



**Verified Carbon
Standard**

CONSERVATION PROJECT REDD+ SURE DEL META BOSQUES DE PAZ, SUSTENTO DE VIDA



Document Prepared by

ALLCOT AG

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1 PROJECT DETAILS

1.1 Summary Description of the Project

The REDD+ Sur del Meta project. Bosques de Paz, Sustento de Vida is located in the municipalities of Vista Hermosa, Puerto Rico, Puerto Concordia and Puerto Lleras in the department of Meta.

The project seeks to protect 77,162.3 hectares of natural forest from the advance of deforestation, which for the year 2017 (IDEAM, 2018) reported an increase in the country of 23% in relation to the previous year, having the department of Meta as the third in national deforestation. The causes of deforestation are directly related to the conversion of forest areas into clean or weeded pastures for extensive cattle ranching (SINCHI, 2016). Considering the low productivity of this type of use, an increase in deforestation is expected, generating larger livestock and agricultural areas, which will allow the subsistence of the families settled there.

Through the implementation of strategic actions, such as improving the productivity and sustainability of livestock, cacao, coffee and citrus, strengthening these production chains in the region, technical training and raising awareness of the role of conservation in the communities, youth, children, leaders, and women, a total of 11,229,458 tCO₂ will be reduced over a minimum of 30-year period, with an annual average of 374,315 tCO₂.

This will improve the living conditions of the families of the 1,265 members, a peasant population, a large percentage of whom are victims of the country's historical armed conflict. It will also strengthen their organizations (unions and community organizations) through training and technical support. All of this will result in an increase in forest governance, bringing direct and indirect benefits to the inhabitants of the four municipalities.

In terms of biodiversity, the area is recognized as a habitat and corridor for species of high conservation interest, such as the jaguar, or species at high risk of extinction, such as the giant otter, as well as other species of wild flora and fauna listed as endangered. In this sense, reducing the loss of their habitats contributes to reducing the risk of extinction of these species. The development of community monitoring plans will not only make it possible to follow up on the status and presence, but also to increase the value of this resource in the community collective

1.2 Sectoral Scope and Project Type

The project is developed under the requirements of Agriculture, Forestry and Other Land Use (AFOLU) projects and is classified as an "Avoided Unplanned Deforestation and Degradation" (AUDD) project for Reduced Emissions from Deforestation and Degradation (REDD), as it seeks to reduce deforestation and degradation and to conserve carbon stocks associated with above and below-ground biomass. These activities are in accordance with REDD+ actions defined by the United Nations Framework Convention on Climate Change (UNFCCC) in decision 1/CP.70.16.

1.3 Project Eligibility

Describe and justify how the project is eligible under the scope of the VCS Program.

1.4 Project Design

- ☐ The project includes a single location or installation only
- ☐ The project includes multiple locations or project activity instances, but is not being developed as a grouped project
- ☒ The project is a grouped project

Eligibility Criteria

- Eligibility

Only forest areas located within the reference region may be included. Specifically, the leakage area has been identified as having the potential to be included, as they are adjacent areas, with the same causes of deforestation and the same forest types. Within the reference area there are other areas, whose owners have not been identified, but which could meet the requirements.

As a grouped project, and according to the VCS Standard V.4.1 in its 3.5.9 and 3.5.15 items, new partners might be added into the project, as long as they fulfilled these conditions.

Recognizing activity instance as: at least one hectare of forest (by Colombia definition¹), that has been forest for the last 10 years, from the moment of inclusion. And that is under risk of deforestation in absence of the project. This area must fulfill these characteristics:

- The person, who wants to be part of the project must provide documentation on legal ownership of the land, according to the process described on the PD.
- The land must be inside the reference area, preferably on the leakage belt area, and by this fulfil the baseline used in the project, described on this PD. regarding physical characteristics, causes of deforestation, uses of land and type of forest
- The land must comply with the additionality based on financial and technology barriers (opportunity cost).
- The new areas of forest (minimum 1 ha) will be using same measures and technologies as described on the PD monitoring plans.
- Committees will have the final decision on the inclusion, considering each candidate and their willingness to comply with the agreements.
- The new partner must sign the accession contract to the master agreement with any of the existent associations or CAB.

¹ Land occupied mainly by trees that may contain shrubs, palms, guaduas, grasses and lianas, in which tree cover predominates with a minimum canopy density of 30%, a minimum in situ canopy height of 5 meters at the time of identification and a minimum area of one hectare.

New CABs or associations must have lands fulfilling the previous requirements or be presented by a group of minimum 1000 ha partners, that will sign under their contract.

- Scalability Limits for the Grouped Projects

By follow the previous mentioned criteria, the project will only include areas inside the reference region. Assuming all possible areas were included in all four municipalities, the project will be inside the expected and calculated scalability limits, financially and technically, as it will be no further than 120,000 hectares. Feasibility studies performed by ALLCOT at the beginning of the project contemplated this scenario as the ideal.

Negative climate impacts, if new areas are included beyond the scalability limits determined, are related to increase risk of non permanence, as monitoring will exceed the expected capabilities of the committees. Social negative impacts, are directly related to governability. The existent proposal of local committees, joining close towns, respect the political and administrative division of the region, to include areas outside the limits, might create disputes with local governs, such as majors.

- Risk Mitigation Approach for Grouped Projects

In the case any land gets included outside the area, but that fulfills the additionality and baseline directions, it will be necessary to design a new governance model, that allows to comply with the monitoring process (social, biodiversity and climate), and the relation cost/benefit, transparently presented to the partners and committees, in order to assure an informed decision by them.

Also, the new areas, located outside the current municipalities, must complete the introductory process with local governance, as well as the reassessment of stakeholders map, trying to identify new risks and opportunities. Communication strategy must be also updated accordingly.

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1.7 Ownership

All land belongs to farmers and peasants who are responsible for their property rights. All landowners can prove their legal ownership of the land through documentation recognized by the government and the Ministry of Agriculture as sufficient to prove land rights.

1.8 Project Start Date

01/01/2019

1.9 Project Crediting Period

01/1/2019 to 31/12/2048 - 30 years of total crediting period. According to the ERPA, this time might be improved by mutual consensus, in the same of inferior number of years.

01/01/2019 to 31/12/2048 – 30 years of total benefits assessment period.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

The estimated annual GHG emission reductions/removals of the project are:

☐ <20,000 tCO₂e/year

- ☐ 20,000 – 100,000 tCO₂e/year
- ☒ 100,001 – 1,000,000 tCO₂e/year
- ☐ >1,000,000 tCO₂e/year

Project Scale	
Project	
Large project	X

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
2019	476.246
2020	446.030
2021	397.800
2022	447.193
2023	467.455
2024	486.000
2025	490.214
2026	391.269
2027	385.398
2028	365.678
2029	361.061
2030	361.998
2031	0
2032	732.098
2033	353.174
2034	352.258
2035	360.647
2036	336.609
2037	345.106

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
2038	354.873
2039	354.371
2040	331.240
2041	329.981
2041	329.505
2043	341.791
2044	336.380
2045	330.772
2046	324.919
2047	328.858
2048	310.536
Total estimated ERs	11,229,458
Total number of crediting years	30
Average annual ERs	374,315

1.11 Description of the Project Activity

The theory of change for this project was design following the adoption of the Open Standards Methodology presented at de Social and Biodiversity Impact Assessment manual for REDD+ Projects, from CCB standard.

Considering that historical data from remote sensors, official Colombian information on drivers and agents and the communities identified the main causes of deforestation as the current extensive cattle ranching system, the lack of land formalization and the lack of sustainable productive alternatives, the project's lines of action are aimed at generating a cultural change through training and capacity building processes to achieve the necessary conditions to advance in the transformation of these causes, formalize land ownership, strengthen forest and project governance, and consolidate sustainable and resilient productive systems.

The project's theory of change matrix and risk matrix can be consulted at Annex. 2.1.11_211104_CO_Teoría del Cambio_V1 and its main objective is to reduce deforestation and control clear cutting. The project aims to achieve this, by supporting partners in adopting sustainable practices and good agricultural and livestock production practices that maintain ecosystem balance as well as

generate the sustainable use of natural resources through the implementation of sustainable agricultural systems².

- *Training and education for the improvement of individual, collective and organizational capacities of project partners*

The project brings together nine associations and 38 community action boards, with different levels of organization, experience and capacities, which have identified the main need to strengthen their project management, planning and administration capacities, as well as their communication, knowledge management and community participation capacities.

For this reason, the first objective of this line of action is to develop training and education programs to improve the individual, collective and organizational capacities of the project partners.

Taking into account that the responsibility for project implementation will fall on the coordinating committees, a training program will be designed for their members, with theoretical and practical modules on topics such as administration, finance, project management, communications, environmental management and green business, and the use of information and communication technologies. There will also be exchanges of experiences among the project partners and with other projects.

With the administrative and financial modules, the Coordinating Committees are expected to have the necessary skills to manage projects, manage resources, formulate business plans and follow up on investments and costs. Thus, they will have the capacity to manage projects to co-finance REDD+ activities. With the communications module, project implementers will keep partners and ALLCOT informed of project progress, be accountable and respond to requests for information and possible non-conformities.

The environmental and green business module will allow projects led by the coordinating committee of each municipality to respect environmental determinants in land use planning and integrate best practices for verification as Green and Sustainable Businesses by the environmental authorities. With the ICT module, the partners will improve their capacities to use IT tools to be more efficient in the implementation process.

Approximately 40 people are expected to take part in these training workshops, according to their role within the committees.

Through the exchange of experiences, the project partners will form communities of knowledge on forest governance, community organization and associativity, sustainable production and consumption. In this way, the coordinating committees will have the necessary skills to manage projects, manage resources, formulate business plans and follow up on investments.

On the other hand, the communities identified the lack of awareness and environmental awareness among the community as another cause of deforestation, as well as the lack of knowledge of climate change and business opportunities for forest protection. The second objective of this line of action is to develop a training program with a differential approach (gender, generational, vulnerability), aimed at all project partners.

Through the development of workshops and meetings, it is expected that people will create a better understanding of the impacts of clearing the forest, and through the knowledge regarding REDD+ and

² For examples, see: Richards, M. and Panfil, S.N. 2011, *Social and Biodiversity Impact Assessment (SBIA) Manual for REDD+ Projects: Part 1 – Core Guidance for Project Proponents*. Climate, Community & Biodiversity Alliance, Forest Trends, Fauna & Flora International and Rainforest Alliance. Washington, DC, 34 – 42.

the potential market for emission reductions, start reducing deforestation in their farms. A total of 600 partners are expected to be reached.

The third objective of this line of action is to create learning routes and experiential meetings with different members of the community, as well as family life plans, to create a community of knowledge (with children, youth, adults, families, educational community) about forests and climate change, which will strengthen interactions between partners and with the rest of the community, a greater and more qualified participation in terms of social, economic and environmental transformation in the territory.

These three linked actions in the line of training and education are aimed at obtaining three significant impacts on the community: i) a cultural change in the way of seeing and relating to nature; ii) installed capacity for community self-management and efficient administration of resources; and iii) more resilient communities in the face of climate change.

The fourth objective is to train the community, in general, in good livestock, agricultural and environmental practices. Even though a specific objective regarding productive projects exist, in here it is the intention to include all the partners in general knowing regarding good practices, even in fields different from their own.

- *Land formalization*

This line of action seeks to contribute to the transformation of one of the structural causes of deforestation and conflict in Colombia, the lack of legal access to land for farmers. During the third year of project implementation, the barriers and specific support needs of each partner will be identified in order to design an advisory and accompaniment program for the land formalization process, which will be structured according to the demand of the partners and in coordination with the National Agency of Land ANT and the mayors' offices.

