (m)
5	1
1	1
9	2
9	2
5	2
8	3
5	3
3	2

2) Once the subplot is located, the crew leader will be careful not to disturb vegetation within a 0.5 m radius of the subplot point. Non-tree biomass will need to be collected in this area, so it should not be damaged prior to collection.

3) A temporary mark will be placed at each point of subsample and the process will be repeated starting at point 1 until the two subplot points are selected.

3.3.3.6 Additional data to record at biomass plots.

1) Photographs will be taken to show the type of plot cover and canopy. Take photos in the north, east, south, and west directions, at point 1. The photos will be taken showing manual signs to indicate the directions, against the cover of the folder where the number of the parcel is. Specifically:
   - A finger indicates that the photo was taken in a northerly direction.
   - Two fingers indicate that the photo was taken in an easterly direction.
   - Three fingers indicate that the photo was taken in a southerly direction.
   - Four fingers indicate that the photo was taken in a westerly direction.

   An assistant will place one hand against the folder cover displaying the parcel number in the upper right-hand corner. The assistant will point their fingers to indicate the direction in which the photo was taken. The crew leader will be placed at least two meters from the assistant and will take the photos in the N, E, S, and W directions, taking care that the forest and fingers appear against the cover of the folder. In each plot, four photos will be taken at point 1. Each photo shows the coverage, fingers for address, and clearly shows the parcel number on the binder cover. The crew leader will record the file number of the photos in the appropriate place on the forms.

   The file number is unique and is associated with each photo. After taking the photos, the name of the photo's metadata will be verified on the cell phone (example: “IMG_3649”). This process may vary slightly depending on the camera. Figure 5 shows an example.

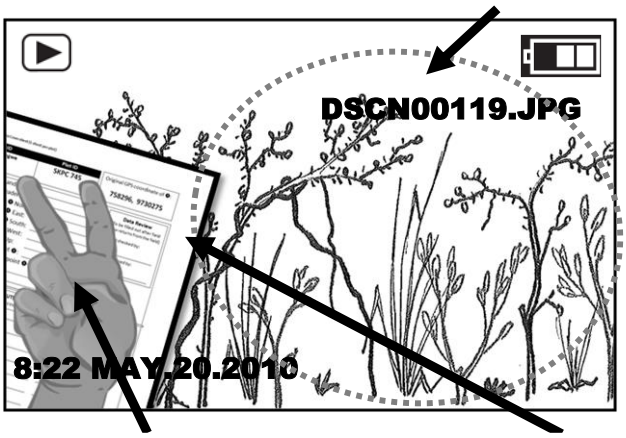


Figure 5. Example of photos to take in biomass plots.

2) Record the aspect of the plot from point 1. Aspect is the direction of the downslope from point 1, this can be expressed as "North" or Southwest". For forestry purposes, the aspect is the direction in which rainwater flows in a catchment.

3) Slope is measured is measured in degrees from point 1, but it must be representative of the plot. If the plot is on a very steep slope, the horizontal distance will be less than 25 m. If the land is flat, write “0” on the form.
   a) The crew leader will measure his eye height against an assistant when looking directly ahead on level ground (an example might be the leader's eye looking directly up the assistant's nose).
   b) The crew leader stands at point 1 and the assistant walks in the direction of the slope (aspect).
   c) The slope is measured once the assistant is about 2 to 8 meters from the leader.
   d) To use the clinometer, the compass dial is turned west, and the compass is held open and on its side. The black arrow on the compass will allow pointing down. When the angle is flat the black arrow points directly to 0.
   e) The crew leader will look over the top of the open compass at the same point where he measured the attendant's height in step a. The compass will move close to the eye so that it points to the angle of the viewing direction. The black arrow points to degrees of slope. Another crew member reads the degrees while the leader is using the internal clinometer.

4) Place a ribbon in a conspicuous location (on a tree or permanent spot such as a rock) in the southwest corner (point 1) as a permanent marker so the plot can be located in the future. Try to place the bar exactly at the corner point of point 1 where the GPS coordinates were measured. Spray paint 4 nearby trees or rocks to point 1.

3.3.3.7 Procedures for measuring biomass within the main plot.

Living trees

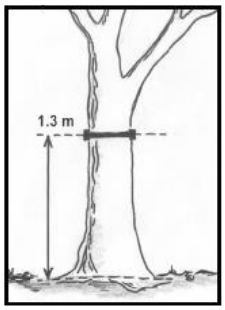
The field team leader is responsible for taking notes, completing the live tree data sheet, and directs all measurement work. Assistants help the field team leader to take measurements and collect the required

information. All trees that have a DBH greater than or equal to 1 cm must be measured following the procedure below:

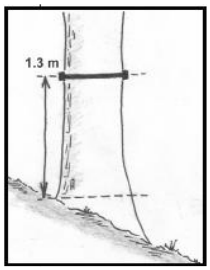
For each tree greater than or equal to 1 cm DBH, the species, height and DBH are recorded regardless of the species or if they were planted.

1) The team leader records all the data at the designated location on the Living Trees data sheet.
2) If a tree is near a plot line, decide carefully whether the tree is inside or outside of a plot. If the pattern is within the parcel boundaries, the tree is considered within the parcel. If stems originating within the plot extend outside the plot boundaries, they are still measured. If the pattern of the tree or sapling is exactly on the edge of the plot, flip a coin to determine if it is inside or outside.

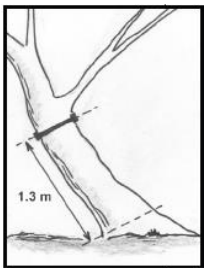
Below are some guidelines for correctly measuring DBH:



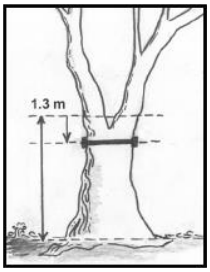
DBH always should be measured at 1.3 m from the ground.



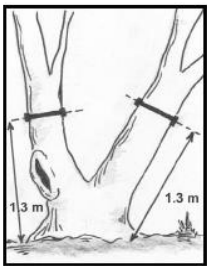
If the tree is on a slope, always measure the DBH at 1.3 m from the ground at the upper side of the slope.



If the tree is tilted, the diameter tape should be perpendicular to the trunk according to the angle of inclination (thus, it should not be perpendicular to the ground).



If the tree forks at 1.3 m or just below, measure below the fork. Measuring forked trees as a single trunk is more accurate for biomass estimation.



If the tree forks at 1.3 m or less from the ground, each trunk is measured as if they were separate trees.

Figure 6. DBH measurement.

Heights can be recorded with a rangefinder or using the internal clinometer inside the compass described below:

- The internal clinometer in the compass is used to find the height of the canopy. The compass dial is turned to the west and the compass is held open and on its side. Angles are measured with the black arrow on the compass. The black arrow on the compass will always point down. When the angle is flat, the black arrow points directly to 0.
- The field team leader looks over the open compass at the top of the tree. The compass is moved close to the eye so that it points to the angle of the viewing direction. The black arrow points to the angle.
- The field team leader walks away from the tree parallel to the slope, keeping the top of the tree visible. Move away from the tree as far as the tree is tall. This is done by visualizing the tree falling from its base directly towards the field team leader and having the top of the tree fall right at the feet of the field team leader. The field team leader will stand at a point that has an angel about 45° from the top of the tree.
- The field team leader uses the clinometer to measure a 45° angle with respect to the treetop. If the angle is less than 45°, he walks toward the tree until the angle is 45°. If the angle is greater than 45°, move away from the tree until the angle is 45°. Another field team member reads the degrees while the field team leader uses the internal clinometer.

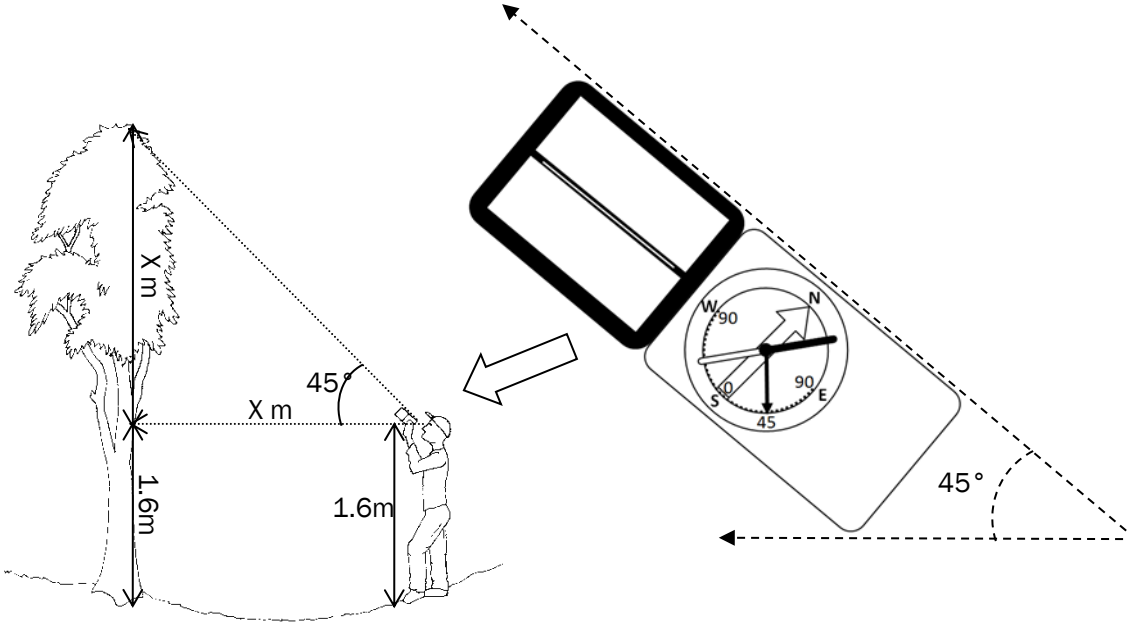


Figure 7. Tree height measurement.

Standing dead wood

The forest leader is responsible for taking notes, filling in the forms, and leads all measurement work. The assistants help the field crew leader with counting and measuring trees and call all information that the field crew leader needs to record.

1) Measure the DBH and height for a standing dead tree. As for live trees, only measure dead trees with a DBH greater than or equal to 5 cm and record on the Standing Deadwood Datasheet.

2) Recording the species of the tree is not necessary for standing dead trees.

3) Estimate the decomposition state of the tree. Use the following guidelines to determine the decomposition class.

Table 21. Stading dead wood decomposition class

CLASS 1	Tree with branches and twigs but without leaves
CLASS 2	Tree with no twigs, but with small and large branches
CLASS 3	Tree with large branches only
CLASS 4	Bole (trunk) only, no branches
CLASS 1	Tree with branches and twigs but without leaves
CLASS 2	Tree with no twigs, but with small and large branches
CLASS 3	Tree with large branches only

CLASS 4	Bole (trunk) only, no branches

4) Estimate the height of the standing deadwood or measure the height using the procedure to find dominate canopy height in Living trees section above.

Lying dead wood

The forest leader is responsible for taking notes to complete the lying dead wood data sheet and directs all measurement work. Assistants help the forest leader count and measure trees and call all the needed information to record.

To measure dead wood, a 10-m string is placed in a north-south direction, 5 meters from the north-south boundaries of the plot.

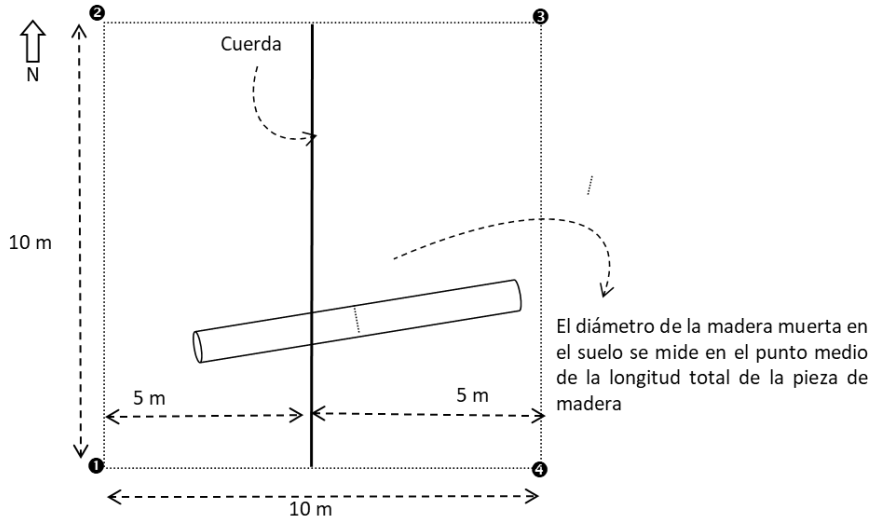


Figure 8.Lying dead wood sampling.