To achieve this, a previous study of challenges and difficulties for legalization process in the region will be performed and used as baseline for the objective.

As a result of this line of action, a greater appropriation and valuation of productive spaces and forests in formalized lands is expected, and as an impact on the community, it is expected to finally achieve the vindication of the right to land, one of the fundamental pillars to achieve peace.

It is important that this process of legalization will only be provided to those partners interested on it. It will not be mandatory in order to continue with the project.

- Consolidate the territorial governance of the project partners and strengthen citizen awareness through knowledge management and learning to generate an intergenerational culture for the care and sustainable management of forests

This line of action is aimed at consolidating the governance of the project partners and strengthening citizen awareness through i) creation and operativity process of coordinating and supervisory committees ; ii) Forest, biodiversity and community monitoring; iii) Information, community participation, citizen service and dispute resolution; iv) Design and implement a communication strategy; v) Institutional articulation; vi) Formulation of farm plans articulating them with delimitation of protection areas, productive areas, pastures and property boundaries.

The coordinating committees will have the capacity to develop instruments for the internal functioning and management of the project, such as operational regulations, strategic plans, operational plans, all design to efficiently manage of the available resources to make investments that curb deforestation. Also, the supervisory committees will enhance their capacities to successfully oversee processes, ensuring transparency and respect for safeguards.

Good governance also implies having a good organization with documented processes and procedures, with guaranteed access to information and full and effective participation of all partners. In this sense, mechanisms for citizen attention, monitoring of compliance with the safeguards adopted by Colombia and accountability will be formally adopted, and a communication and knowledge management strategy will be implemented to promote a process of continuous learning and improvement, and to consolidate a culture of care and sustainable management of the forests and their biodiversity.

The participatory monitoring, not only in the technical process, but in how the information is translated and spread among the communities, beyond the project area and into the leakage belt at least, will be supported and strengthened during the first years of the project. This will support social appropriation of knowledge on forest and biodiversity to control deforestation

For communities to achieve their long-term improvement goals, articulation of actions and resources with other stakeholders, especially governmental ones, will be supported, guided and subscribed under agreements, interventions, contracts, etc.

To achieve the expected reduction of CO₂ emissions caused by deforestation in southern Meta it is essential for communities to be able to identify conservation areas and have clear limits to the agricultural frontier, ensuring its sustainable management, but allowing families to improve their quality of life. For this, baselines, zoning, and consensual farm plans will be developed during the implementation of the project.

- Sustainable productive projects

The fourth line of action of the project is aimed at promoting an economy based on sustainable productive projects for integrated rural development, contributing to closing the agricultural frontier and improving forest goods and services. This is one of the central components that will concentrate most of the investments and generate the most relevant results and social impacts on communities, biodiversity and climate.

It includes six main activities: i) identification, formulation and implementation of productive projects; ii) Identify, formulate and implement a manual of good agricultural and environmental practices; iii) formulation of a technical assistance and agricultural extension program for each line of production aimed at project partners; iv) identification of potential products and byproducts associated with the main lines of production; v) development of a program to strengthen production chains and generate added value for the products, vi) biodiversity, forestry and carbon stock monitoring

Beginning with the consensual community process of identification of productive projects that will improve positive social and environmental impacts, will lead to selection and formulation of project profiles. This first activity will be developed on several steps that will allow communities and committees to have project documents and business plans for each line, and from there yearly based, developed an operational plan with activities and budgets (at least 5 expected on the first 10 years of the project).

For communities the fact that this process is developed with them, including their real needs and expectations, is expected to improve the amount of areas that will successfully developed and applied the productive projects, with constant environmental improvement.

It is expected that at least 50% of the partners will have access to technical training geared to their selected line of action (sustainable livestock, cocoa, coffee, avocado or citrus). The inclusion of at least half of the project's women in these trainings should always be considered. As the previous activity, this one will need of at least four steps, which includes diagnosis and analysis of agricultural and livestock activities that will lead to a document of gaps in production systems, in relation to

markets and solution alternatives. With this, and always teaming up with communities, 4 technical assistant programs will be developed.

Technical assistance programs aim to strength community knowledge, cooperativity systems, nets and, at long term, besides reducing deforestation associated to low productivity on their existent fields, it is expected to improve yields, reduce contamination associated to agrochemicals and thus contribute with the produce and recovery of ecosystem services in the area.

Actions iii and iv are expected to be the migration of the chain of value from sector one to sector two of the economy, allowing partners to develop a portfolio of potential secondary products, identifying needs, barriers and potentials for the required transformation processes. The possibility to develop bases for this will, at the long term, allow owners to improve their incomes and thus their social and economic well-being.

Finally, monitoring is what will allowed project to produce the information needed, not only to follow up the state of forest, and thus the performance by period, traduced on carbon credits generation, but also it will provide the tools to make on-time decisions, aimed to secure the general objective of the project, reduce deforestation. The detailed aspects of these monitoring plans are presented during the PD, on the corresponding item.

As a result of these actions, it is expected to reduce deforestation, make sustainable use of resources, achieve cost/efficient decisions by the coordinating committees, reduce risks, increase productivity, increase employment opportunities, new business opportunities and sources of income, facilitating the creation of new products and services, and a fair and equitable distribution of benefits.

As a long-term impact on biodiversity, it is expected to increase the area of conserved forest and connectivity between these areas, as well as the maintenance of environmental goods and services. In the community, greater environmental awareness and better territorial governance are expected, as well as an improvement in income, a decrease in poverty levels and an improvement in the living conditions of participating families.

1.12 Project Location

The reference region and project area are located in the department of Meta, more specifically in the municipalities of Puerto Rico, Vista Hermosa, Puerto Concordia and Puerto Lleras, this project is known as the REED+ PROJECT SOUTH OF META, FORESTS OF PEACE; SUSTAINING LIFE. The spatial location of the project is shown below.

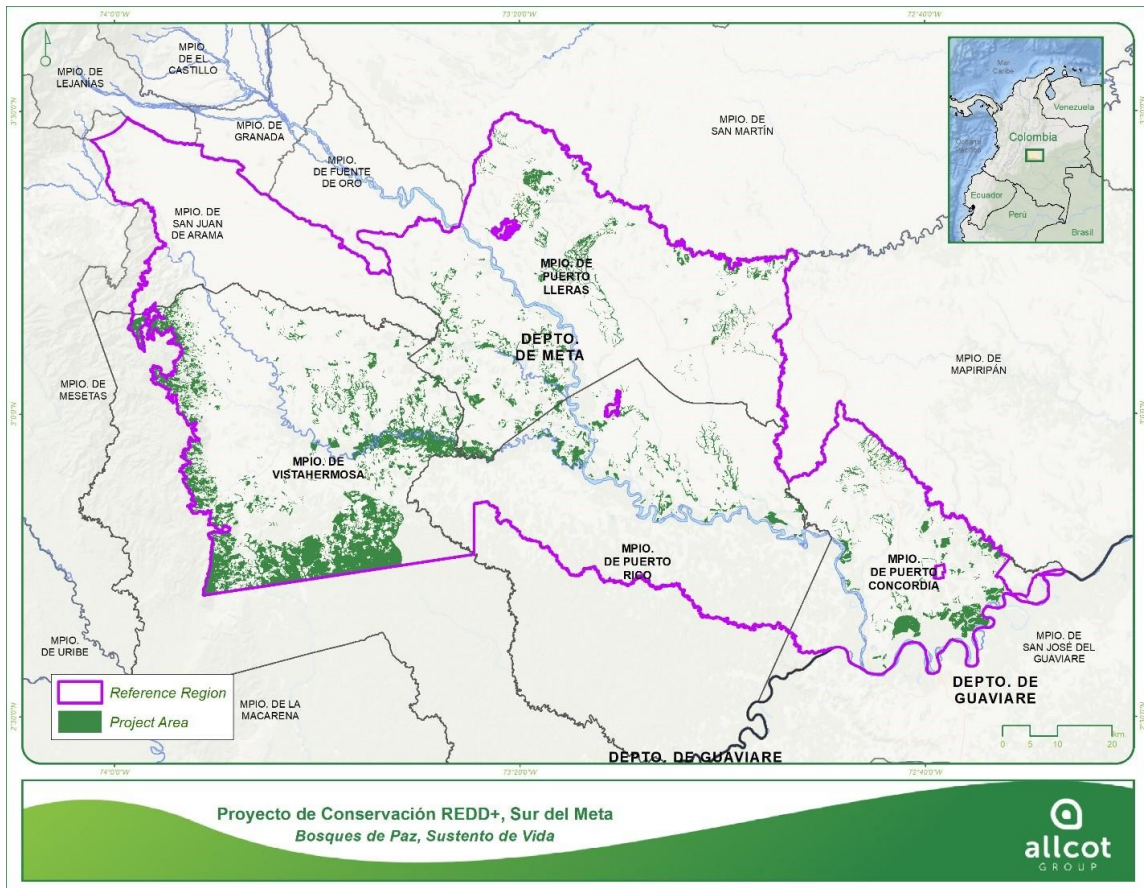


Figure 1. General location of the Project

Source: ALLCOT 2021

The following is a list of the project's flat coordinates in the Magna_Colombia_Bogotá coordinate system, which is part of the official coordinates systems for Colombia.

Table 1. Coordinates location

Coordinates	
North	878,618 m
South	776,006 m
East	1,182,561 m
West	1,004,312 m

Source: ALLCOT 2021

1.13 Conditions Prior to Project Initiation

- Has the land been cleared of native ecosystems within 10 years of the project start date?

☒ Yes

☐ No

This zone corresponds to a spatial delimitation from which information will be obtained on rates, agents, drivers, patterns of land use and land cover change, on which a monitoring of the evolution of deforestation from 2005 to 2018 is made, and at the end an evaluation projected into the future.

The definition of the main drivers of deforestation and the historical behavior of deforestation from 2005 to 2018 made it possible to observe where this activity has been displaced and how it has been occurring in an area of the territory, where the conditions of the drivers and agents of deforestation are the same, focused on issues of expansion of the agricultural frontier.

The following are some of the biophysical characteristics delimited to the Project's Reference Region

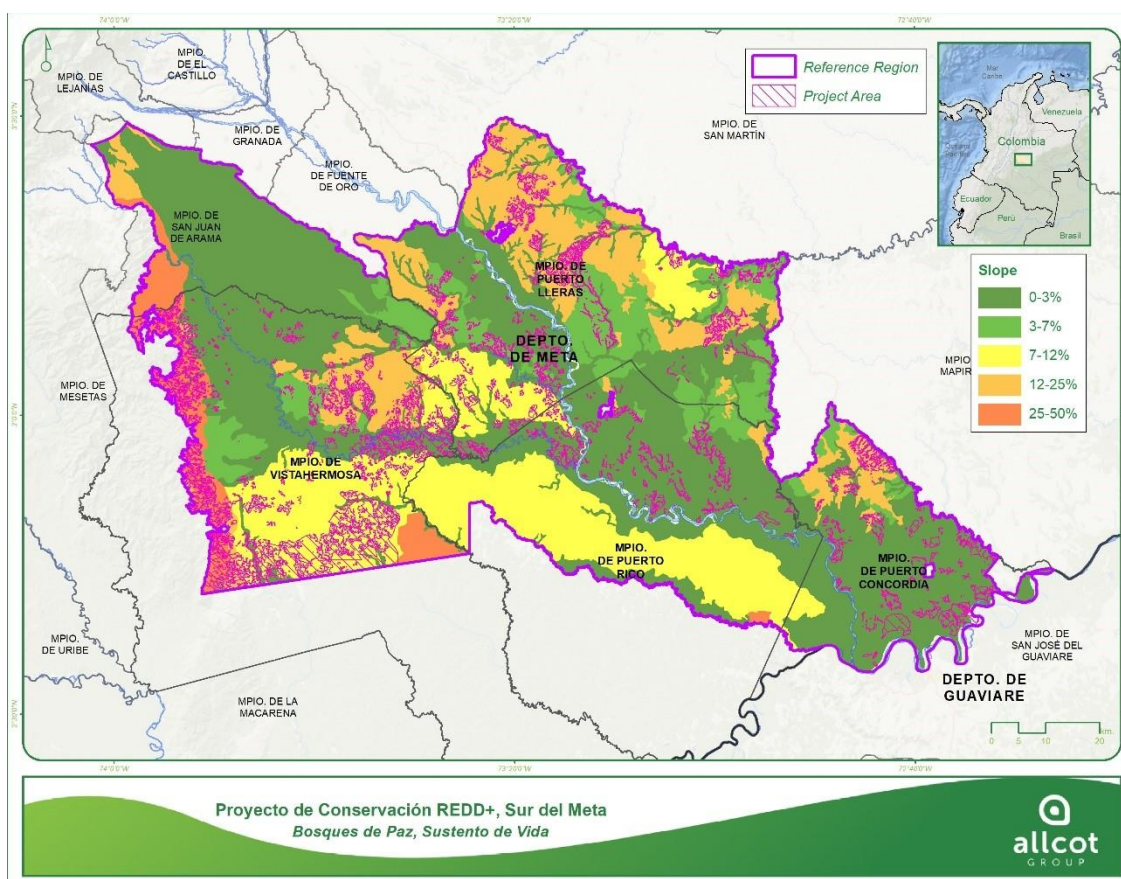


Figure 2. Slopes in the study area

Source: ALLCOT, 2021

Slopes³: 50.5% (456,354 ha) of the Reference Region has slopes between 0-3%, described as level/almost level, which have characteristic processes and terrain conditions associated with non-

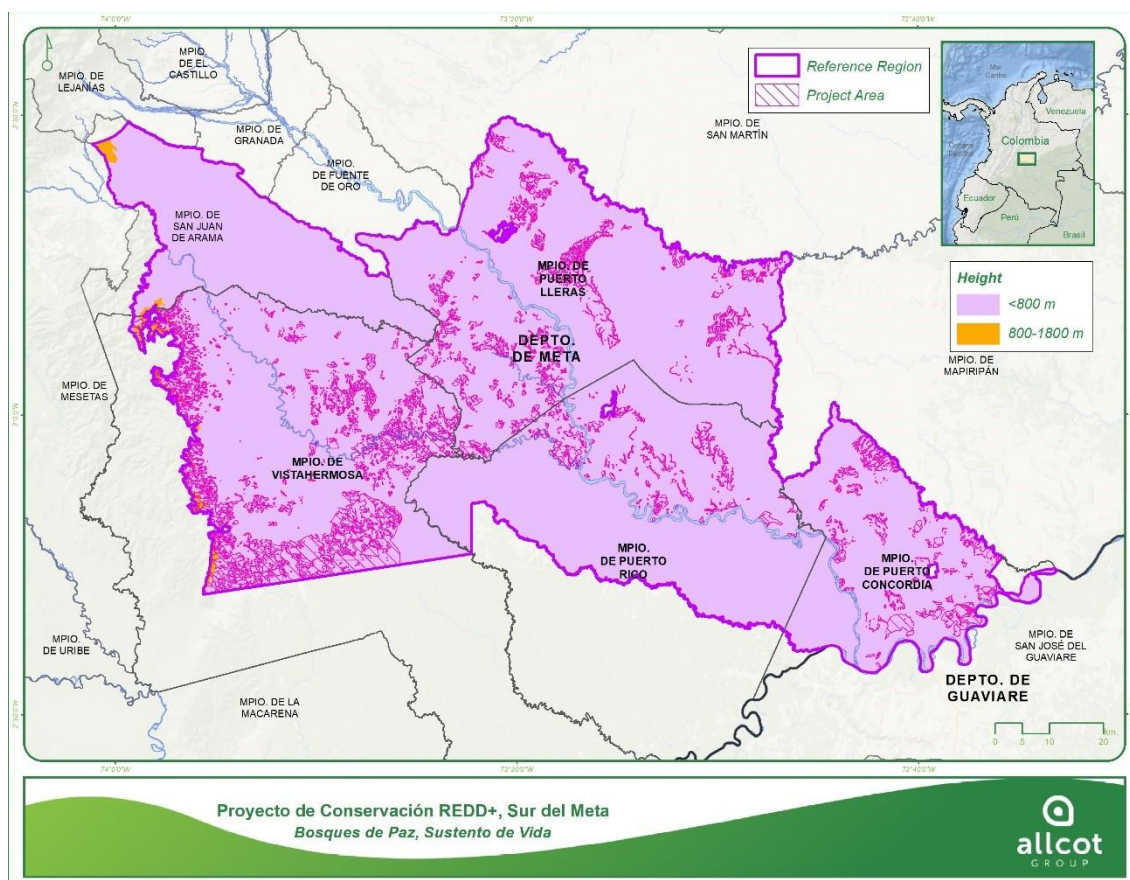
³ Soil Maps of the Colombian Territory at a scale of 1: 100,000. Department: Meta. <https://gw-geoportal-test.igac.gov.co/gateway/geoportal/api/geoportal/pendata/resource/2d3da07e-19d9-4ef0-bdb8-2095a878e81c?apikey=f2664478-8877-4516-9d12-ed339d336c99>

negligible denudation, with favorable passable and workable conditions, traditionally used for agricultural activities and whose use is mainly difficult under dry or low humidity conditions. 20.3% of the Reference Region (183,635 ha) is located on slopes with a range of 7-12%, described as moderately steep, and characterized mainly by slopes susceptible to low velocity mass movements.

In third place, slopes in the range of 12-25% predominate in the Reference Region, with a predominance of 14% of the surface (126,427 ha), considered as strongly sloping or moderately undulating, present mainly towards the north towards the center, characterized by mass movements of all types and erosion, mainly in ruts. Regarding the remaining slope classes, 9.8% (88,474 ha) of the Reference Region has slopes between 3-7%, being slightly inclined slopes and with minimal effects caused mainly by water erosion. The 4.6% (41,894 ha) corresponds to slopes in the 25-50% range, located mainly towards the western zone, with the presence of intensive denudation processes and clear evidence of soil erosion. For the water bodies, identified as non-soil and with no associated slope range, the percentage of coverage is 0.8% (7,290 ha).

- *Elevation⁴*

Elevation measured in meters above sea level, for the Reference Region presents elevations less than 800 meters for 98% of the total area, the remaining percentage presents elevations between 800 and 1800 masl.



⁴ 30-meter resolution elevation data from NASA's Shuttle Radar Topography Mission (SRTM). <https://dwtkns.com/srtm30m/>

Figure 3. Elevation above sea level of the reference region

Source: ALLCOT, 2021

- *Precipitation*⁵

Based on the average annual precipitation conditions in millimeters, the Reference Region has a predominance of precipitation for 95.3% of its territory in a range of 2500 to 3000 mm per year. Towards the northwestern zone of the Reference Region, 4.6% of its surface area has a precipitation range of 3000-4000 mm per year, and 0.1% has a precipitation range of 4000-5000 mm per year.

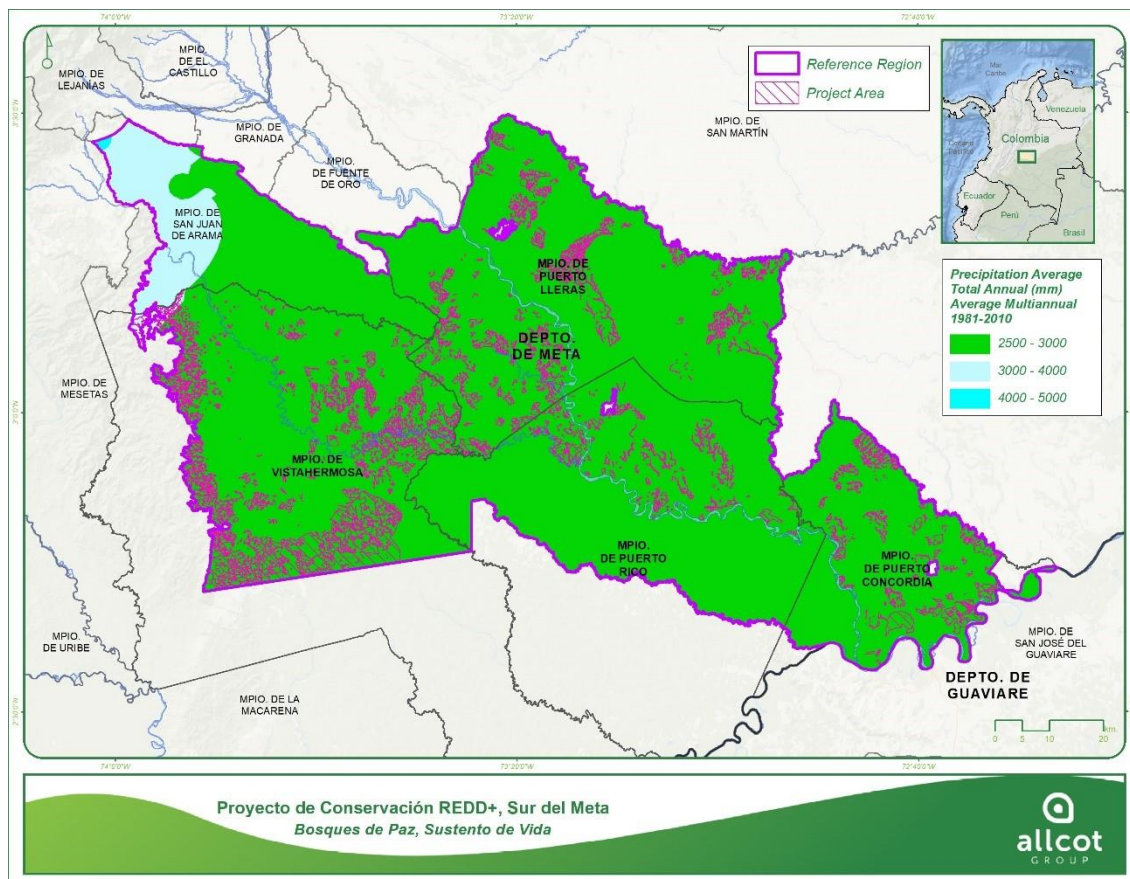


Figure 4. Precipitation on the reference region

Source: ALLCOT, 2021

- *Temperature*⁶

Based on the average annual temperature conditions in degrees Celsius, the Reference Region has a predominance of temperature in 72.9% of its territory in a range of 24 to 26 °C. In the central and northeastern part of the Reference Region, 25.6% of its surface area has an average temperature

⁵ Multiannual Average Decadal Precipitation during the period 1981-2010. Downloaded from IDEAM.
[http://bart.ideam.gov.co/cneideam/Capasgeo/Precipitacion Decadal Promedio Multianual 1981 2010.zip](http://bart.ideam.gov.co/cneideam/Capasgeo/Precipitacion%20Decadal%20Promedio%20Multianual%201981%202010.zip)

⁶ Annual Average Multiannual Average Temperature 1981-2010 period. Downloaded from IDEAM.
[http://bart.ideam.gov.co/cneideam/Capasgeo/Temperatura Media Anual Promedio Multianual 1981 2010.zip](http://bart.ideam.gov.co/cneideam/Capasgeo/Temperatura%20Media%20Anual%20Promedio%20Multianual%201981%202010.zip)

range of 26 to 28 °C, and the remaining 1.5% of the surface area has a temperature range of 22 to 24°C, located in the western part of the region.