1) The field team leader walks between point 1 and point 4 and marks the location of the chord, 5 m east of point 1. The rope is then placed directly north of the point indicated by the field team leader.

2) Walk the length of the rope and analyze each intersecting piece of dead wood with a diameter greater than or equal to 5 cm at the point where the log crosses the rope. Dead wood that is less than 5 cm in diameter where it crosses the line is not measured. For each piece of dead wood that comes across, the field team leader records the following on the dead wood data sheet:

- The outer diameter at the center of the trunk,
- The length of the trunk,
- The density class,

3) Assign each piece of dead wood to one of the three density classes.

Table 22. Lying dead wood decomposition class

CLASS1	healthy wood; a machete does not sink into wood with a single blow.
CLASS 2	Intermediate wood; a machete partially sinks into wood with a single blow
CLASS 3	Rotten wood; a machete cuts through wood with a single blow.

3.3.3.8 Procedures for measuring biomass within subplots.

Non woody biomass

1) At the undisturbed site of each of the two subplots, the forest leader carefully measures a circle around the subplot location with a radius of 0.5 m and places the tape measure from the center of the plot to the north. Assistants help the field team leader by placing a rope on the ground around the circle measured by the field team leader (See Figure 9).

2) The field team leader weighs the empty bucket sack and records the weight of the empty bucket on the above-ground non-tree biomass data sheet.

3) The field team collects all non-tree vegetation, including ferns, herbs, grasses, etc., both alive and dead, standing at a height of less than 2 meters. Harvesting is done by cutting all the plants on the ground and placing them in the bucket. Ferns, dry grasses, and dead grasses are collected, while fallen leaves, twigs, and dead grasses are not collected. All seedlings, saplings and trees are left in the circle. Only the plants that are inside the circle or in the space of two meters above it are collected. If a plant hangs inside the circle, but the roots grow outside the circle, only the part of the plant that hangs inside the circle is collected. Similarly, if a plant is growing inside the circle, but hanging outside the circle.

4) The team leader weighs and records the bucket, filled with standing live and dead non-tree biomass, at the location designated on the data sheet.

5) Workers use the pruning shears to cut all collected standing non-tree biomass into pieces no larger than 5 cm by 5 cm and mix them into the bucket. The team leader then selects a 100 g sample of material that is representative of the composition of the material found in the bag. If the material is very wet, try shaking off the excess water. If there is less than 100 g of non-tree biomass, take all of it. If there is none, check the box indicating that there is no aboveground non-tree biomass on the subplot. The team leader places this sample in a bag and labels it with the plot identification and the subplot number (1 or 2) (to be taken to the laboratory to determine moisture content and dry mass).

6) The bucket is emptied of its contents away from the subplot and shaken to remove excess.

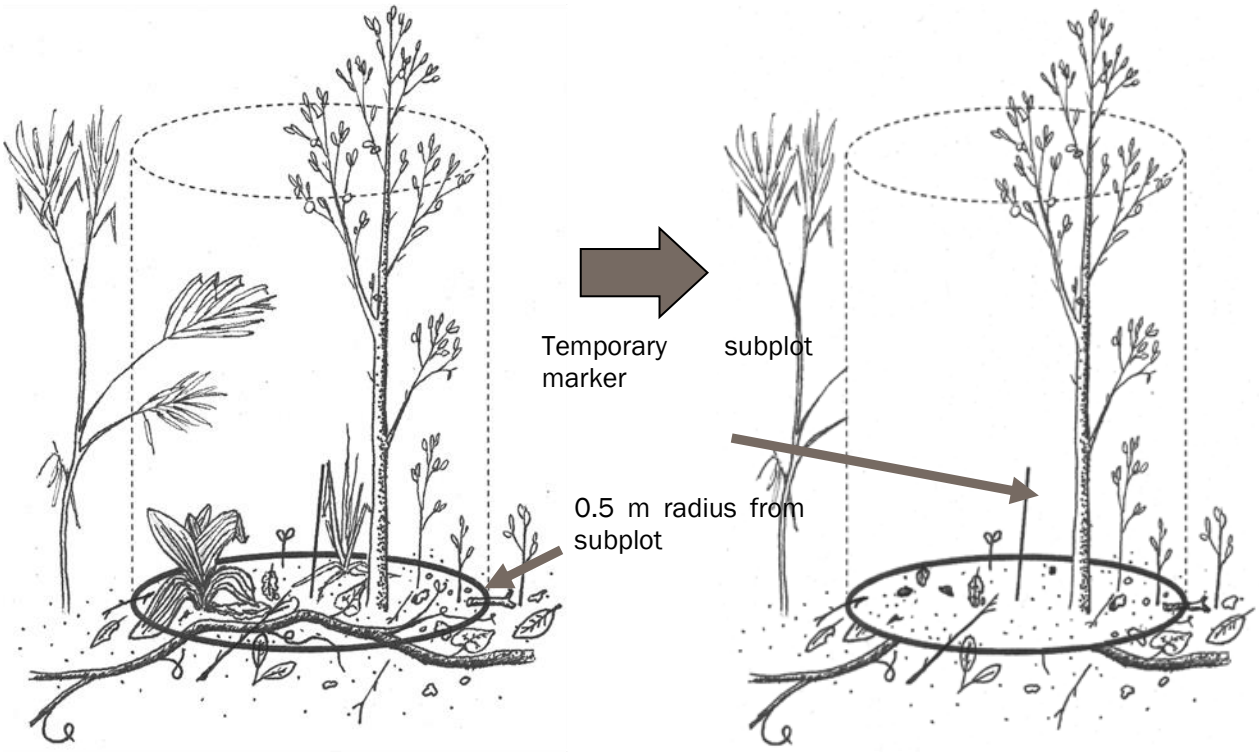


Figure 9. Non woody biomass sampling.

Litter

1) The amount of litter on the ground is measured and a sample is collected. This consists of collecting the entire layer of litter and humus found in each of the two subplots of 0.5m radius. After the non-tree biomass is removed, all dead and decaying material on the soil of the plot less than 5 cm in diameter should be collected.

2) The field team leader weighs the empty bag and records the weight of the empty bag on the Soil-Litter Data Sheet.

3) Assistants move around the subsample plot again starting with the tape measure and moving clockwise collecting all litter and humus including fallen leaves, cocoa berries, sticks, bark, etc., that is less than 5cm in diameter. Since there may be many roots in the humus layer, it may be necessary to use pruners to cut the roots and remove them from the sample. Live or dead/dry material (eg dry grass) is not collected from the plot floor.

4) The collection is completed by gathering all the lying material from the ground within the subplot and placing it in the bag. All seedlings, saplings and trees are left in the circle. Only fallen material that is inside the circle is picked up. If there are large pieces of litter inside and outside the circle, only collect the part of the litter inside the circle.

5) The bag and decomposed material are weighed and recorded by the team leader at the location designated on the data sheet.

6) Community workers use pruning shears to cut all the collected material into pieces no larger than 5 cm by 5 cm and mix it in the bag. The team leader then selects a 250 g sample of material that is representative of the composite material found in the bag. If the material is very wet try to shake off the excess water. If there is less than 250 g of the forest floor, take it all as a sample. If there is no material on the forest floor, check the box that there is none on the subplot. This sample is placed in a zip-lock bag and marked with the sample plot ID and plot number (1 or 2) by the team leader (to take to the lab/farm to determine the sample size). moisture content and dry mass).

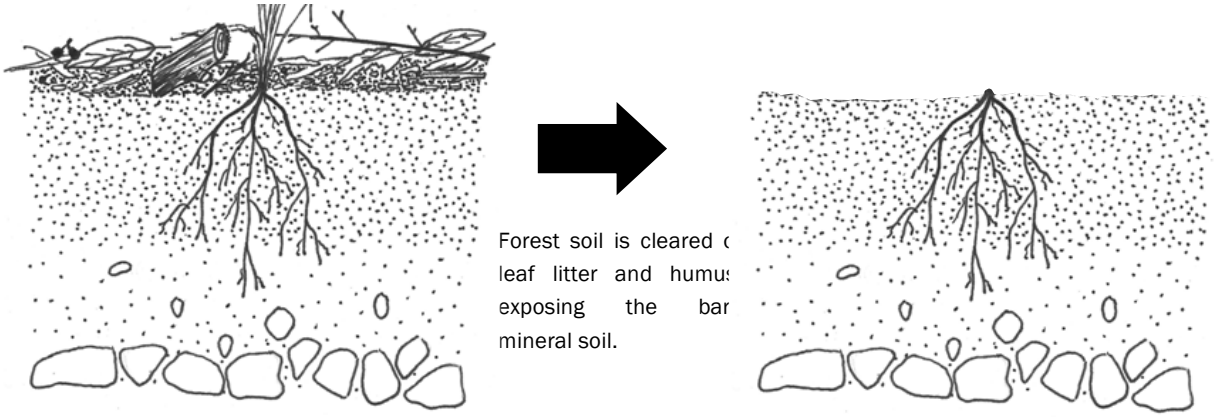


Figure 10. Litter sampling.

Soil sampling

A soil sample is taken from the center of each subsample plot.

1) The workers dig a hole in the center of the plot according to the instructions of the team leader. The hole does not need to be wider than the shovel, but it does need a clean vertical face cut into the ground 30cm deep.

2) The team leader uses the soil sample cylinder to collect three soil samples from each hole. Samples are taken at a depth of 1-10 cm, 10-20 cm and 20-30 cm.
   a) This is done by pressing the soil sample tube horizontally into the clean vertical face of the hole until the tube is filled with soil (the tube may need to be hammered into the face with a damper).
   b) Once the tube is full, it is carefully removed from the hole, allowing the soil to ooze out of each end.
   c) The team leader then carefully cuts off any soil sticking out from each end so that the tube is filled with soil and contains exactly 100 cm3 of soil.
   d) The soil within the tube is placed in a zip-lock bag, and the bag is closed and labeled with the plot identification and subsample number (1 or 2). Soil samples from each depth can be combined in the zip-lock bag so that there is only one zip-lock bag for each sub-sample.

3) This process is repeated twice so that each biomass inventory plot is in the center of each of the subplots.

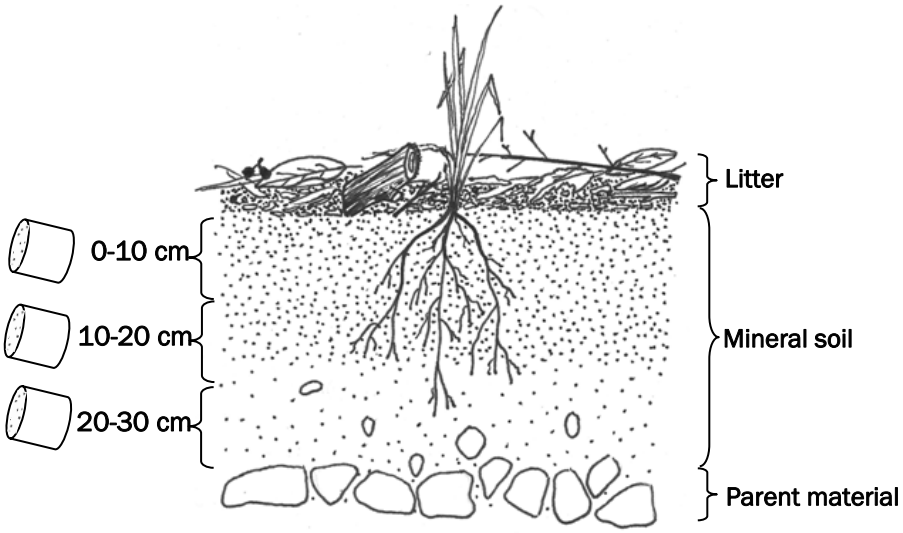


Figure 11. Soil sampling.