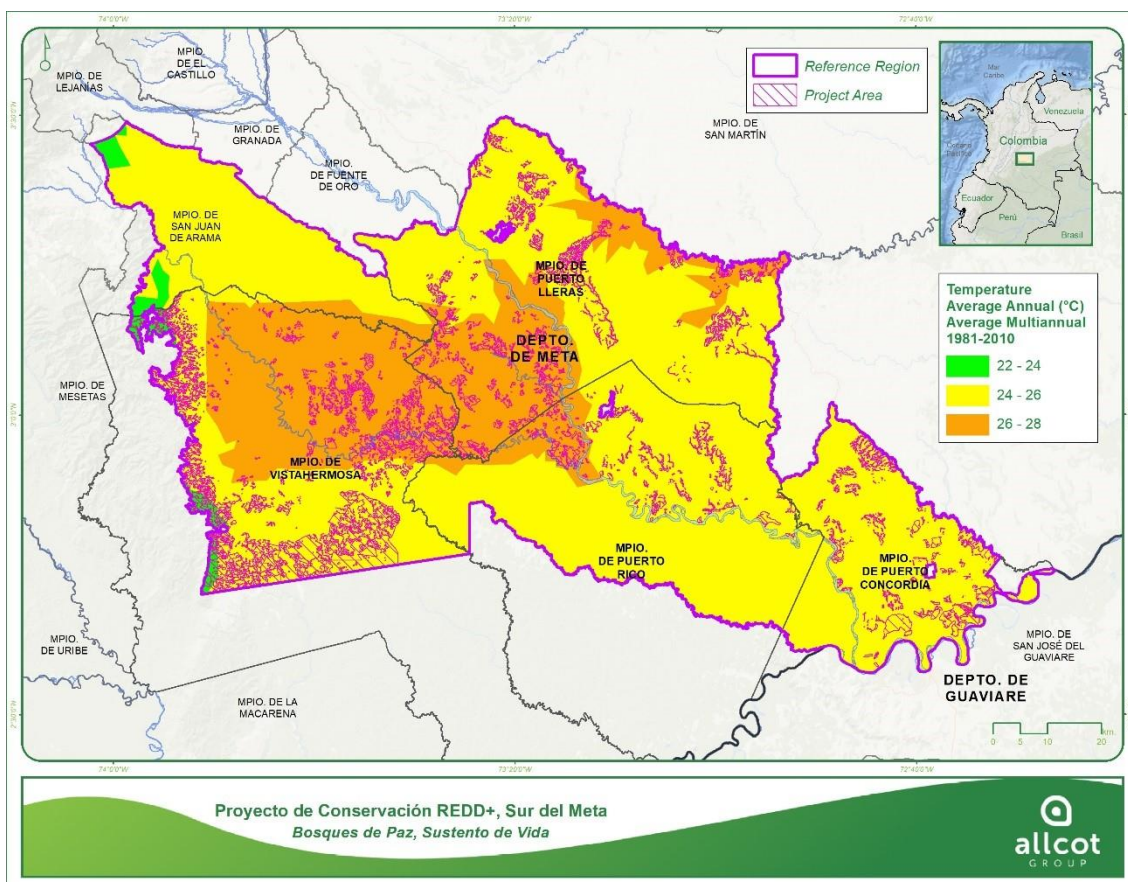


Figure 5. Temperature on the reference region

Source: Allcot Colombia 2021

- *Climate*

For the Project Area and Reference Region, according to the Caldas Lang Climate Classification⁷, 95.2% of the surface area is predominantly Humid Warm Climate, followed by 2.7% of the surface area in Semi-humid Warm Climate towards the central-northern part of the Reference Region, and the remaining 2.1% towards the western part of the Reference Region in the foothills, with Humid Temperate and Super humid Temperate Climates.

⁷ Caldas Lang Climate Classification developed by IDEAM 2012. Downloaded from Sistema de Información Ambiental de Colombia-SIAC. http://bart.ideam.gov.co/cneideam/Capasgeo/Clasificacion_Climatica_Caldas_Lang_2012.zip

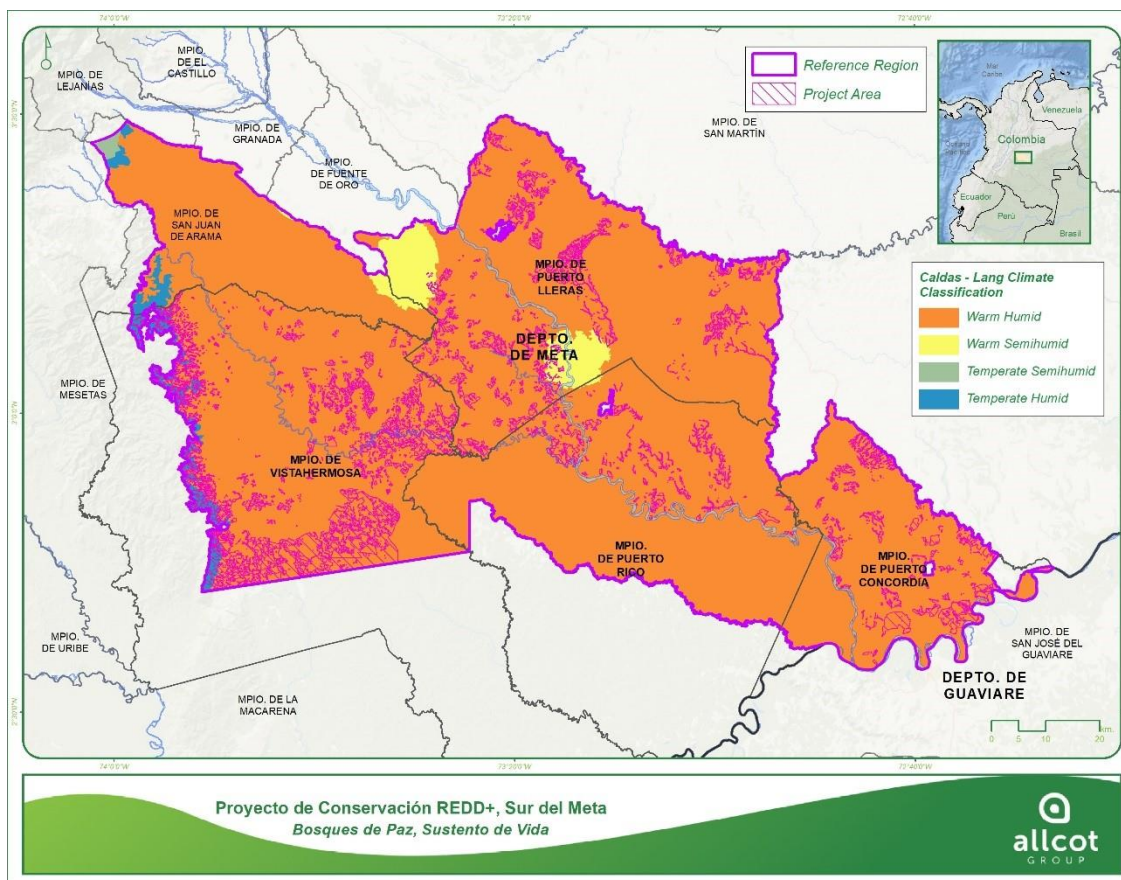


Figure 6. Caldas – Lang Climate Classification on reference region

Source: Allcot Colombia 2021

- Soils⁸

40.5% of the area of the Reference Region has Oxisol type soils, mostly distributed in the northern part, associated with rice, cocoa and rubber crops. In terms of dominance, entisols follow, with 33.8% of the area of the Reference Region, which are weakly formed soils with low fertility and are not recommended for agricultural use, so there are large extensions of savannahs within the study area. Inceptisols dominate 15.6% of the area of the Reference Region, and are soils that are mostly used for forestry activities. Finally, Ultisols, with a dominance of 9% of the area of the Reference Region, correspond to acid soils, with high aluminum saturation, low organic carbon content and low exchange capacity; in general, they are of low fertility, mainly clayey in texture and develop preferably in climates with high temperature and humidity.

In relation to 1.2% of the area of the Reference Region, according to the source of information consulted, this percentage is associated with the class identified as No Soil, and may correspond to areas of rocky outcrops or bodies of water.

⁸ Soil Maps of the Colombian Territory at a scale of 1: 100,000. Department: Meta. <https://gw-geoportal-test.igac.gov.co/gateway/geoportal/api/geoportal/opendata/resource/2d3da07e-19d9-4ef0-bdb8-2095a878e81c?apikey=f2664478-8877-4516-9d12-ed339d336c99>

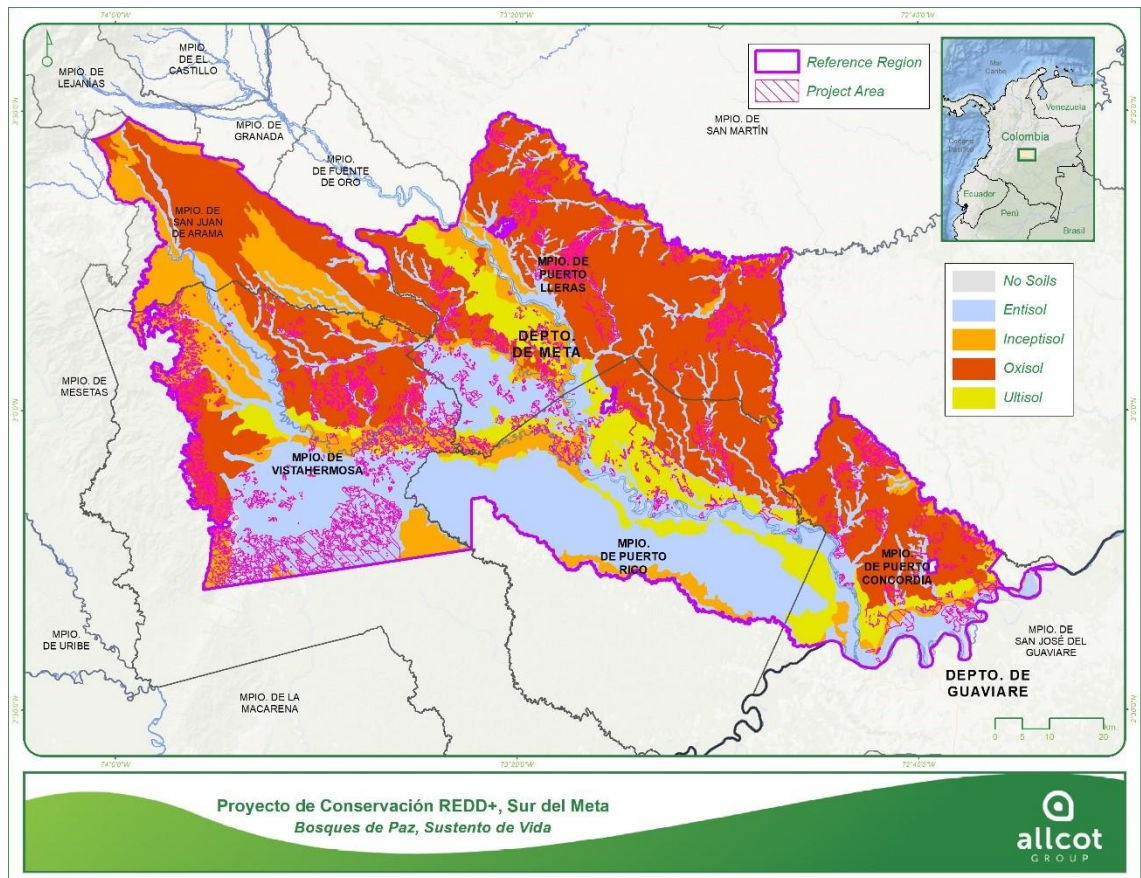


Figure 7. Soils on the reference region

Source: ALLCOT, 2021

- *Hydrography - hidrology⁹*

The Ariari River flows in a northeast-southeast direction, crossing the central part of the Reference Region, this tributary is the main body of water in the study area; it is characterized by its yellowish waters in winter, which become lighter in summer. The Güejar River passes through the municipality of Vistahermosa and joins the Ariari River in the Reference Region, and then flows into the Guayabero River.