3.3.3.9 Field forms verification

The crew leader is responsible for reviewing and verifying all measurement work. The following procedures must be followed before the crew leaves the plot:

- Ensure that all lines on the forms are filled in. This is the leader's responsibility, and each form must be complete for the plot data to be acceptable.
- When the forms are completed, the leader will double-check the GPS coordinates, 30 cm diameter, DBH, and tree species for obvious outliers. • It must be ensured that the photos are not blurry and that the coordinates on the GPS screen are legible in the photos. It must be confirmed that each photo identifier is on the correct line of the form.
- Before leaving the plot, the crew leader will collect all forms and write the plot number on each sheet, front and back.
- To verify that the biomass plot is complete, the leader will sign their name on the gray cover of the Data Review box.

3.3.3.10 Desktop work

- Before separating the forms, ensure that they all have the correct plot identifications (in case they get mixed up, they can be reunited).
- Field forms will be reviewed for missing information (if information is missing, the data may be insufficient for biomass calculations and the plot will need to be remeasured).
- All data must be transferred to an Excel file. Each plot should have its own file, and each carbon reservoir or additional measured property will be listed as a separate sheet within the file. The naming convention will be consistent for all files and sheets.
- Field forms will be gathered in a folder.

- Common errors occur when handwriting is illegible or incorrectly interpreted. The crew leader should enter the data as it was recorded in the field. If the leader does not enter the data, any questionable data should be reviewed with the crew leader.
- After entering the data, it should be reviewed by another person who did not input information and is not the leader.
- Review the forms and save the files in the same folders as the photos. Ensure that all files and photos are correctly labeled following a consistent system and are saved in the corresponding folders.
- Download the GPS coordinates and save them in a file. The file should be kept in a separate folder from the data and photos.
- When downloading data from the GPS and camera, ensure that all data has been labeled following a consistent system and saved properly before clearing the internal memory of both devices.

3.3.3.11 Laboratory measurements

The purpose of this section is to measure samples of leaf litter that have returned from the field. These subsamples are measured both "wet" as soon as possible after returning from the field, and "dry" after drying to a constant weight. Weighing is done using the digital compact scale placed on a flat, dry surface.

1) Before measuring the biomass of the selected sample, verify that the plot ID and subsample number on the bag match the plot ID and subsample number on the data sheet.
   a) Ensure that the scale displays "0" and place the "wet" biomass bag on the scale. Weigh the bagged wet subsample.
   b) Record the weight to the nearest 0.01 g shown on the screen.

2) Bake the subplot sample in a conventional kitchen oven.
   a) Turn on the thermometer and place the temperature gauge in the oven frame and close it.
   b) Set the oven to 21°C and wait for 10 minutes for the oven to reach the desired temperature.

3.3.4 Dissemination of Monitoring Plan and Results (VCS, 3.18; CCB, CL4.2)

The summary of the Climate Monitoring Plan will be created and translated into Spanish and shared with workers and other stakeholders. This monitoring plan will be disseminated along with the Project Document with the support of on-the-ground project partners. Local stakeholders will be asked to comment on the monitoring plan. The Monitoring Plan will be made publicly available on the public website www.verra.org

3.4 Optional Criterion: Climate Change Adaptation Benefits

Gold level exceptional Climate Change Adaptation benefits not applicable to this project

3.4.1 Regional Climate Change Scenarios (CCB, GL1.1)

3.4.2 Climate Change Impacts (CCB, GL1.2)

3.4.3 Measures Needed and Designed for Adaptation (CCB, GL1.3)

4 COMMUNITY

4.1 Without-Project Community Scenario

4.1.1 Descriptions of Communities at Project Start (CCB, CM1.1)

The Puerto Carreño municipality is located in the Colombian Orinoquía, where the Meta River delivers its waters to the Orinoco River. Since the time of the missionaries, in the 17th century, the history of this place is characterized by the clash of different cultures. It was only until the beginning of the 20th century that it was possible for some families to settle there, giving rise to the current city, whose growth and development began in the 1970s. Since then, its inhabitants have been building their own identity. as "carreñenses" that combines their different origins: Andean, llanero and indigenous (Guarín, C. & Martínez, M., 2018).

The settlement process in Puerto Carreño and surrounding areas has been determined by the productive possibilities and the political-social conflicts generated within the country. Puerto Carreño had a great development mainly in the last three decades of the 20th century, which implied a significant demographic growth with population coming from different parts of the country in search of job opportunities. According to a study carried out by the National University, the main places of origin of immigrants are Meta, Casanare, Arauca, Altiplano Cundiboyacense, Valle del Cauca and Tolima. Demographic growth in the urban area of Puerto Carreño according to various censuses (Guarín, C. & Martínez, M., 2018).

The first settlers were mainly of urban origin and sought to have an equally urban model of life. For this reason, Puerto Carreño is not a city in which the countryside and its exploitation is a frequent activity of its inhabitants, neither commercially nor recreationally. There is, however, a segment of the population that works as a salaried worker on the few farms in the area, or families that request licenses to grow cotton (exclusively seasonal activity) in the Meta River valleys during the summer. The indigenous population that lives in Puerto Carreño, like the settlers, are populations that for various reasons have displaced their places of origin looking for job and life opportunities in the city: they are a minority population compared to the mestizo populations and They are not very mixed. The settlers have a very contemptuous image of the indigenous people. A very common image in the streets of the town of Puerto Carreño is to observe an indigenous mother with her children collecting material that can be recycled from the trash cans and bags, or children begging in the streets. For this reason, there is an image of indigenous people as beggars and vagrants. This population is highly discriminated against and only some have achieved prestige by demonstrating that, contrary to common opinion, they are trustworthy workers (Guarín Salinas, C., & Martínez Sánchez, M. L., 2018).

In this scenario lies Col La Paz Project, where poverty rates are high, and access to health services is scarce as the proportion of people with unsatisfied basic needs in the department reaches 67% according to the Colombian National Administrative Department of Statistics (DANE, 2018)he situation of indigenous communities is worrying as only about 10% of the indigenous population has access to electric power services, the water service coverage reaches only 9% of indigenous people, and in general, health care services are very limited, directly affecting the quality of life in the area. In this scenario, Puerto Carreño municipality has a total population of 20,294 inhabitants (DANE, 2018), that live mainly in the urban area of the municipality (77,4%). It is a culturally diverse city with more than 4,500 indigenous inhabitants from multiple indigenous communities like Sikuani, Sáliba, Amorúa, Piapoco, Piaroa, Puinabe, Curripaco, and Cubeo. Communities of various origins such as long-established farmers coming from other parts of the

country, displaced victims of the armed Colombian and Venezuelan conflicts, which reflects in a regional floating population of nearly 20% (STATISTA, 2018). It is a low populated region with afforestation firms and some smallholders' cattle farms. Due to the region's remoteness, infrastructure is scarce and food and essential goods are expensive as nearly all food is brought from Bogota by air transport. Increased poverty and the influx of migrants are creating social tensions in the area as unplanned migrant influx can strain local resources and infrastructure, potentially leading to competition for land, jobs, and services. Regarding land tenure and restitution process for indigenous communities, social tensions can arise due to competition for resources and cultural clashes between indigenous communities, local communities, and migrants.

In this context, afforestation companies such as Col La Paz, are receiving increased attention as they are perceived both as drivers of local development and as foreign forces taking over natural resources are receiving increased attention as they are perceived both as drivers of local development and as foreign forces taking over natural resources.

At Col La Paz, there are two types of employment: fixed and temporary. The fixed workers do not have an end contract date, while the temporary ones are employed according to the farm's demand and season. Throughout the years since the start of the Project, the number of fixed and temporary employees varied, from 14 to 23 fixed employees, and from 15 to 54 temporary workers.

4.1.2 Interactions between Communities and Community Groups (VCS, 3.19; CCB, CM1.1)

Interactions between communities and community groups in forestry projects play a crucial role in fostering collaboration, knowledge sharing, and sustainable development. In the case of Col La Paz Project, communities and community groups are essential stakeholders for the long-term project holistic sustainability as their active involvement and collaboration are vital for the project's success, representativeness, and efficiency (Antwi-Agyei, 2021) Col La Paz is surrounded by stakeholders that affect and are affected by activity development.

4.1.3 High Conservation Values (CCB, CM1.2)

There are no cultural or social HCV areas inside of the project area, besides the ecologically important HCV area of the morichales, but this is more specified in Section 5.1.2.

4.1.4 Without-Project Scenario: Community (CCB, CM1.3)

The "without-project" scenario refers to the situation where the project and its set of implemented and planned activities does not exist or has not been implemented. In the absence of sustainable forestry practices, farmers may continue using conventional forestry practices that contribute to forest and soil degradation (Montgomery, 2021) in the case of Col La Paz edaphoclimatic characteristic, this can include excessive tillage and consequent lack of organic matter replenishment and the depletion of forest resources. As a result, the decrease of soil's fertility over time leads to reduced production yields, long-term productivity challenges and consequently decrease in wellbeing conditions directly affecting the income of engaged project communities, potentially pushing them into poverty or exacerbating existing poverty levels (Albaladejo, 2021).

In rural communities heavily dependent on agriculture such as those involved on Col La Paz Project, soil degradation can limit livelihood options. When agricultural productivity declines, farmers may face difficulties in generating sufficient income from their land. This can result in a loss of livelihood opportunities and increased vulnerability to poverty (Ahmed, 2019). Limited income from agriculture may also force community members to seek alternative sources of income, which might be less reliable or

provide lower wages (Walker, 2020). In the without-project scenario considered, farmers might rely heavily on chemical pesticides to control pests and diseases without proper knowledge of their adverse effects, leading to pesticide residues in crops, soil, and water bodies, harming beneficial insects, pollinators, and human health (Alengebawy, 2021).

4.2 Net Positive Community Impacts

4.2.1 Expected Community Impacts (CCB, CM2.1)

Targeted Project Outcome 1: Increased knowledge, income, and livelihoods for workers

Community group	Col La Paz's fulltime workers
Impact(s)	*Identify impact(s)* With the implementation of project activities, it is expected that the following impacts will be achieved: • Increase job opportunities in the Project Activity Instance • Increased income for employees offering long term employment opportunity. • Increase workers' knowledge and skills on Forestry systems management, health and work safety, and biodiversity conservation. Provide legal and extra-legal benefits to employees (food subsidies, social security, good working conditions, and yearly medical visits).
Type of benefit/cost/risk	The impact is predicted, direct and benefit to the community
Change in well-being	Increase in income level and decrease in income variability over time, and improvement of skills.

4.2.2 Negative Community Impact Mitigation (VCS, 3.19; CCB, CM2.2)

The project is not expected to have any negative impact on the community.

4.2.3 Net Positive Community Well-Being (VCS, 3.19; CCB, CM2.3, GL1.4)

To demonstrate that the anticipated net well-being impacts of Col La Paz Project are predicted to be positive for all identified community groups compared with their anticipated well-being conditions under the without-project land use scenario, a comprehensive assessment was performed to determine the Project's baseline (HHS and PRAs). This assessment considered various aspects of well-being and was thought to compare the projected outcomes of the project with the baseline conditions. It also aimed at evaluating the

anticipated impacts of the Project on each community group's well-being, considering both positive and negative effects.

The predicted positive well-being changes with the implementation of the project activities are improvement of Financial Capital (increase of income levels, variability of income over time), and Human Capital (improvement of educational level and skills).

4.2.4 High Conservation Values Protected (CCB, CM2.4)

There are socially and culturally important HCV areas mentioned in the Participatory Rural Appraisals (PRAs) that are outside of the project area, such as the Cerro de la Bandera, Cerro Bita, Paso Ganado, the harbor and the Tiestero. Those areas have been identified, however since they are outside of La Paz jurisdiction, there will not be activities in those HCV areas.
Inside the Project Area, the morichales are considered ecologically important HCV areas, and they are fundamental for the environmental services that they provide as a water reservoir due to their permanence in lagoons and natural drainage areas. Additionally, they have biodiversity importance due to the presence of fauna and flora, common to the area. There will be on-going activities to raise awareness to the workers of the importance of the morichales, besides the ones mentioned on Section 5.2.4.

4.3 Other Stakeholder Impacts

4.3.1 Impacts on Other Stakeholders (VCS, 3.18, 3.19; CCB, CM3.1)

No other stakeholders have been identified, therefore there are no impacts.

4.3.2 Mitigation of Negative Impacts on Other Stakeholders (VCS, 3.18, 3.19; CCB, CM3.2)

No mitigation is needed since no other stakeholders have been identified.

4.3.3 Net Impacts on Other Stakeholders (VCS, 3.18, 3.19; CCB, CM3.3)

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No Project activities are anticipated to generate net negative impacts since no other stakeholders have been identified.

4.4 Community Impact Monitoring

4.4.1 Community Monitoring Plan (CCB, CM4.1, CM4.2, GL1.4, GL2.2, GL2.3, GL2.5)

The social impacts of the Project will be monitored over the crediting period. A detailed social monitoring plan has been developed to quantify the social impacts and meet the requirements of the Climate, Community and Biodiversity Standard.

Participatory community monitoring is essential to the project. As part of the Project Activities, employees will engage in community monitoring. These community monitors will assist in field-based assessments.
Participatory community monitoring is a foundational and indispensable element within the broader framework of La Paz project. This theme encapsulates the idea that our project's success is intricately linked to the active involvement of the local community and our dedicated employees.

First and foremost, participatory community monitoring must reflect the project's commitment to inclusivity and grassroots involvement. By actively engaging farm workers, La Paz aims to foster a sense of ownership and empowerment among its workers cohort considering their crucial role as their engagement is not passive but proactive, involving building relationships, gaining trust, and empowering the project. This engagement extends beyond simple data collection; it includes dialogues, feedback loops, and capacity-building initiatives to ensure that the workers community is not just informed but also knowledgeable and equipped to participate effectively.

La Paz understands that the community is made of local experts who bridge the gap between the project team and the community at large. These monitors are instrumental in gathering valuable data and feedback from the field. Their on-the-ground insights are invaluable for making informed decisions and adjustments in real-time, ensuring that the project remains responsive to the community's evolving needs and priorities. Moreover, community monitors do not function in isolation. They are supported, trained, and equipped by the project, which further enhances their capacity to contribute effectively. This capacity-building aspect extends beyond the project's timeline, leaving a lasting legacy of community empowerment and resilience. In essence, the theme of participatory community monitoring embodies a philosophy of co-creation, transparency, and mutual accountability. It is an acknowledgment that La Paz Project's success is not solely defined by its outputs but by the positive, lasting change it fosters within the community. This approach promotes a more comprehensive understanding of progress and success, which goes beyond mere project metrics and numbers, encompassing the transformation of lives, communities, and the sustainability of the impact achieved.

Please see the separate CCB Monitoring Plan provided in Appendix 4: Commercially Sensitive Information.

4.4.2 Monitoring Plan Dissemination (CCB, CM4.3)

The summary of the Community portion of the CCB Monitoring Plan has been created and translated into Spanish and shared with workers.
The dissemination of the Monitoring Plan was conducted by the on-the-ground project partners. Workers will be asked to comment on the monitoring plan.
The following meetings were held to disseminate the Monitoring Plan:

Participants	Purpose	Date
Workers	Informational meeting, socialize PD summary and process for comments and feedback	February 2024
Local authorities	Written communication	February 2024

The feedback from the Communities was collected during the meetings and summarized into public comments which were posted for the CCB public comment period.
The Monitoring Plan will be made publicly available on the public website www.verra.org. All stakeholders will be asked to comment on the project description along with the summarized translated version, and if needed to send comments to CCBStandards@vcs.org.

During each Monitoring Period the results of the project will be reported to the workers. This will be the responsibility of Col La Paz and should be conducted every verification period.

4.5 Optional Criterion: Exceptional Community Benefits

Gold Level exceptional community benefits do not apply to this project.

4.5.1 Exceptional Community Criteria (CCB, GL2.1)

4.5.2 Short-term and Long-term Community Benefits (CCB, GL2.2)

4.5.3 Community Participation Risks (CCB, GL2.3)

4.5.4 Marginalized and/or Vulnerable Community Groups (CCB, GL2.4)

4.5.5 Net Impacts on Women (CCB, GL2.5)

4.5.6 Benefit Sharing Mechanisms (CCB, GL2.6)

4.5.7 Benefits, Costs, and Risks Communication (VCS, 3.18; CCB, GL2.7)

4.5.8 Governance and Implementation Structures (CCB, GL2.8)

4.5.9 Smallholders/Community Members Capacity Development (CCB, GL2.9)

5 BIODIVERSITY

5.1 Without-Project Biodiversity Scenario

5.1.1 Existing Conditions (VCS, 3.19; CCB, B1.1)

Colombia is geographically divided into five regions (Amazon, Andean, Atlantic, Orinoquia, and Pacific), each with its distinct environmental, social, cultural, and political characteristics (Nassar-Montoya, 2000). As a result, the relationship between humans and nature varies depending on the geographical region, cultural heritage, proximity to urban or rural centers, and socioeconomic status. Attitudes towards wildlife in Colombia are influenced by two different perspectives: the indigenous and the colonizer. The indigenous perspective involves the use of fauna based on cultural beliefs and traditions, while the colonizer's perspective emerges from regional and national colonization processes driven by the expansion of agricultural frontiers and other social factors (Fals Borda, O., 1979).

According to the 2023 data from Colombia's Diversity Information System (SIB), the national territory boasts approximately 76,000 species. Among these, there are 1,954 bird species, 887 amphibian species, 752 reptile species, and 543 mammal species. This remarkable biodiversity ranks Colombia as the global leader in bird diversity, second in amphibians and reptiles, and fifth in mammals. Colombia's exceptional diversity of fauna is attributed to its geographical, climatic, topographical, and geological features, among others. Globally, Colombia has the highest bird and amphibian diversity, third highest in reptiles, and fourth highest in mammals.

The department of Vichada, the second largest in Colombia, comprises diverse savannah ecosystems that encompass a vast biological diversity and provide essential ecosystem services. These ecosystems are

closely interconnected with the internal forests, wetlands, and the alluvial plains of the Andean rivers, Orinoco, and Amazon regions. The Vichada department is characterized by a mosaic of terrestrial and aquatic ecosystems that have evolved to adapt to the seasonal water fluctuations of the Orinoco River. These areas provide diverse habitats that support a wide range of ecological communities. They serve as an ecological corridor for local species and hold significant biological, landscape, and economic value for the neighboring populations (Buitrago G. et al., 2019).

The diverse species found within the department play vital roles in maintaining numerous natural processes and significantly contribute to our understanding of essential ecological processes and functions in various natural environments. Furthermore, it holds economic and cultural significance for Colombia, influencing the nation's economic and social development. However, despite the department's biodiversity being a central organizing factor of the territory, there are several anthropogenic issues that pose risks and threats to the preservation of local flora and fauna. Problems such as deforestation, the introduction of invasive species, and indiscriminate hunting have irreversible effects, including desertification, habitat fragmentation, loss of habitat, population reduction, and even local extinctions (Buitrago G. et al., 2019). The following information was found regarding to the different taxa:

5.1.1.1 Flora

Colombia has great floristic diversity as it presents environments with exceptional characteristics for the speciation and adaptation processes of species (Vander Hammen, 1992; Webster, Churchill, Balslev, Forero, & Lutyen, 1995; Van Der Hammen & Hooghiemstra, 2001). As a result of floristic explorations and research in recent years in the country, there has been an increase in its knowledge and today, Colombia is recognized as one of the main centers of diversity and speciation in the world ((Madrinan, Cortes, & Richardson, 2013; Kapelle & Brown, 2001; Hamilton, 2010),with more than 100 varieties of ecosystems (Rangel et al, 1997-B). Such ecosystems have been the support of economic development and culture of Colombia (Alvear, Betancur, & Franco-Rosselli, 2010), drawing a fragmented landscape due to human activities that transform the forest such as wood extraction, the establishment of agricultural areas (Kattan, Chaves, & Arango, 1997), Mining and the expansion of cities. Despite this, the country has 59 protected areas that belong to the National Natural Park System, which represent a total area of 17,541,489 hectares (Colombia, 2019) and forests with representative flora of the area are still preserved.

The flora species in this region of Colombia is very high and historical data and literature with data from the first monitoring period, has demonstrated the species present in the Project Activity Instance. There are a total of 2,016 distinct species identified for the region (Bernal, R., S.R. Gradstein & M. Celis., 2015). Among these, only 17% (348) have been evaluated and fall under some form of threat category. Specifically, two species are classified as Critically Threatened (CR), one species as Endangered (EN), four species as Vulnerable (VU), one species lacks sufficient data for evaluation (DD), and 330 species are considered Least Concern (LC). The threatened categories, including CR, EN, and VU, consist of seven species that are listed in Table 23 within the dataset.

Table 23. **Threatened flora species, reported for the department of Vichada.**

FAMILY	SPECIE	IUCN CATEGORY
Annonaceae	*Oxandra espintana (Benth.) Baill.*	CR
Elaeocarpaceae	*Sloanea eichleri K.Schum.*	CR
Chrysobalanaceae	*Parinari pachyphylla Rusby*	EN
Bromeliaceae	*Pepinia heliophila (L.B.Sm.) G.S.Varad. & Gilmartin*	VU

FAMILY	SPECIE	IUCN CATEGORY
Fabaceae	*Dipteryx oleifera Benth.*	VU
Podostemaceae	*Apinagia ruppioides (Kunth) Tul.*	VU
Podostemaceae	*Macarenia clavigera P.Royen*	VU

Out of the 19 endemic species documented in the Department's Catalog of Plants and Lichens of Colombia (Bernal, R., S.R. Gradstein & M. Celis., 2015), 10 species have biological records available in herbaria or their presence has been confirmed through specific vouchers mentioned in the literature (Buitrago G. et al., 2019). However, the remaining 9 species listed in the report by Bernal et al. (2015) as occurring in Vichada are not included in the current collection (refer to Table 24).

Table 24. Species of endemic plants of Colombia, present in the department of Vichada

Family	Species
Annonaceae	*Guatteria metensis*
Bromeliaceae	*Pepinia heliophila*
Lamiaceae	*Hyptis crassipes*
Melastomataceae	*Henriettea goudotiana*
Passifloraceae	*Passiflora cauliflora*
Phyllanthaceae	*Phyllanthus vichadensis*
Poaceae	*Digitaria cardenasiana*
Primulaceae	*Cybianthus llanorum*
Proteaceae	*Euplassa saxicola*
Rubiaceae	*Remijia amphithrix*

5.1.1.2 Herpetofauna

In the reptile group, there are a total of 9 species distributed among 3 orders (Testudines, Crocodylia, and Squamata) and 4 families (Podocnemididae, Testudinidae, Crocodylidae, and Colubridae). Within the order Testudines, which includes turtles or chelonians, there are six species belonging to two families (Podocnemididae and Testudinidae). Among the Podocnemididae family, which consists of aquatic or semi-aquatic turtles, there are 4 species identified: *Peltocephalus dumerilianus*, *Podocnemis erythrocephala*, *Podocnemis expansa*, and *Podocnemis unifilis (*Table 25*)*. These species are all reported to be under some level of threat (Acosta-Galvis, A.R., 2000) (Lynch, J. D. & Á. M. Suárez-Mayorga., 2001) (Buitrago G. et al., 2019).