⁹ IGAC's base mapping 2019. Escala 1:100.000. Simple and Double Drains. <https://www.colombiaenmapas.gov.co/?e=-82.43784778320864,-0.17644239911865092,-71.23179309571162,9.90326984502256,4686&b=igac&u=0&t=23&servicio=205>



Source: IGAC, 2021

- *Roads and access*¹⁰

In the northwest-northeast direction is National Route 65, which crosses the Colombian national territory bordering the Eastern Cordillera, from Putumayo to Arauca near the Venezuelan border. In the Orinoquia Region and the foothills of the plains, it interconnects cities such as Villavicencio and Yopal. Within the Project's Reference Region is section two of National Route 65, known as the Troncal del Llano, interconnecting the municipalities of Puerto Concordia and Puerto Lleras. In terms of land transportation and access, there are other departmental and municipal roads, including the Granada-San Juan de Arama and Mesetas road, located in the northwest corner of the Reference Region.

In terms of fluvial accesses, as described above, there is the Ariari River, the area of the river that is located within the Reference Region corresponds to the Lower Ariari, mainly encompassing the municipalities of Puerto Lleras, Puerto Rico and Puerto Concordia, whose names are a notion of the port activities that are carried out around the river related to transportation and more recently to tourism, mainly recreational rafting.

¹⁰ IGAC's base mapping 2019. Escala 1:100.000. Tracks, Simple and Double Drains.
<https://www.colombiainmapas.gov.co/?e=-82.43784778320864,-0.17644239911865092,-71.23179309571162,9.90326984502256,4686&b=igac&u=0&t=23&servicio=205>

In general, within the Reference Region, there are rural or minor roads and streams with a high percentage of coverage; however, their access is intermittent depending on the high rainfall seasons.

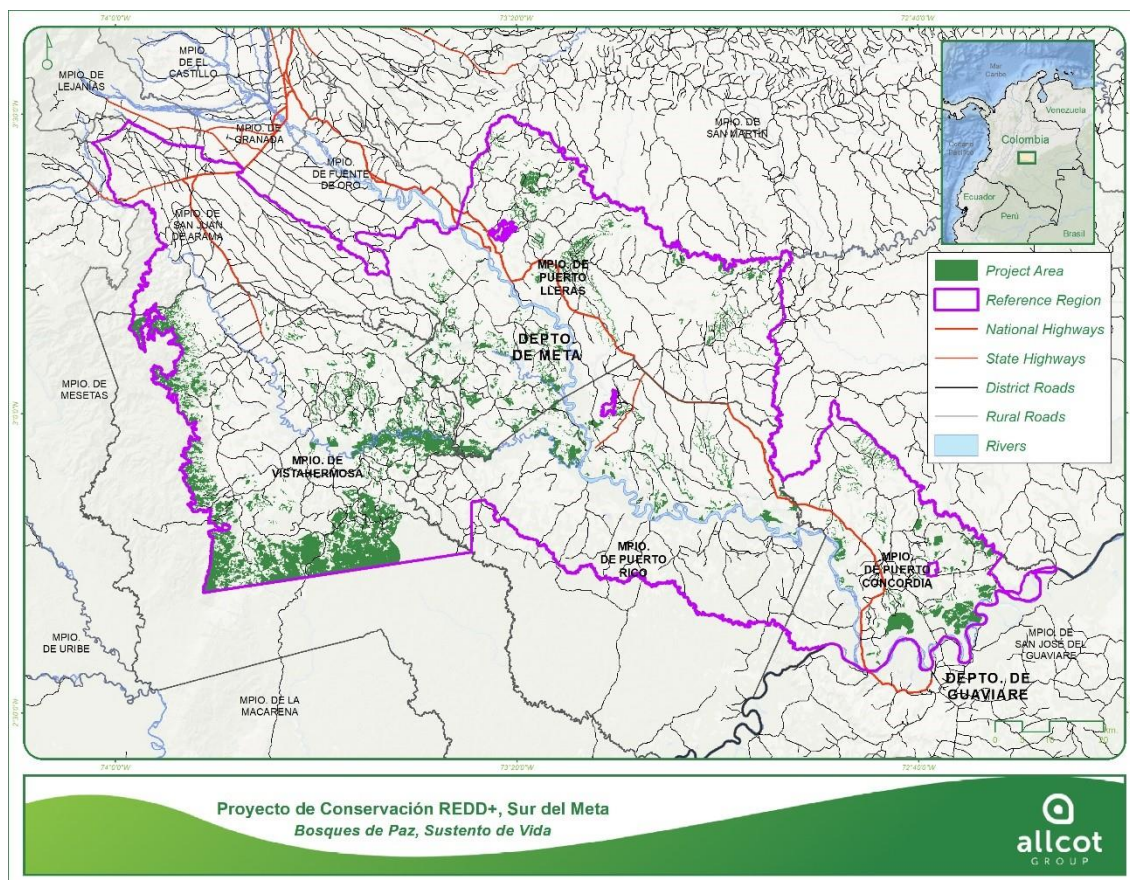


Figure 9. Roads and access in the reference region

Source: IGAC, 2021

- Land Cover¹¹:

For the reference region of the Project, the land cover classes are aligned to level 2 of CORINE Land Cover, 10 cover types are found within the study area. Below are the areas for the year 2018.

Table 2. Land covers for the Reference Region. For the year 2018

CODE	CORINE Land Cover Classes	AREA hectares
11	Urban fabric	611
21	Transient Crops	12,471
22	Permanent Crops	13,899
23	Pastures	259,641
24	Heterogeneous agricultural áreas	127,662
31	Forest	280,650

¹¹ Visual Interpretation of Landsat 7 and Landsat 8 images from NASA. Downloaded from <https://earthexplorer.usgs.gov/>

CODE	CORINE Land Cover Classes	AREA hectares
32	Scrub and/or herbaceous associations	189,984
33	Open spaces with little or no vegetation	6,332
41	Inland wetlands	2,904
51	Inland Waters	9,919

Source: Allcot Colombia 2021

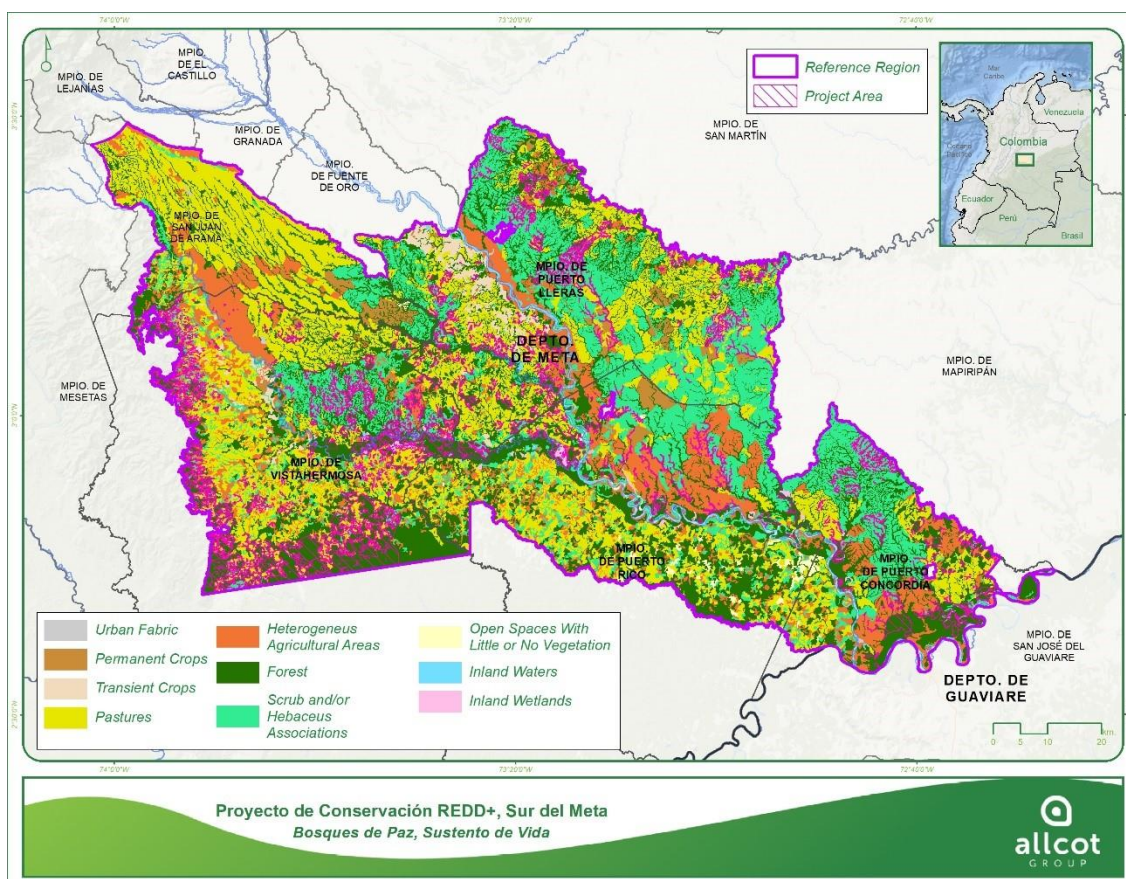


Figure 10 Land covers for the Reference Region. For the year 2018

Source: ALLCOT, 2021

- Land uses¹²:
Using land covers, land use was determined, resulting in 9 land use classes within the Reference Region.