Table 25. List of reptile species under some degree of threat according to the IUCN Red List and locally RES 383, reported for the department of Vichada

Family	Species	IUCN	RES 383
Podocnemididae	*Peltocephalus dumerilianus*	VU	
Podocnemididae	*Podocnemis erythrocephala*	VU	VU

Podocnemididae	*Podocnemis expansa*		CR
Podocnemididae	*Podocnemis unifilis*	VU	CR
Testudinidae	*Chelonoidis denticulatus*		EN
Testudinidae	*Chelonoidis carbonarius*		CR
Crocodylidae	*Crocodylus intermedius*	CR	CR
Colubridae	*Chironius carinatus*	DD	

Upon reviewing additional information, a total of 22 bird species were identified as meeting certain criteria for global threat, with three of them also falling under national criteria. These species are distributed across nine orders and 12 families (Renjifo, L.M., M.F. Gómez, J. Velásquez-Tibatá, A.M.Amaya-Villarreal, G.H. Kattan, J.D. Amaya-Espinel & J. Burbano-Girón., 2002). The orders with the highest number of species are Passeriformes and Galliformes, with six and five species respectively. They are followed by the families Accipitridae, Psittacidae, and Furnariidae, each having three, two, and two species respectively. The remaining families (seven in total) each have one species. Following the first biodiversity monitoring study for the Project, a total of 111 species were identified from 17 orders and 38 families. Of these species, two atr classified as Near Threatened by the IUCN (*Mitu tomentosum* and *Thamnophilus nigrocinereus).* Furthermore, there is an almost endemic species known as the Cherrie's Antbird (*Myrmotherula cherriei*). Additionally, 21 bird species were categorized under CITES Category II. These species belong to diverse families such as Trochilidae (Hummingbirds), Falconidae (Falcons), Accipitridae (Sparrowhawks), Psittacidae (Parrots), and the White-breasted toucan (*Ramphastos vitellinus*) (Table 26).

Table 26. List of bird species under some threat criteria at a global and national level (MADS_RES. 0192/2014, registered in the department of Vichada (NT: Near Threatened, VU: Vulnerable, EN: Endangered and CR: Critically Threatened)

Family	Species	IUCN Red List	MADS_RES. 0192/2014
Accipitridae	*Accipiter poliogaster*	NT	
Accipitridae	*Harpia harpyja*	NT	
Accipitridae	*Morphnus guianensis*	NT	
Anatidae	*Neochen jubata*	NT	
Columbidae	*Patagioenas subvinacea*	VUc	
Falconidae	*Falco deiroleucus*	NT	
Cracidae	*Crax alector*	VU	
Cracidae	*Crax daubentoni*	NT	VU
Cracidae	*Mitu tomentosum*	NT	
Cracidae	*Pauxi pauxi*	EN	EN
Cracidae	*Pipile pipile*	CR	
Odontophoridae	*Odontophorus gujanensis*	NT	
Psophiidae	*Psophia crepitans*	NT	
Furnariidae	*Deconychura longicauda*	NT	
	Thripophaga cherriei	VU	
Parulidae	*Myiothlypis cinereicollis*	NT	

Family	Species	IUCN Red List	MADS_RES. 0192/2014
Thamnophilidae	*Hypocnemis cantator*	NT	
Thamnophilidae	*Thamnophilus nigrocinereus*	NT	
Thamnophilidae	*Thamnophilus tenuepunctatus*	VU	
Ramphastidae	*Pteroglossus pluricinctus*	EN	
Psittacidae	*Amazona farinosa*	NT	
Psittacidae	*Ara militaris*	VU	VU

5.1.1.3 Mammals

Colombia is home to around 543 mammal species. Among these, chiropterans, commonly known as bats, represent the most diverse order with 180 species, followed by rodents with 135 species (Alberico, Cadena, & Munoz-Saba, 2000). The study of these creatures is important because they have a profound impact on the structure, composition, and dynamics of ecosystems. Additionally, small mammals like bats serve as reliable indicators of habitat changes (Medellin, Equihua, & Amin, 2000). Furthermore, it is worth noting that approximately 38% of Colombia's mammal species are exclusively found in the Andean region, encompassing piedmont areas, Andean jungles, and paramos (Mann, 1986). Based on data from the IUCN, Resolution 543, and data acquired from the first monitoring period, it was found that 15 mammal species in Vichada are facing some level of global threat. These species are classified across 8 orders and 12 families (see Table 27).

Table 27. List of mammal species under some threat criteria at a global and national level, registered in the department of Vichada.

Family	*Scientific Name*	IUCN
Canidae	*Speothos venaticus*	NT
Mustelidae	*Pteronura brasiliensis*	EN
Felidae	*Leopardus wiedii*	NT
Felidae	*Panthera onca*	NT
Mustelidae	*Lontra longicaudis*	NT
Tayassuidae	*Tayassu pecari*	VU
Dasypodidae	*Dasypus sabanicola*	NT
Dasypodidae	*Priodontes maximus*	VU
Tapiridae	*Tapirus terrestris*	VU
Myrmecophagidae	*Myrmecophaga tridactyla*	VU
Aotidae	*Aotus brumbacki*	VU
Atelidae	*Ateles belzebuth*	EN
Atelidae	*Lagothrix lagothricha*	VU
Trichechidae	*Trichechus manatus*	VU
Iniidae	*Inia geoffrensis*	DD

Species and habitat	*Demonstrate that the project will not adversely impact habitats for rare, threatened, or endangered species.*
...Morichales forests and Non-flooded and flooded gallery forests	These habitats are considered areas of HCV and activities are in place to protect them and restrict any use of the habitat resources
RTE Species	Through the protection of the farm and areas of HCV, RTE species will be positively impacted by project activities. The environmental policy of no hunting and other harmful activities will provide the wildlife with a needed sanctuary and habitat corridor. A full list of the RTE species found in the area can be found in the tables of this section.

5.1.2 High Conservation Values (CCB, B1.2)

High Conservation Value	Species diversity
Qualifying Attribute	The Project Activity Instance contains species of great importance for conservation due to their degree of threat such as *Tapirus terrestrial, Myrmecophaga trydactyla, Priodontes maximus, Tayassu pecari, Pteronura brasiliensis, Chelonoidis carbonarius and Mitu tomentosum* present in different landscape covers, demonstrate the importance of existence of these areas, their riparian forests and the role of plantations as shelter sites and connection between forests.
Focal Area	Forestry system and surrounding habitats of the Project Activity Instance is the focal area as it is in a degraded state.

High Conservation Value	Ecosystems and habitats (Non flooded and flooded gallery forest-morichales, and riparian forest)
Qualifying Attribute	The ecosystems present in the area represent a high value for the region because they provide habitat for a variety of species and, if not protected, their conservation status could be altered and with it their ecological functions. Morichales are important patches of *Mauritia flexuosa* and are important habitats for different wildlife species.
Focal Area	Forestry system and the surrounding habitats of the Project Activity Instance is the focal area as it is in a degraded state.

5.1.3 Without-project Scenario: Biodiversity (CCB, B1.3)

The biodiversity without the project can face several situations. The region of the Colombian Llanos and Puerto Carreño is an area with an important number of fauna species that can be detected with some ease, especially medium and large land mammals, birds, and reptiles. These groups of fauna are usually the most affected by issues of meat consumption, use and sale of skins, consumption of eggs and meat in the

case of turtles, and illegal trafficking for various animals, including birds. Additionally, hunting for sport or fun is also recurrent in the region and the animal parts are widely used for medicinal remedies, ointments, etc., which also adds pressure to wildlife populations and is a threat to their survival. In particular, you would expect a decrease in population sizes of species that are usually consumed by people in the region (turtles and their eggs, various mammals, for example: tapir, deer, limpet, white-lipped peccary). In this sense, biodiversity, in a scenario without the project, could be in greater decline and have changes in its structure and composition, present species with population changes (some that decrease and others that increase).

The project intends with the plantations to regenerate the soil, provide nutrients, and produce long-term services, this, which will enhance the ecosystem's capacity to adapt to climate change. Such a scenario will surely bring positive changes to wildlife, seeking to maintain the ecosystem services they offer. Therefore, not planting the acacia plantations would likely lead to further soil degradation and plant communities' reduction in the Project Activity Instance. This would reduce habitat quality over time and could negatively impact existing biodiversity. Without the project in place, forest plantations would not be planted, and larger areas of land would be converted for other agricultural or grazing purposes, further disconnecting intact habitats for wildlife to move through. Within other changes that occur are the decline of populations due to anthropogenic causes, hunting, and consumption of wildlife meat with less control, fauna habitats most exposed to anthropic disturbance, and less awareness in the population about wildlife and its importance.

5.2 Net Positive Biodiversity Impacts

5.2.1 Expected Biodiversity Changes (VCS, 3.19; CCB, B2.1)

The Project Activity Instance was not cleared of natural ecosystems in the last 10 years. According to the La Paz Forest Management Plan, any area being prepared for planting was already degraded and there is no interference with native forests or near water sources.

The following outcomes are the expected long term impacts that the project will have on the biodiversity in the Project Activity Instance.

Project Target Outcome 4: Preserve conservation areas (only native forests under 12Tree property) for biodiversity purposes

Biodiversity Element	Establish conservation strategy
Estimated Change	We expect that the establishment of a conservation strategy will help to increase the flora and fauna in the Project Activity Instance. trainings sessions on data collection methods (Operational Report, Intermediate Outcome 4.1) • # of participants (Operational Report, Intermediate Outcome 4.1) • Protocol implemented (Operational Report, Activity 4.1.1.1) • # fires registered (Operational Report, Activity 4.1.1.2) • # firebreaks (Operational Report, Activity4.1.1.2) • #Policies applied (Reforestadora La Paz, 12Tree) Operational Report, Activity4.1.1.3)
Justification of Change	The Agrofrestry area is home to a diverse assortment of flora and fauna and the conservation of these species is imperative for the

	overall productivity and health of the system. Therefore, the establishment and implementation of a conservation strategy will help to maintain and increase the biodiversity in the area.

Biodiversity Element	Restoration and conservation of biodiversity in the project area
Estimated Change	Project activities that include environmental policy to prevent hunting, fishing, and illegal activities in the area of operation and wildlife tracking are expected to be implemented with the Project. These activities should increase the # of species of different taxa present in the Project Activity Instance and increase the number of new species observed to that area. • new species observed (Biodiversity Assessment, Intermediate Outcome 4.2) • # individuals per taxa (Biodiversity Assessment, Intermediate Outcome 4.2) • # endangered species (Biodiversity Assessment, Intermediate Outcome 4.2) • # of species of the different taxa (Operational Reports, Activity 4.2.1.1) • # observation reports (# of species observed) (Operational Report, Activity 4.2.1.1) • Policy being implemented and monitored (hunting and illegal activities) (Operational Report, Activity 4.2.1.2) • # trainings (Operational Report, Activity 4.2.1.3)
Justification of Change	Uncontrolled illegal activities that occur in areas with high biodiversity can become detrimental if not dealt with. Uncensored hunting can lead to the decline of important species populations, especially those at risk of extinction. Illegal logging of timber can also degrade the habitats these species depend on and push them out of the Project Activity Instance. By implemented policies to prevent such activities and compliment with wildlife monitoring, population trends, species presence/absence can be more accurately assessed and the prevention of illegal activities will also help to stabilize and improve certain wildlife populations.

5.2.2 Mitigation Measures (VCS, 3.19; CCB, B2.3)

We do not expect the project to have negative impacts on biodiversity or the HCV's identified, in or around the Project Zone. However, if such impacts are possible, there are some activities that help to mitigate any negative impacts on the HCVs: wildlife diversity (HCV1) and the gallery forests/morichales (HCV3). The gallery forests extend along the western side of the property and many project activities can impact on these forests. These forests and the plantation are home to a diverse array of species as well (HCV1).

These are some of the project activities to be implemented that will mitigate negative impacts on the areas of HCV (morichales and species diversity). In order to mitigate the negative impacts identified in the project, the following measures are proposed:

Perform integrated waste management (hazardous and non-hazardous) of the 12Tree property.

- Improved waste management on the farm including in the native morichales (posted as protected area on the farm), will reduce harmful litter and pollution, reduce the risk of fire spreading, and improve the plantation and forest health.

Establishment of firebreaks and prevention of fires in the project area within the native forests of the 12Tree property.

- The establishment of firebreaks and other fire prevention activities will reduce the number of fires that impact the farm, mitigate exacerbated impacts on the farm due to fire, and protected the established plantation, morichales, and wildlife there.

Implement the planting of established forest species on the farm.

- will ensure forest cover and connectivity of forested habitats for wildlife to pass through. This will not only increase the number of wildlife species in the farm and morichales, but also improve ecosystem services necessary for the plantation. (i.e. soil integrity, maintenance of water cycles).

Establishment of an environmental policy to prevent hunting, fishing, and illegal activities in the area of operation of the project.

- Because the workers on the farm must adhere to policies implemented by La Paz, the environmental policy that is established and implemented should mitigate negative impacts on the biodiversity and HCVs on the farm. Signs have also been added around morichales to inform and prevent these illegal activities around the farm.

5.2.3 Net Positive Biodiversity Impacts (CCB, B2.2, GL1.4)

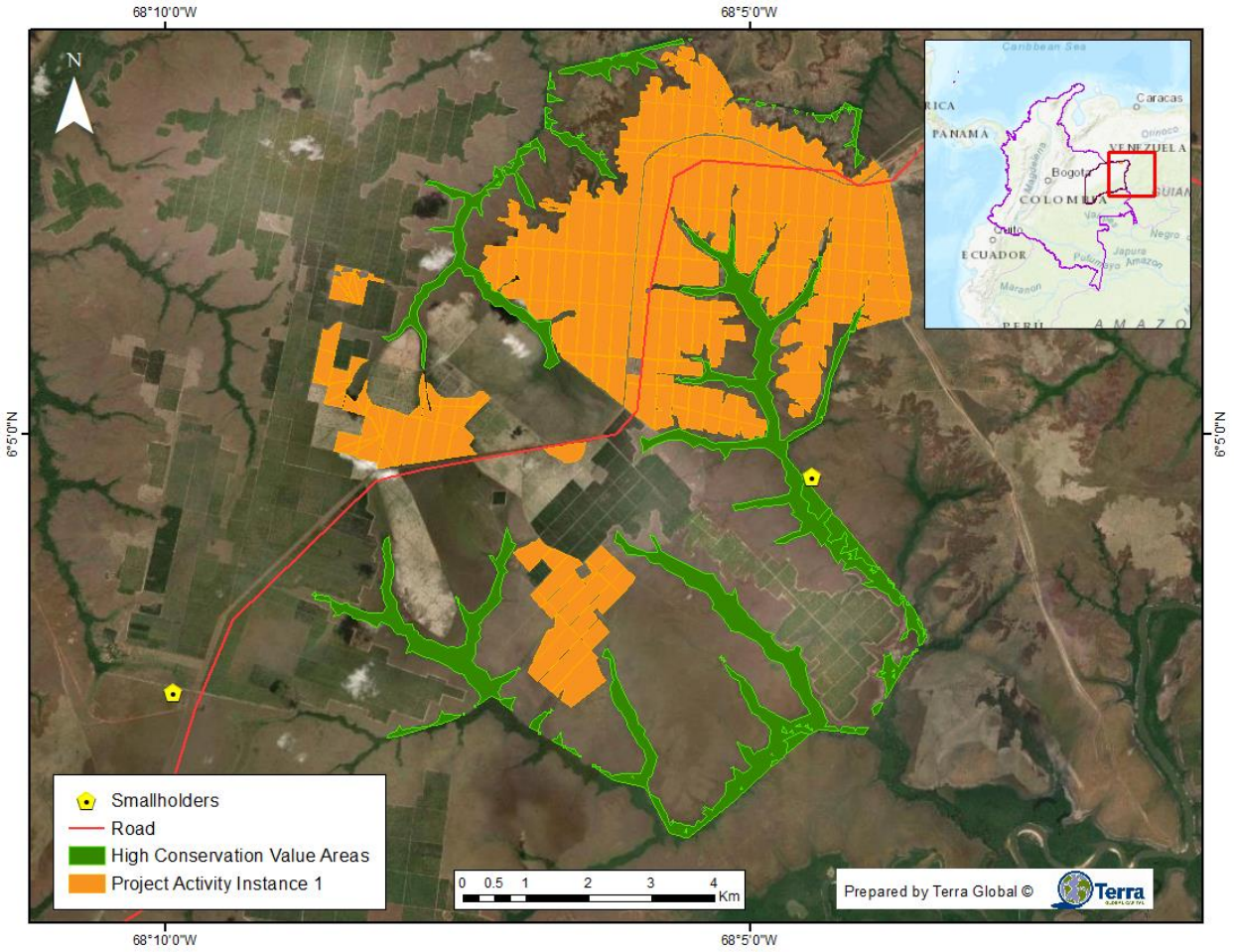
In the absence of the project, the project area is anticipated to maintain degraded soil conditions, which offers limited habitat for the existing species. However, the development of project activities will not have an impact on the existing forest areas. As time progresses and the plantation trees mature, they have the potential to beneficially connect existing forest patches by providing tree cover in an area where the presence of degraded soil currently separates the forests.

5.2.4 High Conservation Values Protected (CCB, B2.4)

The study area is immersed in a strategic region for the conservation of biodiversity. In this region, the presence of large rivers such as the Orinoco, Meta and Bita, is key to research and conservation of the fauna of Puerto Carreño.

Col La Paz presents various gallery forests with tributaries that flow into the Bita River and the Meta River. These forests are key to the conservation and protection of the identified trigger species, since they are sites that can provide rest, shelter, food, and conditions for reproduction.

In this sense, a key biodiversity area was defined by the amount of gallery forests and morichales in the project area, the presence of the Juriepe River and streams that feed it, and also by the species that were recorded, as shown in Map 10.



Map 10. Area defined as High HCV Conservation Value in the study area.

This HCV has an area of approximately 634 hectares, which corresponds to 4.2% of the area of the entire polygon of Col La Paz.

In general, species from all groups evaluated were recorded in this area, including animals that were only seen in this area, such as the River Otter (*Pteronura brasiliensis*), the Mountain Dog (*Potos flavus*), the Opossum *(Marmosa sp.*), the Galápaga (*Podocnemis vogli*), the Babilla (*Caiman crocodilus*) and the Ashy Batará (*Thamnophilus nigrocinereus*), to mention a few. Additionally, this area covers the Juriepe river basin, a key element for the protection of a fragile aquatic and riparian ecosystem due to external pressures such as hunting, deforestation, and livestock. Thus, due to the significance for the health of the plantation and for the diverse number of wildlife species in the Project Area, there will not be any negative impacts on these gallery forests or to the wildlife.

5.2.5 Species Used (VCS, 3.19; CCB, B2.5, B2.6)

Species introduced	Classification	Justification for use	Adverse effects and mitigation
Acacia mangium Willd	Non-native	These species are only grown within the farm and are effectively managed. They are also not known as invasive species and	No known adverse effects from these tree species are known and thus

		are safe to plant in agroforestry systems.	mitigation efforts are not needed.
Pinus caribaea	Non-native	These species are only grown within the farm and are effectively managed. They are also not known as invasive species and are safe to plant in agroforestry systems.	No known adverse effects from these tree species are known and thus mitigation efforts are not needed.
Eucalyptus pellita	Non-native	These species are only grown within the farm and are effectively managed. They are also not known as invasive species and are safe to plant in agroforestry systems.	No known adverse effects from these tree species are known and thus mitigation efforts are not needed.

5.2.6 Invasive Species (VCS, 3.19; CCB, B2.5)

No known invasive species are used by the project and are known to exist within the Project Activity Instance. All future monitoring periods will monitor potential invasive species from outside of the project and project activities, though it is not expected to occur, Mitigation measures will be enacted to ensure any future invasive species do not spread.

5.2.7 GMO Exclusion (CCB, B2.7)

The project maintains their own nurseries, where they reproduce the tree species utilized in the project. It is important to note that no Genetically Modified Organisms (GMOs) are employed in the propagation process of the plants used within this project.

5.2.8 Inputs Justification (VCS, 3.19; CCB, B2.8)

The use of fertilizers and agrochemicals in the Project Activity Instance is minimal. The application process adheres to proper instructions, timings, and safety protocols. The project staff monitors the usage to minimize costs by applying only the necessary amounts. All fertilizers and agrochemicals are applied based on the specific requirements and growth stage of the trees while following applicable national and local regulations.

Name	NPK fertilizer
Justification of use	The use of biological compounds as fertilizers is used minimally and helps reduce the environmental impact that other complex fertilizers may have.
Potential adverse effect	Though not expected, the use of compounds may increase acidification of soil. The minimal use of the fertilizer in key stages of growth will

	ensure the potential adverse effects do not occur.

Name	Glyphosate
Justification of use	The use of glyphosate is used to control grasses in the agroforestry system and the use are compliant and approved by the criteria of FSC® certification. All doses are applied with the recommendations set by the manufacturer under the required safety protocols.
Potential adverse effect	If used incorrectly, the potential adverse effects include the accumulation of the product in the soil and degradation of microorganisms. However, the use of the pesticide is used sparingly and should not have these impacts on the farm.

5.2.9 Waste Products (VCS, 3.19; CCB, B2.9)

The Project Activity Instance will create a Waste Management Plan that outlines policies for identifying and managing various waste products such as fresh water, wastewater, solid waste, fuels and oils, and chemicals. In line with this plan, the project will form partnerships and establish contracts with specialized companies that offer specific treatment methods for waste disposal. These practices will adhere to the national regulatory guidelines set by PMIRS. Additionally, the project's operating personnel will receive training to ensure proper waste classification and disposal procedures are followed.

5.3 Offsite Biodiversity Impacts

5.3.1 Negative Offsite Biodiversity Impacts (CCB, B3.1) and Mitigation Measures (CCB, B3.2)

The biodiversity outside of the project zone will have a positive impact from activities that are implemented in the Project Area, thus no negative offsite biodiversity impacts will be incurred as most farming activities will not affect wildlife.

5.3.2 Net Offsite Biodiversity Benefits (VCS, 3.19; CCB, B3.3)

In addition to benefits within the Project Activity Instance, this project will also provide biodiversity benefits outside the project area for its several ecosystem services that are provided for maintaining and conserving wildlife and flora species and areas of high conservation values. Under this scenario, wildlife provides humanity with some ecosystem services, from which both direct (food source, medicine, trade) and indirect benefits (pollination, seed dispersal, pest control and disease vectors) are obtained. Similarly, the role of these organisms in processes such as nutrient cycling and energy flow could be helping to maintain the structure and functioning of the ecosystems of which they are a part, influencing the stability of the various systems and therefore the provision of services by them to the surrounding areas. Overall, the net offsite biodiversity benefits are expected to be positive.

5.4 Biodiversity Impact Monitoring

5.4.1 Biodiversity Monitoring Plan (CCB, B4.1, B4.2, GL1.4, GL3.4)

A monitoring plan is proposed in order to determine the composition and structure of the flora communities and of amphibians, reptiles, birds and mammals present in the Project Activity Instance. These monitoring studies will be used to assess how project activities impact the flora and fauna communities in the project zone over time.

For the flora assessment, plots of 500 m^2 (50x10m) will be established in the identified coverage, following the methodologies of (Gentry, 1982), (Gentry, 1996),and (Rangel & Velazquez, 1997). These plots will be subdivided into smaller sampling areas: 1x1 m. for seedlings, 5x5 m. for saplings (DBH ÿ1cm and <5cm), 10x10 m. for lattices, and 50x10 m. (DAP ÿ5cm and <10cm) for stems. Sampling units will be set along a central axis of 50 meters for information registration. The starting coordinate of this central point will be georeferenced using a Garmin 64x GPS with a precision of ±5 meters. Information will be collected within a width of 5 meters on both sides of the central axis for all individuals in various categories (Seedlings, Saplings, Latizales, and Stems). The collected field data will include dasometric measurements (total height, commercial diameter), and species identification (common name, scientific name, taxonomic description, use). For species lacking taxonomic certainty, a botanical sample of each sampled individual will be collected. Two (2) methods will be employed for plant material collection: manual collection for plants within reachable height and an extension pruner for taller tree species.

The floristic composition will be analyzed based on the presence or absence of the taxa. Additionally, the distribution of the taxa will be taken into account, emphasizing the composition at the family level. Other analyses that will be expected for the data include relative abundance and diversity index (i.e., Shannon-weiner). Species identified in the field will also be classified to the level of threat according to the IUCN Red List and endemicity.

The sampling design of the fauna study should be carried out in two (2) annual outings that coincide with each climatic season, in the forests of the Project Activity Instance, even in neighboring savannah and plantation sectors so that the use given by the fauna and the existence or not of connectivity between the forest patches and these other covers. The parameters that must be evaluated are: richness, diversity, relative abundance and composition of species; likewise, species accumulation curves should be made in each of the sampled plant covers. The above in order to analyze the changes over time, detecting possible negative or positive effects on the fauna. These data should pay particular attention to the triggering species to determine their permanence in the areas and their population trend over time.