Table 3. Land use within the reference region of the project

¹² Visual Interpretation of Landsat 7 and Landsat 8 images from NASA. Land use information generated by land use designation for each land cover class. Images Downloaded from <https://earthexplorer.usgs.gov/>

COLOR CODE	LAN USE CLASSES	AREA hectares
	Forest management	281,947
	Restoration and recovery	3,982
	Mixed farming	123,044
	Farming	33,284
	Livestock	644
	Lands at rest	40,774
	Special uses	2,972
	Settlements	411,741
	Use and/or conservation of water resources	14,253

Source: ALLCOT, 2021

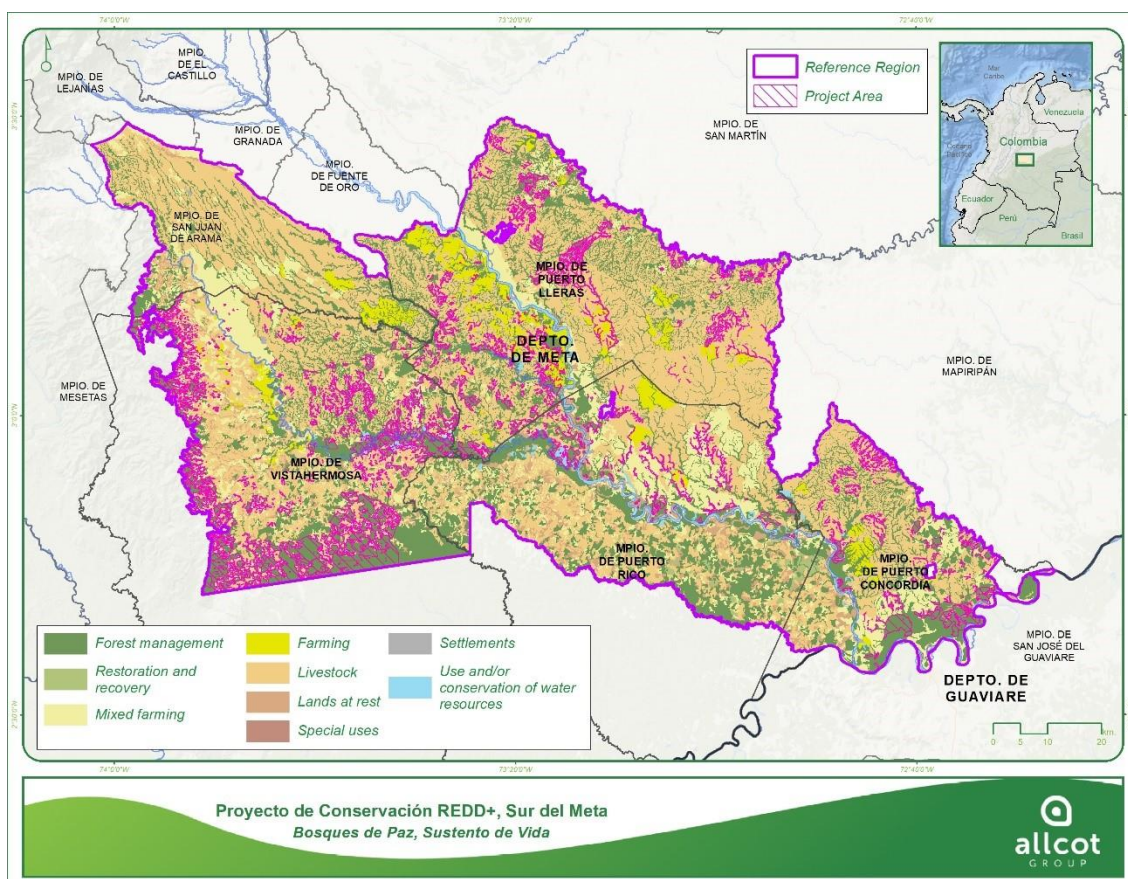


Figure 11 Land Use, 2018

Source: ALLCOT, 2021

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

ALLCOT orients its actions based on the constitutional and legal framework in force in relation to the environment, biodiversity and climate change. In Colombia, Law 164 of 1994, which ratifies the United Nations Framework Convention on Climate Change (UNFCCC), has had important developments such as the National Policy on Climate Change (PNCC) whose objective is to incorporate climate change management in public and private decisions to advance in a climate-resilient and low-carbon development path, which reduces the risks of climate change and allows taking advantage of the opportunities it generates.

In accordance with the PNCC, ALLCOT, through its AFOLU projects, contributes to the implementation of the Colombian Low Carbon Development Strategy (ECDBC), the National Climate Change Adaptation Plan (PNACC) and the Integrated Strategy for the Control of Deforestation and Forest Management (EICDGB).

In this context, ALLCOT is recognized as part of the National Climate Change System (SISCLIMA) created through Decree 298 of 2016, which according to its Article 2, is made up of the "set of state, private and non-profit entities, policies, standards, processes, resources, plans, strategies, instruments, mechanisms, as well as information pertaining to climate change, which is applied in an organized manner to manage greenhouse gas mitigation and adaptation to climate change in the country."

In addition to the political and legal framework on climate change, it is of special interest and business commitment to be aligned with Law 165 of 1994, which adopts the Convention on Biological Diversity (CBD), which establishes the guidelines for States Parties to know, conserve and sustainably use biodiversity, recognizing the importance of indigenous peoples, black and peasant communities for its conservation and sustainable use. Particularly the rights recognized in Article 8j and related articles of the CBD, related to the protection of traditional knowledge associated with biodiversity.

Law/Decree/Conventions	Compliance
<p>Law 164 of 1994:</p> <p>Ratifies the UNFCCC decision 1/CP16 about the national circumstances that define the measures that parties should adopt to reduce emissions from deforestation and forest degradation, protect forest reserves and sustainable manage forest</p>	<p>The project complies with this law because its main purpose is to contribute in the reduction of GHG emissions through the conservation of important forest remnants that are highly endangered due to the expansion of grasslands and croplands</p>
<p>Forest Policy (1996). The national forest policy that was adopted in 1996 through the document 2.384 of the National Council for Economic and Social Planning, aim at achieving the sustainable use of</p>	<p>The project complies with the national Forest Policy because it promotes forest conservation and the fair and informed inclusion of the local communities that make part of it. In addition, the project supports the sustainable</p>

Law/Decree/Conventions	Compliance
<p>forest in order to consolidate the forestry sector in the national economy.</p> <p>Such policy set targets and procedures to halt deforestation by coordinating different economic sectors, promotion of reforestation of forest, rationalization of administrative processes for the sustainable use of forest and addressing social and economic problems of the local communities:</p>	<p>management of forest by promoting agroforestry systems especially in zones located inside the leakage management areas. The Project will also enforce the local economic development by improving production systems, generating employment, transferring technology and by investing in the execution of the activities proposed by the project participants</p>
<p>Law 2nd of 1959 (Congreso de Colombia, 1959). This law defines the national forest reserves and forest areas of common interest. Special management policies apply to these designated areas and harvesting and commercialization of ecosystem services is restricted and in some cases forbidden</p>	<p>The project is located inside the national Amazonian Forest Reserve. Different categories of management have been defined for these areas. The project complies with this law because it aims at reducing deforestation by promoting conservation and sustainable practices considered by the Law 2nd of 1959</p>
<p>Convention for the Protection of the World Cultural and Natural Heritage. Paris, 1972</p>	<p>The project protects remnants of primary and secondary forest form the Amazonian biome and all its associated biodiversity. The project will do that by conforming vigilance patrols, demarcating the territory and by training the project participants and other stakeholders in the importance of the conservation of forest,</p>
<p>Convention on International Trade in Endangered Species: wild fauna and flora. Washington, 1973 and law 357 of 1997</p>	<p>The project protects remnants of primary and secondary forest form the Amazonian biome and all its associated biodiversity. Hunting will not be allowed, and only sustainable fishing will be permitted.</p> <p>Because the forest inside the project is owned by peasants and farmers and because the main deforestation driver identified was the expansion of grasslands for livestock production, the project will not allow the extraction of wood for commercial purposes.</p> <p>Only those able to obtain harvesting permits for domestic purposes will be allowed</p>
<p>Convention on Biological Diversity. Rio de Janeiro, 1992. Convention on Wetlands of International</p>	<p>The project area does not include any wetland of International Importance as defined by the RAMSAR convention. On the other hand, the</p>

Law/Decree/Conventions	Compliance
Importance especially as Waterfowl Habitat - Ramsar (hosted by Colombia in 1997).	project protects the biodiversity by promoting the conservation of forest and by enforcing alternative productive systems that can reduce the pressure on the permanence of forest
Decree 1076 of 2015. Set the rules for the management of regional and national forest protecting areas and decree 2811 of 1974	The project does not include any national forest protecting area
Decree 2372 of 2010 That regulates the National Protected Areas	The project area does not include any national protected area
Decree 1791 of 1996. Defines the rules for the harvesting of forest and planted areas in Colombia	The decree grants the public or private landowners the possibility of harvesting wood for domestic purposes. Hence only domestic harvesting will be allowed by the project upon approval from the regional environmental authority CORMACARENA
Law 1333 of 2009 that rules the national environmental sanctions	None of the project participants have any environmental sanction.
Resolution PS-GJ. 1.2.6.180633 of CORMACARENA which prohibits the use of open fires inside its entire jurisdiction area and the controlled fires inside the municipalities of La Macarena, Mapiripan, Uribe, Vistahermosa, Mesetas, Puerto Rico and Puerto Colombia	All human-induced fires inside the project area and leakage management areas are forbidden. The committees will make sure no fires are being caused inside the project area
Resolution 1447 of 2018 that creates the national MRV system for GHG mitigation activities.	<p>The project is in the process of certification with the VCS s standard and once validated and verified it will be registered in the National Registry of GHG Emission Reduction - RENARE (yet the RENARE has not been fully operational).</p> <p>On the other hand, according to the resolution, the baseline scenario is a type of baseline that represents GHG emissions measured in tons of CO2e that would occur in the absence of GHG mitigation policies, plans, strategies or initiatives in the timeframe in which climate change targets or commitments are subscribed to. As for the Baseline, the decree defines it as the scenario representing the GHG emissions</p>

Law/Decree/Conventions	Compliance
	<p>that would occur in the absence of a mitigation initiative.</p> <p>Currently, the only approved reference scenario for Colombia is the Amazon biome reference scenario. Although the project is located inside such reference scenario, it only covers emissions reduced for the period 2013-2017 and the baseline was also defined only for that period.</p> <p>Such reference scenario, baseline and deforestation rates have not been updated for the emissions produced after 2018 inside the Amazon biome. For this reason, the project proponent has decided to define its own reference region in order to better estimate the actual deforestation rates and to use updated information, especially because deforestation in the project area has increased drastically and the previously defined reference region lacks of updated data that can account for the increased forest loss.</p> <p>There have been presented a new reference level, but the UNFCCC has not yet finishing the approbatory phase and the time scale does not cover the one for the project.</p> <p>Consequently, the project complies with such the resolution.</p>
Decree 926 of 2017 that rules the national carbon tax	<p>The project will be certified through the VM0015 methodology from the VERRA Standard. The Verified carbon Units may be used by passive agents of the national territory for the non-causation of the carbon tax, since it complies with the characteristics of the GHG reduction and removals conditions as summarized below:</p> <p>The project is a GHG mitigation initiative developed in the national territory: The project is located in the department of Meta</p>

Law/Decree/Conventions	Compliance
	<ul style="list-style-type: none"> . The GHG mitigation initiative is formulated according with the VERRA procedures and methodologies. VERRA is an internationally recognized standard that has a platform for public registration of GHG emission reductions and removals . The project activities are not enforced by mandate of an environmental authority to offset the impact produced by the work or activity subject to an environmental authorization. This is a complete voluntary initiative . The project is in process of validation and verification
<p>Law 388 of 1997</p> <p>Decree Law 1989 of 1989 creates the Especial Area of Management of Macarena</p>	<p>According to Environmental Determinants by Law 388 of 1997, the regions declared as Environmental determinants must prevail over any other type of use, going against it will be considered illegal. Decree Law 1989 of 1989 creates the Especial Area of Management of Macarena. This area is governed by the Renewable Natural Resources Code and Decree 622 of 1977. There the permitted activities are indicated, such as: conservation, research for conservation, research, education, recreation, culture, recovery and control. This decree includes the forbidden actions on these types of areas, declaring: Article 30: "To develop agricultural or industrial activities, including hotel, mining and oil activities".</p>

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

A research on different GHG programs was performed and no coincidences were found. CDM was not applicable, as this is a REDD project, so VCS, Cercarbono and Proclima. Annex 2.5.13 participation under other GHG Programs includes the complete list of existing programs, as indicative the map shows the places, where clearly no superposition with the project is detected.