The recommended methodology for each group is presented below, which must correspond to the one used in the initial study and be replicated over time to detect changes during the different stages of the Project:

Amphibians: Record of species through the Visual Encounter (VES - Survey Visual Encounter) method, which consists of making tours of a delimited area and during a previously defined time; this method will be supported with auditory recordings of the vocalizations in order to increase the efficiency of the study and cover the largest area. Preferred microenvironments will be taken into account such as: vegetation, leaf litter, edges of ponds, streams, roads, under rocks and logs, among others.

Reptiles: The evaluation of this group will be carried out through day and night tours, the same as those proposed for amphibians. Inspections will be carried out, making removal of preferential microhabitats (trunks and stones) and observation of hollow trunks, shrubby vegetation and potential shelters; supported by tools such as tweezers and herpetological hooks. For this group, some covers not dependent on water will be evaluated, since most snakes and lizards require high temperatures to regulate their metabolism. It is important to consider that the biological activity of reptiles has its maximum peaks between 10:00 and 12:00; and between 5:00 p.m. and 7:00 p.m. (on a normal sunny day, since they are not active on cloudy or rainy days). Outside of these hours these animals are inactive in their refuge sites. The recording of the data will be carried out in the field notebook, which will allow to qualify and quantify the observations and the geographic, morphological, and ecological data, additionally a photographic record will be made that allows highlighting the patterns and chromatic characteristics.

Birds: Two techniques will be developed, the first consists of making direct visual and auditory records in pre-established transects and counts by intensive observation points. The second consists of capturing

birds with mist nets (12 x 2.5 m, 30 mm mesh eye) located in strategic locations. These will be open in the morning and afternoon, according to the peaks of greatest bird activity; They will be checked every 30 minutes. A photographic record and data on age, sex, reproduction, and plumage status will be taken from the captured individuals prior to their release. In order to expose the capture effort applied, the following equation is described: EC = No. T x TM Where: EC: Capture Effort: Total number of nets, during the entire sampling in each habitat. No. T: Number of 12 m nets. No. TM: Sampling time. From the previous equation, the sampling effort in hours/network can be inferred for each monitoring site.

Mammals: The size categories will be taken into account:

• Medium (50 g to 5 Kg) and large mammals (weight greater than 5 Kg): Does not imply capture of animals due to the complexity of handling them. They will then be recorded through direct observation tours and search for traces in the morning (5:30 and 9:00 a.m.) and night (6:00 p.m. and 10:00 p.m.), in the hours of greatest activity of the animals. Since no captures are made for this group, the sampling effort will be defined as the time invested in the observation tours. Captured animals will have morphometric measurements, dental morphology, arrangement of hairs, among others, taken before their release.

The installation of camera traps is proposed to estimate the values of relative abundance species of medium and large mammals found for each coverage through the use of camera traps. Camera traps will be placed in randomly selected areas in the Project Zone to determine distribution of the mammal species.

With the records in each monitoring phase, key data on the abundance of the species will be obtained, which will make it possible to infer the trend of wildlife populations in the evaluated area.

5.4.2 Biodiversity Monitoring Plan Dissemination (CCB, B4.3)

The summary of the Biodiversity Monitoring Plan will be created and translated into Spanish and shared with communities in the Project Zone. This monitoring plan will be disseminated with the Project Document with the support of on-the-ground project partners. Local stakeholders will be asked to comment on the monitoring plan along with the summarized translated PD. The Monitoring Plan will be made publicly available on the public website www.verra.org.

5.5 Optional Criterion: Exceptional Biodiversity Benefits

Gold Level exceptional biodiversity benefits do not apply to this project.

5.5.1 High Biodiversity Conservation Priority Status (CCB, GL3.1)

5.5.2 Trigger Species Population Trends (CCB, GL3.2, GL3.3)

APPENDIX 1: STAKEHOLDER DESCRIPTION TABLE

Stakeholder	Rights, interest, and overall relevance to the project
La Paz employees	The project's employees will represent an important stakeholder as they will be hired to implement activities according to the strategic and operational plan.
CORMACARENA	It is the highest environmental authority in the area of jurisdiction in accordance with the guidelines drawn up by the Ministry of the Environment. Cormacarena grants the environmental concessions, permits, authorizations and licenses required by law for the project to use renewable natural resources (water) or for the development of activities that affect or may affect the environment.
Smallholders around the project area	The smallholders surrounding the Project Activity Instance will serve as strategic partners, ensuring adherence to property boundaries and responsible use of communal resources. Open and effective communication channels will be established to foster a safe operating environment for project activities.

APPENDIX 2: PROJECT ACTIVITIES AND THEORY OF CHANGE TABLE

Activity description	Expected climate, community, and/or biodiversity			Relevance to project's objectives
	Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
1.1.1.1 Development of forest reforestation plan	1.1.1 Establishment of forest species	1.1 Aboveground and belowground biomass increase	1. Adopted regenerative climate-smart practices	The implementation of the activities will ensure that La Paz establish and maintain their forest, along with the implementation and establishment of a residue, organic waste management plan. All of which increases the carbon removals.
1.1.1.2 Planting of established forest species				
1.1.1.3 Efficient fertilizer management (synthetic products, mineral amendments)				
1.2.1.1 Organic waste management (weeds, crop residues, litter)	1.2.1 Establishment of forest management practices	1.2 Degraded soil areas rehabilitated		
1.2.1.2 Carry out silviculture activities (thinning, maintenance pruning)				

2.1.1.1 Increase number of job opportunities in the project area	2.1.1 Increase in the number of workers receiving extra benefits	2.1 Guarantee long-term economic income (minimum wages and extra legal benefits) to workers	2. Improve plantation workers' livelihoods	By implementing the activities of this outcome, there will be better working conditions with multiple extra benefits, which in turn increases the chances of permanence of workers which benefits the maintenance of the project during its duration
2.1.1.2 Payment of minimum wages to workers (labor)				
2.1.1.3 Provide accommodation for workers				
2.1.1.4 Provide daily meals (3) to workers				
2.1.1.5 Provide transportation to-workers				
2.1.1.6 Implement bonus program				
2.2.1.1 Provide training about health, work safety and environmental management	2.2.1 Adoption of practices from trainings	2.2 Increase knowledge of workers		
2.2.1.2 Facilitate formal or informal education for the workers' family (SENA and other entities)				

2.3.1.1 Design and develop a health and safety prevention system at the workplace (staffing, procedures) under national regulations	2.3.1 Establishment of health and safety prevention system plan	2.3 Assurance of a safe and healthy work environment		
2.3.1.2 Implement recreational activities				
3.1.1.1 Perform integrated waste management (hazardous and non-hazardous)	3.1.1 Develop and Document a comprehensive strategy	3.1 Established Conservation Strategy	3. Preserve conservation areas (only native forests under 12Tree property) for biodiversity purposes	The implementation of the activities for this outcome will ensure the conservation and maintenance of the native forests through creation and maintenance of firebreaks, establishment of wildlife tracking activities and creation of an environmental policy, which will conserve the biodiversity existent.
3.1.1.2 Establishment of firebreaks and prevention of fires in the project area				
3.1.1.3 Develop and reinforce Zero Deforestation policy of native forest (HCV areas), wetlands, or HCS				
3.2.1.1 Wildlife tracking log by workers	3.2.1 Implementation of habitat restoration and biodiversity conservation initiatives in the project area	3.2 Restoration and conservation of biodiversity in the project area		
3.2.1.2 Establishment of an environmental policy to prevent hunting and				

illegal activities in the area of operation of the project				
4.1.1.1 Design continuous training plan with La Paz staff	4.1.1 Strengthen local capacity for continuous data collection over time	4.1 Establish local capacity for the development of the monitoring plan on the collection and registration of information on the farm	4. Monitoring and reporting	The implementation of monitoring and reporting activities are aligned with the VCS and CCB requirements to collect, analyze and disseminate findings.
4.1.1.2 Annual trainings on monitoring and project management				
4.1.2.1 Carry out training on how to carry out biomass inventory and data collection	4.1.2 Carry out biomass plot inventory and analysis of satellite images to define carbon reserves			
4.1.2.2 Acquire and analyze satellite images				
4.1.2.3 Perform QA/QC on biomass inventory and incorporate into monitoring report				
4.1.3.1 Collect, review and analyze data collected on social surveys and rural participatory diagnosis	4.1.3 Carry out social surveys according to VCS/CCB requirements			
4.1.3.2 Carry out social surveys				

4.1.3.3 Perform QA/QC and incorporate into monitoring report				
4.1.4.1 Trainings on biodiversity monitoring	4.1.4 Conduct biodiversity monitoring according to VCS/CCB requirements			
4.1.4.2 Carry out biodiversity assessment				
4.1.4.3 Perform QA/QC and incorporate into monitoring report				
4.1.5.1 The project collects information on monitoring activities for which it is responsible	4.1.5 Collect, prepare and disseminate monitoring reports according to VCS/CCB plans			
4.1.5.2 Prepare and disseminate monitoring reports every quarter of the year				
4.1.5.3 Monitoring reports are disseminated with the community and other interested partners				
5.1.1.1 Compile data for regular reports and scan		5.1 Validation conducted in participatory manner to		The implementation of the activities for this

all hard copies of monitoring data	5.1.1 Prepare for VCS Validation requirements for VCS/CCB	support management and achieve a Validated REDD+ Project Document with an established baseline for on-going measurement results	5. Validation and Verification Completed	outcome ensures that the Project is able to validate and verify its findings, which enables the generation of carbon credits
5.1.1.2 Review and finalize the draft of monitoring plans				
5.1.1.3 Write non-carbon Sections of VCS/CCB PDD				
5.1.1.4 Perform carbon calculations for VCS/CCB PDD: Baseline calculation of carbon under the project scenario				
5.1.1.5 Perform carbon calculations for VCS/CCB PDD: ex-ante calculations of carbon under project scenario				
5.1.1.6 Perform carbon calculations for VCS/CCB PDD: Calculations of the non-biomass related emissions				
5.1.1.7 Perform carbon calculations for VCS/CCB PDD:				

Estimation of leakage potential				
5.1.1.8 Translate draft Combined Project Document into Spanish				
5.1.1.9 Finalize VCS/CCB Combined Program Design Document				
5.1.2.1 Disseminate Spanish draft combined PD to appropriate stakeholders using appropriate means	5.1.2 Conduct VCS/CCB Validation			
5.1.2.2 Gather stakeholder comments on draft combined PD				
5.1.2.3 Incorporate stakeholders comments into the combined PD				
5.1.2.4 Facilitate communities' engagement with VVB and assist with field visit logistics				
5.1.2.5 Communities activity engage with VVB				

5.1.2.6 Conduct field visit with VVB				
5.1.2.7 1st round of CARs for VVB				
5.1.2.8 2nd round of CARs for VVB				
5.2.1.1 Compile data for regular reports and scan all hard copies of monitoring data	5.2.1 Prepare for VCS Verification requirements for VCS/CCB	5.2 Verification conducted in participatory manner to support management and achieve VCUs with carbon assets with multiple co-benefits created and monetized based on agreements		
5.2.1.2 Write non-carbon Sections of VCS/CCB MIR				
5.2.1.3 Perform carbon calculations for VCS/CCB MIR: ex-post calculations of carbon				
5.2.1.4 Perform carbon calculations for VCS/CCB MIR: Calculations of the non-biomass related emissions				
5.2.1.5 Perform carbon calculations for VCS/CCB MIR:				

Estimation of leakage potential				
5.2.1.6 Translate draft Monitoring and Implementation Report into Spanish				
5.2.1.7 Review and finalize the CCB monitoring plans				
5.2.1.8 Finalize VCS/CCB Monitoring and Implementation Report				
5.2.2.1 Disseminate Spanish draft combined Monitoring and Implementation Report (MIR) to appropriate stakeholders using appropriate means	5.2.2 Conduct VCS/CCB Verification			
5.2.2.2 Gather stakeholder comments on draft MIR				
5.2.2.3 Incorporate stakeholders comments into the MIR				

5.2.2.4 Activity engage with VVB and assist with field visit logistics				
5.2.2.5 Communities activity engage with VVB				
5.2.2.6 Conduct field visit with VVB				
5.2.2.7 1st round of CARs for VVB				
5.2.2.8 2nd round of CARs for VVB				

APPENDIX 3: PROJECT RISKS TABLE

Project risks are identified:

Identified risk	Potential impact of risk	Mitigation or preventative measure(s)
Human -induced risk caused Inadequate safety conditions for executing project activities.	Threaten safety conditions like the safety of personnel;	To mitigate these risks, it is important to prioritize safety measures such as proper training, personal protective equipment, clear safety protocols, and ongoing monitoring and assessment of working conditions.
Natural risks caused by fire or pests and disease	Threaten the project's success and impact local biodiversity, potentially hindering soil regeneration and the growth of forest species.	To mitigate these risks, the project will employ fire management strategies and pest monitoring to protect the growing trees and ecosystems. Measures include installing fire breaks and keeping watch for pest activity.

APPENDIX 4: COMMERCIALLY SENSITIVE INFORMATION

Section	Information	Justification
A	Summary of Project cash flows	Project Financial information
B	Monitoring Plan	Project Internal Protocol for monitoring
C	Long Term Implementation Plan	Project Defined Activities
D	TGC Anticorruption Policy	Project Internal process
E	La Paz Anticorruption Policy: Manual de la Política y Procedimientos Sagrilaft	Project Internal process
F	Usufruct Contract Document	Project Internal process

6 REFERENCES

Acosta-Galvis, A.R. (2000). *Lista de los Anfibios de Colombia. .* Villa de Leyva: Batrachia Colombia.

AFD. (2022). Retrieved from Estrategia Climatica de largo plazo de Colombia E2050: https://e2050colombia.com/

Ahmed, I. A.-K. (2019). Climate change, environmental stress and loss of livelihoods can push people towards illegal activities: a case study from coastal Bangladesh. *Climate and Development, 11(10).*

Albaladejo, J. D.-P. (2021). Eco-holistic soil conservation to support land degradation neutrality and the sustainable development goals. . . *Catena, 196, 104823.* .

Alberico, M., Cadena, A., & Munoz-Saba, Y. (2000). Mammals (Synapsida: Theria) of Colombia. *Colombian Biota, 1*(1).

Alengebawy, A. A. (2021). Heavy metals and pesticides toxicity in agricultural soil and plants: Ecological risks and human health implications. . *Toxics, 9(3), 42.*, p. 42.

Alvear, M., Betancur, J., & Franco-Rosselli, P. (2010). Floristic diversity and structure of Andean forests remnants in the buffer zone of Los Nevados National Natural Park, Colombian-Central-Cordillera. *Caldasia, 32*(1), 39-63.

Antwi-Agyei, P. (2021). Improving the effectiveness of agricultural extension services in supporting farmers to adapt to climate change: Insights from northeastern Ghana. . . *Climate Risk Management, 32.*

Baptiste, L. G., Polanco, R., Hernández, S. & Quiceno, M. P. (2002). Fauna silvestre de Colombia: Historia económica y social de un proceso de marginalización. In A. U. (Ed.), *Rostros culturales de la fauna. Las relaciones entre los humanos y los animales en el contexto colombiano* (pp. pp. 295-340). Bogotá: Instituto Colombiano de Antropología e Historia.

Bernal, R., S.R. Gradstein & M. Celis. (2015). *Catálogo de Plantas y Liquenes de Colombia.* Bogotá, D.C.:: Instituto de Ciencias Naturales, Universidad Nacional de Colombia.

Broad, S., Mulliken, T. & Roe, D. (2001). The nature and extent of legal and illegal trade in wildlife. In S. O. (Ed.), *The Trade in Wildlife: Regulation for Conservation* (pp. pp. 3-22). London: London, Sterling, VA: Earthscan Publications Ltd.

Buitrago G. et al. (2019). *Aportes al fortalecimiento del conocimiento en biodiversidad y servicios ecosistémicos del departamento del Vichada.* Bogota: Instituto de Investigación de Recursos Biológicos e Instituto de Biotecnología de la Universidad Nacional de Colombia. Bogotá D. C.

Colombia, N. P. (2019, June 5). *The most representative ecosystems of the country are protected by the Colombian Park Rangers*. Retrieved from Colombia Potencia de la Vida: https://old.parquesnacionales.gov.co/portal/es/los-ecosistemas-mas-representativos-del-pais-son-protegidos-por-los-guardaparques-de-colombia/

Cuevas, M. (2007). *Estructura y composición de un ensamble de anfibios en cuatro unidades de cobertura vegetal de la reserva natural Bojonawi.* Bogotá: Pontificia Universidad Javeriana.

DANE. (2005, DANE. “Censo Vichada”. 2005.).

DANE. (2018, DANE. “Informacion estrategica”. February 2018. http://www.dane.gov.co). *DANE. “Informacion estrategica”. February 2018. http://www.dane.gov.co*.

DANE. (2020). Retrieved from https://www.dane.gov.co/

Departamento Nacional de Planeacion (DNP). (2021). *Puerto Carreno, Dialogos Regionales Vinculantes para el Plan Nacional de Desarrollo.* Puerto Carreno.

Departamento Nacional de Planeacion. (2019). *Plan de Desarrollo 2018-2022*. Retrieved from https://colaboracion.dnp.gov.co/CDT/Prensa/PND-Pacto-por-Colombia-pacto-por-la-equidad-2018-2022.pdf

Ernesto Reyes, C. D. (2020). *BEEF CASE STUDY IN THE FLOODED SAVANNAS OF COLOMBIA.* Berlin: WWF Deutschland.

Etnollano, F. (2013). *“Diagnóstico Económico del Departamento del Vichada y Guía*.

Fals Borda, O. (1979). *Historia de la cuestión agraria en Colombia.* Bodota: Ediciones Punta de Lanza.

Fischer, G. F. (2008). Global Agro-ecological Zones Assessment for Agriculture. *GAEZ* .

Galvis Vergara, J., & Perilla, C. (2001). *Aspectos Geologicos del nordeste del departamento del vichada.* Bogotá: Ingeominas.

Gentry, A. (1982). Patterns of neotropical plant species diversity. *Evolutionary Biology, 15*, 1-84.

Gentry, A. (1996). *A field guide to teh gamilies and genera of woody plants of northwest South America (Colombia ,Ecaudaor, Peru).* Chicago: University of Chicago Press.

Guarín, C. & Martínez, M. (2018). *Estado del arte de la historia y patrimonio cultural de Vichada.* Puerto Carreño - Colombia: Corporación Universitaria Minuto de Dios.

Hamilton, L. (2010). A campaign for cloud forests, unique and valuable ecosystems at risk. In M. Alvear, J. Betancur, & P. Franco-Rosselli, *Floristic diversity and structure of Andean forests remnants in the buffer zone of Los Nevados National Natural Park, central Colombian mountain range* (pp. 39-63). Caldasia: IUCN Focus Series.

IDEAM. (2011). *Calsificaciones climáticas Colombia.* Bogotá.

IDEAM. (2014). *Regionalización de Colombia según la estacionalidad de la precipitación media mensual, a través dde componentes principales.* Bogotá.

IDEAM. (2017). *Atlas climatológico de Colombia.* Bogotá: Imprenta Nacional de Colombia.

IDEAM. (2017). *Atlas de viento de Colombia.* Bogotá.

Instituto Geografico de Colombia IGAC. (2010). *Leyenda Nacional de Coberturas de la Tierra.* Bogotá.

Kapelle, M., & Brown, A. D. (2001). *Cloud forests of the neotropics.* Santo Domingo de Heredia: National Institute of Biodiversity.

Kattan, G., Chaves, M. E., & Arango, N. (1997). *Landscape transformation and habitat fragmentation.* Colombia.

Lynch, J. D. & Á. M. Suárez-Mayorga. (2001). The distributions of the gladiador frogs (Hyla boans group) in Colombia, with comments on size variation and sympatry. *Caldasia*, 23: 491-507.

Madrinan, S., Cortes, A. J., & Richardson, J. E. (2013). Paramo is the world's fastest evolving and coolecst biodiversity hotspot. *Front Genet, 4*, 192.

Medellin, R. A., Equihua, M., & Amin, M. A. (2000). Bat Diversity and Abundance as Indicators of Disturbances in Neotropical Humid Forests. *Conservation Biology, 14*(6), 1666-1675.

Montgomery, D. R. (2021,). Soil health and nutrient density: beyond organic vs. conventional farming. *Frontiers in Sustainable Food Systems, 5, 417.* Retrieved from Frontiers in Sustainable Food Systems, 5, 417.

Moreno, J. F. (2022). Importancias de la Fauna Amenazada por Incendios Forestales en las Sabanos Adyacentes a la Laguna de La Primavera, Vichada.

Nassar-Montoya, F. (2000). Actitud y pensamiento sobre la fauna silvestre en Colombia. In N.-M. &. (Eds.), *Actitudes hacia la fauna en Latinoamérica* (pp. pp. 27-43). Bogota: Humane Society International/Humane Society Press/Centro de Primatología.

Ojeda, F. S. (2015). *Efecto de Borde Post Quema Sobre el Contenido de Carbono Orgánico del Suelo en una Interfase Sabana-Bosque de Galería en El Vichada, Colombia.* Bogotá: Universidad Nacional de Colombia.

Rangel, C. J., & Velazquez, A. (1997). Methods of studying vegetation. In C. J. Rangel, C. J. Aguirre, & M. G. Andrade-C, *Colombia biotic diversity II. types of vegetation in Colombia.* (pp. 59-87). Bogota: Institute of Natural Sciences - National University of Colombia.

Reforestadora La Paz. (2021). *Forest Management Plan - PMF GFR-PL-001.* Medellin, Antioquia.

Renjifo, L.M., M.F. Gómez, J. Velásquez-Tibatá, A.M.Amaya-Villarreal, G.H. Kattan, J.D. Amaya-Espinel & J. Burbano-Girón. (2002). *Libro Rojo de Aves de Colombia, Volumen 1.* Bogota D.C.: Editorial Pontificia Universidad Javeriana.

Rosales, J., Suarez, C., & Lasso, C. (2010). Descripción del Medio Natural de la Cuenca del Orinoco. In *Biodiversidad de la cuenca del Orinoco* (pp. 51-74). Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, WWF Colombia, Fundación Omacha, Fun- dación La Salle de Ciencias Naturales e Instituto de Estudios de la Orinoquia.

STATISTA. (2018). *Inmigrantes venezolanos en Colombia por departamento*.

UNESCO. (2020, https://unesdoc.unesco.org/ark:/48223/pf0000374692).

Unidad de Planificacion Rural Agropecuaria (UPRA). (n.d.). *Mercado de tierras rurales en Colombia*. Retrieved from https://upra.gov.co/documents/10184/11165/Articulo_mercado_tierras_baja.pdf/e71e318b-ab57-456b-aaf7-c99e8ce27314?version=1.0

Van Der Hammen, T., & Hooghiemstra, H. (2001). *History and paleoecology of Neotropical Andean montane forests.* Heredia: National Institute of Biodiversity.

Vander Hammen, T. (1992). *History, ecology, and vegatation.* Bogota: Corporacion Colombiana para la Amazonia Araracurara.

Vanhooren, J. (2017). *Biotopes of south America.* Retrieved from cefishessentials.com: https://cefishessentials.com/blog/biotope-aquarium-101-an-authentic-rio-meta-biotope-for-ram-cichlids-more/

Villareal, H. (2007). *Caracterización biológica del Parque Nacional Natural El Tuparro (Sector noreste), Vichada, Colombia. .* Retrieved from Instituto de Investigación de Recursos Biológicos Alexander von Humboldt.: https://repository.javeriana.edu.co/

Webster, G. L., Churchill, S. P., Balslev, H., Forero, E., & Lutyen, J. L. (1995). The panorama of Neotropical cloud forests. *Biodiversity and conservation of Neotropical montane forests* (pp. 53-57). New York Botanical Garden: Alexander Von Dumboldt Biological Resources Research Institute.