Figure 12. GHG REDD+ Projects registered in Colombia

1.15.2 Projects Rejected by Other GHG Programs

No records were found on the project being rejected by any other program or standard.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

As described previously, any kind of overlapping with national emissions trading programs is detected by RENARE and does not allow the inscription of the project. Since the project has been already accepted by the platform, it is the understanding of the project that no limits on this matter exist.

In addition, for the area, the only existing program is Vision Amazonia, but since the project is working only with private owners, it is understood that they require the signing of a contract and registration in RENARE in order to generate payment for reductions in such areas. As Colombia

has not generated a transparent and clear process regarding the allocation of mitigation potential or the nesting of private options, which are clearly allowed under the National REDD Strategy and the latest version of the NDC, inclusion in RENARE is considered the only requirement.

1.16.2 Other Forms of Environmental Credit

Has the project sought or received another form of GHG-related credit, including renewable energy certificates?

☐ Yes

☒ No

1.17 Sustainable Development Contributions

The project can contribute to the achievement of the Sustainable Development Goals (SDGs), particularly those related to poverty and hunger eradication, gender equality, decent work, reduction of inequalities, responsible production and consumption, climate action, life of terrestrial ecosystems, and peace.

Colombia has included SDG on its national goals and planning for 2030, as CONPES 3918¹³ from 2018, declares. On its page 44, it presents DNP and the web page <https://www.ods.gov.co/es> as the responsible entity and the digital main source of information, regarding the advance on the implementation and monitoring of SDG.

On page 46, it is presented national, regional and local planning as the tools for SDG to be implemented and the possibility of private sector to show success cases. Nevertheless, on the official site, monitoring and implementation advances is presented on national basis (2021) and department scale from 2008 to 2017.

There have not been detected, on the municipal planning documents any monitoring space or link to present results of SGD, in order to be included on the national results. Nevertheless, the project will continue to look forward spaces to present results on this aspect.

In order to know the project's contribution over time, a baseline will be generated through the application of a survey addressed to a representative sample of 300 project partners and 300 people from the control group (leakage belt). Overall, the project is expected to contribute to the following objectives:

Sustainable Development Goal	Project Objective	Articulation between Theory of Change and the Sustainable Development Goals
Goal 4: Quality education	1. Training and education for the improvement of the individual, collective	Through practical theoretical modules of training and training aimed at partners, coordinating committees and overseers

¹³ <https://colaboracion.dnp.gov.co/CDT/Conpes/Econ%C3%B3micos/3918.pdf>

Sustainable Development Goal	Project Objective	Articulation between Theory of Change and the Sustainable Development Goals
	and organizational capacities of the project partners.	create a learning community that guarantees the acquisition of knowledge, its appropriation and elements for decision-making that benefit individuals, their families and the territory.
Goal 5: Achieve gender equality and empower all women and girls.	<p>1. Training and education for the improvement of the individual, collective and organizational capacities of the project partners.</p> <p>4. Promote an economy based on sustainable productive projects around integral rural development, contributing to the closure of the agricultural frontier and improvement of forest goods and services.</p>	To link women in an inclusive way in the processes of formation, training and participation, recognizing their active role in society and the contribution they make to the production, reproduction and support to the home, encouraging their participation in decision-making spaces and construction of processes in a transparent, fair, equitable and inclusive manner.
Goal 8: Decent work and economic growth	4. Promote an economy based on sustainable productive projects around integral rural development, contributing to the closure of the agricultural frontier and improvement of forest goods and services.	Improve productivity levels, family income level and employment for men, women and vulnerable groups within the project.
Goal 10: Reducing inequalities	<p>1. Training and education for the improvement of the individual, collective and organizational capacities of the project partners.</p> <p>2. Support the formalization of ownership through processes of belonging, titling and judicial processes.</p> <p>3. Consolidate the territorial governance of the project partners, and strengthen citizen awareness, through knowledge management and learning to generate an intergenerational culture for the care and sustainable management of forests.</p> <p>4. Promote an economy based on sustainable productive projects around integral rural development, contributing to the closure of the agricultural frontier and improvement of forest goods and services.</p>	Improvement of social and economic well-being such as: per capita income, reduction of the level of poverty and access to education. At a transversal level, the project will work on training, governance of the territory and forests, formalization of properties, the promotion of the economy through the implementation of sustainable productive projects, which will guarantee the reduction of gaps, the increase of productivity and technological innovation.

Sustainable Development Goal	Project Objective	Articulation between Theory of Change and the Sustainable Development Goals
Objective 11: Sustainable cities and communities	4. Promote an economy based on sustainable productive projects around integral rural development, contributing to the closure of the agricultural frontier and improvement of forest goods and services.	Design and develop business plans promoting the production of healthy products based on a program of technical assistance and agricultural extension by productive line aimed at project partners, guaranteeing the coexistence of peasants in the region avoiding migration to the city.
Goal 12: Responsible production and consumption	4. Promote an economy based on sustainable productive projects around integral rural development, contributing to the closure of the agricultural frontier and improvement of forest goods and services.	Adoption of good livestock, agricultural and environmental practices based on the identification of gaps in production systems and alternative solutions by adopting sustainable technologies and forms of production.
Goal 13: Climate action	3. Consolidate the territorial governance of the project partners, and strengthen citizen awareness, through knowledge management and learning to generate an intergenerational culture for the care and sustainable management of forests.	Partners strengthen their capacity to learn, practice and implement effective climate change prevention and mitigation strategies. Reduction of CO2 emissions caused by deforestation in the southern Goal through forest, biodiversity and community monitoring.
Goal 15: Life in terrestrial ecosystems	3. Consolidate the territorial governance of the project partners, and strengthen citizen awareness, through knowledge management and learning to generate an intergenerational culture for the care and sustainable management of forests. 4. Promote an economy based on sustainable productive projects around integral rural development, contributing to the closure of the agricultural frontier and improvement of forest goods and services.	Reduction of habitat loss and reduction of threatened species through the conservation and sustainable use of the forest and its biodiversity through its recognition, valuation and social appropriation by the partners and organizations linked to the project.
Goal 17: Partnership to achieve the Goals	3. Consolidate the territorial governance of the project partners, and strengthen citizen awareness, through knowledge management and learning to generate an intergenerational culture for the care and sustainable management of forests.	Seek articulations with local, national, non-governmental, cooperation, private and public organizations to achieve physical, economic and technical resources for the fulfillment of local and regional objectives and goals.

1.18 Additional Information Relevant to the Project

1.18.1 Leakage Management

Leakage management areas were determined based on non-forest areas located outside the project area in which sustainable alternative activities to those that produce deforestation are intended to be carried out and thus reduce the risk of leakage for the project. These areas strictly correspond to areas of land owned by landowners who are adherent partners of the project and who will be the beneficiaries of the transfer of benefits from the sale of carbon credits. Preliminarily, the defined area corresponds to 47,560 hectares. In the Leakage management area, the activities considered for the transfer of benefits and alternatives to deforestation and prevention of leakage displacement are sustainable cattle ranching, low-impact crops of citrus, cocoa, avocado and coffee in smaller proportions for areas where conditions are suitable for their development.

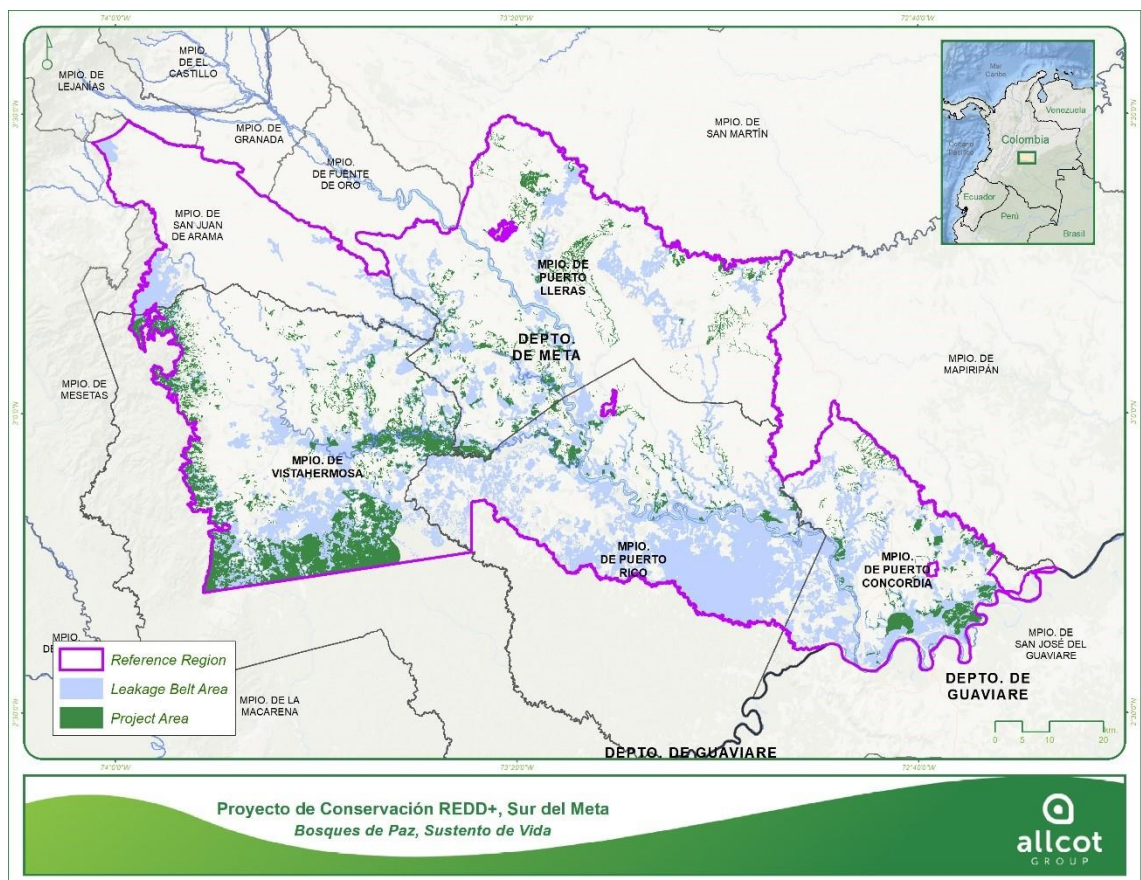


Figure 13. Project Boundary – Reference region, project area and leakage belt

Source: ALLCOT 2021

- Forest

The forest areas for the reference region, project area, and leakage belt management area were delimited using the layers of the forest and carbon monitoring system (SMBYC) of the IDEAM,

which constitutes the official information used to determine the statistics of the annual status and monitoring of forests, which has been generated considering the official definition of forest for the country using medium and high resolution images (Sentinel 1/2 and Planet Scope). Forest" for the SMBYC is defined as: "The land occupied mainly by trees that may contain shrubs, palms, guaduas, herbs and lianas, in which the tree cover predominates with a minimum canopy density of 30%, a minimum canopy height in situ of 5 meters at the time of identification and a minimum area of one hectare. Tree cover of commercial forest plantations, palm plantations and trees planted for agricultural production are excluded". Land with a cover other than natural forest is referred to as non-forest area.

Since this information is of official order, with partial annual temporality¹⁴, with national coverage for Colombia and free access, it was downloaded through the IDEAM's open data geographic information portal for the historical reference period, The information was downloaded through the geographic information portal of IDEAM's open data for the historical reference period, and then crossed with the information of Holdridge Life Zones of IDEAM in order to categorize the forests within the limits of the project in order to perform the analysis of historical land use and land change, analysis of the future projection of deforestation and therefore the ex ante estimation of carbon in the reservoirs defined for the project according to the VM0015 methodology.

The forest categories determined are Tropical humid forest - bh-T and very humid Pre-Montane forest - bmh-PM. For the project start date considered in numeral 3.1.3 Project Boundary, according to step 1 of the methodology, in the Temporal boundaries. Forest cover for the reference region in 2018 is 259,727.4 ha for bh-T and 4,740.8 ha for bmh-PM. The Figure 14. shows that the project areas correspond clearly to forest areas when overlaid with the information from the IDEAM forest/non-forest layer.

¹⁴ Annual monitoring as of 2012, and for previous years with a periodicity of between 5 and 10 years. For the project, information was taken for the years 2005, 2010, 2012 to 2018, extending the coverage of the reference period given that between 2005, 2010 and 2012 there is no information for intermediate years.

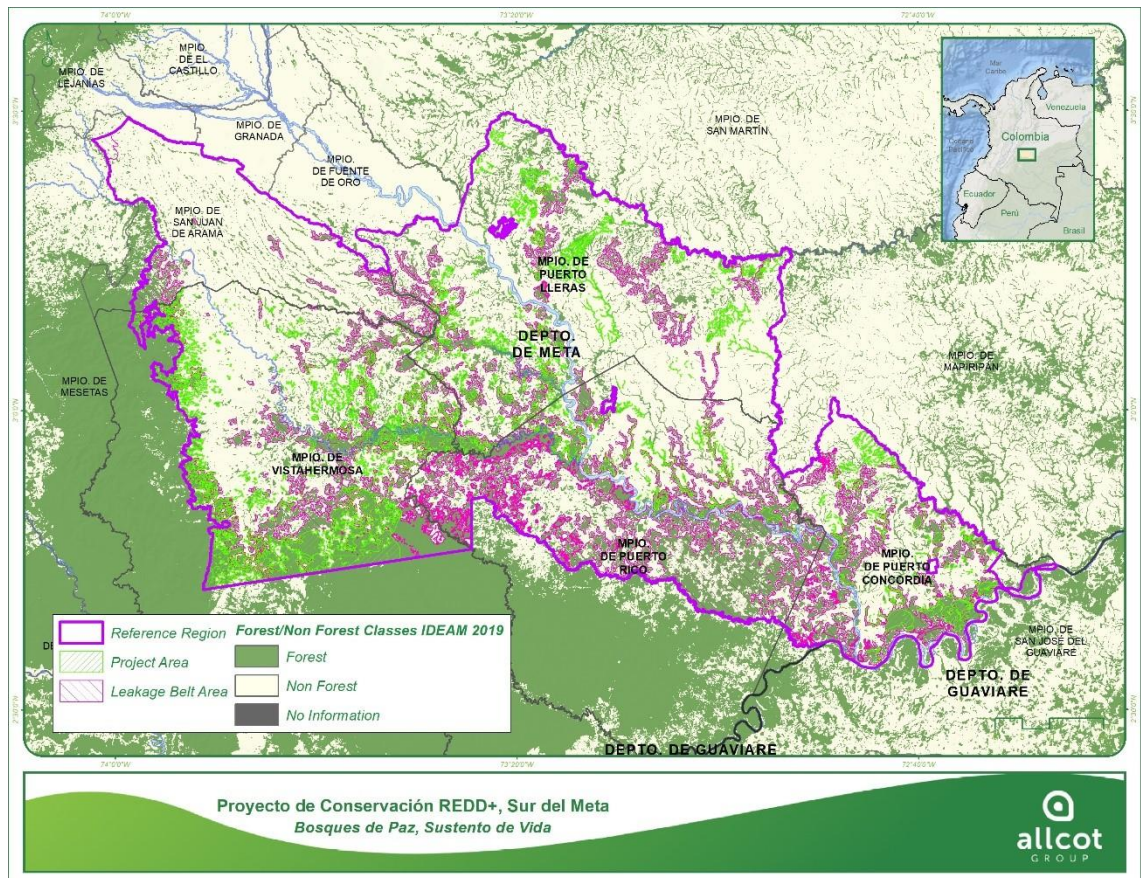


Figure 14. Project Boundary – Forest of project

Source: ALLCOT, 2021

- Temporal boundaries

Taking into account the VM0015 methodology, the following are the temporal boundaries for the project:

Starting date and end date of the historical reference period: Start: 01/01/2005 End: 31/12/2018

Starting date of the project crediting period of the AUD project activity: Start: 01/01/2019

Starting date and end date of the first fixed baseline period: Start: 01/01/2019 End: 31/12/2029

Starting date monitoring period: Start: 01/01/2019 End: 31/12/2021

- Carbon pools

According to the methodology, the six carbon pools listed in **Error! Reference source not found.** are considered in the methodology and some of these have considered for the project.

Carbon pools	Included / TBD ¹ / Excluded	Justification / Explanation of choice
Above-ground	Tree: Included	Carbon stock change in this pool is always significant
	Non-tree: excluded	The final use of the land is majoritary grass
Below-ground ⁺	included	IDEAM generates data base approximation
Dead wood ⁺	excluded	no significant
Harvested wood products ⁺	excluded	no significant
Litter	excluded	no significant
Soil organic carbon ⁺	no included	Not to be measured in conversions to pasture grasses and perennial crop according to VCS, grass conversion being the most common. Program Update of May 24th, 2010.

Source: ALLCOT, 2021

PENDIENTE POR CONFIRMAR

1.18.2 Commercially Sensitive Information

For security reasons, topics related to the financial well-being of the organizations, as well as contacts of some individuals and the total database will not be included. The Agreements, prices, and data relating commercial agreements are considered sensitive information as well. Some of the tools designed by ALLCOT are also considered commercially sensitive information (follow up, stakeholders mapping in some parts, PIN) as been part of ALLCOT's Know-how.

1.18.3 Further Information

Further information in Annex 4.5.6_CO_Distribución de Beneficios SdM_V2.

2 SAFEGUARDS

2.1 No Net Harm

Summarize any potential negative environmental and socio-economic impacts and the steps taken to mitigate them.

2.2 Local Stakeholder Consultation

Stakeholder consultations have taken place at different levels and times, using methodologies adapted to each case.

As described in 2.3.1 and 2.3.2, in the socialization spaces, information tools and methodologies were used to provide stakeholders with relevant information and gather first-hand information on the expectations, interests and needs of the communities. First through their representative leaders of the organizations, and later with the direct participation of the communities in the community centers.

Between June 2018 and December 2019, informative meetings were held with the organizations' partners about the company and about REDD+ in the framework of the voluntary carbon markets, assemblies of the organizations were convened and commercial contracts were signed in Puerto Rico and Vista Hermosa. Also, in two other municipalities that finally were not included in the project.

In Puerto Rico, on May 8, 2019, a meeting was held with ANUC and the presidents of 42 community action boards, in the facilities of the Municipal Council. In this meeting, the progress in the structuring of the Project was socialized, advances in the early actions that were planned to be developed at that time were presented, the investment schedule was defined, the requirements for the disbursement of resources in a fiduciary assignment in the Agrarian Bank, and the legal and oversight mechanism for the implementation of early actions through ANUC.

On September 8, 2019, a follow-up meeting was held with ANUC. This meeting included a review of the role of the committee, prioritized activities, presentation of the open account for the fiduciary assignment and definition of authorized signatures, and presentation of progress in early actions.

In Vista Hermosa on December 16, 2018 ASOPROGÜJAR Assembly was held, on April 6, 2019 Agrocavis members assembly was held, and on May 8, 2019 a meeting of the operating committee to identify and prioritize possible early actions to be developed and define the monitoring committee, and on September 7, 2019 a meeting of operating and overseer committees was held to organize the implementation of possible early actions.

In the first quarter of 2020 the second moment of information and participation of the communities was carried out, when the ALLCOT technical team convened the operational committees with the leaders of Puerto Rico and Vista Hermosa to resume and redirect the early actions and hold informative meetings with the communities in 9 veredal nuclei defined in the two municipalities.

On January 18, 2020 a meeting was held with the Operating Committee and Oversight Committee of Puerto Rico and on January 19, 2020 with the respective committees of Vista Hermosa. In these meetings, with the assistance of ALLCOT's technical and administrative teams, a formal presentation of ALLCOT was made, the available budgets for early actions were clarified and the need to socialize the project directly in the villages was made evident, and therefore, some community centers and dates were jointly defined to socialize the project directly with the communities interested in participating.

As a result of the meetings with the committees of these two municipalities, it was agreed to hold information meetings in the rural communities, where all the interested communities could participate, learn firsthand about the scope, benefits and risks of the project, and in general clear up

all their concerns. It was agreed to hold 4 workshops in Vista Hermosa and 6 in Puerto Rico, but in Vista Hermosa one of the workshops could not be held due to public order reasons.

In this way, the communities and their representatives have had the opportunity to influence the design of the project, since they are the ones who know the territory in depth and provide the necessary elements and criteria to understand the territorial dynamics, define the project area, the reference region, the measures and actions to be implemented and the internal coordination mechanisms.

Through consultations with leaders and communities, inputs were gathered for:

- The prioritization of the villages with the greatest forest potential and the feasibility of establishing conservation agreements with owners and possessors.
- The socialization route, indicating the appropriate sites to bring together three or more villages in a core area, to facilitate access to the population to the informative meetings.
- The construction of the agenda, methodology and logistics of the informative workshops aimed at the communities in the veredas.
- Analysis of the causes and agents of deforestation.
- Socialization of the project among the communities in veredas and farms.
- Georeferencing of properties.
- Obtaining supporting documentation of registered families.
- Identification and prioritization of lines of action to halt deforestation.
- Conducting an analysis of weaknesses, strengths, threats and opportunities for each organization.
- Planning sustainable actions.
- The definition of criteria for the distribution of benefits.
- Some partners participated in the application of the SDG survey others helped oversee the process such as ANUC in Puerto Rico.

The results of the workshops, interviews, meetings and surveys conducted were integrally incorporated into the project design, particularly in the diagnosis, theory of change and design of the sustainable actions to be implemented, as well as for the analysis of management capacity and the governance structure of the project.

Specifically for the design of sustainable actions, 32 workshops were convened in each of the municipalities. The first cycle of workshops was held in November 2020 with the leaders of the partner organizations, who identified the causes and agents of deforestation and possible actions aimed at transforming these causes. In these same workshops they made an analysis of the existing biodiversity in their territories.

With the results of the first workshop, the second workshop was designed on sustainable actions to be carried out in the Veredal nuclei with the participation of all the partner communities, to present the proposal of actions identified by the leaders of the organizations, validate them and carry out the participative prioritization of these actions.

After prioritizing the sustainable actions with broad community participation, ALLCOT's technical team proceeded to carry out the corresponding studies to determine the feasibility of the prioritized actions, the management capacity of the organizations and the benefit distribution alternatives with the

financial projections that were landed as the forest inventory progressed. In the second week of February 2021, virtual workshops were held with the organizations in each municipality to advance the strategic planning of the sustainable actions to be developed.

The project's Theory of Change, objectives, goals and indicators clearly reflect the results of the stakeholder consultations.

Finally, it is worth noting that in the involvement of local teams to carry out the socialization and forest inventory activities, the participation of the partners in the contracting that ALLCOT carried out throughout the process in the four municipalities was favored.

Supporting documents for the Veredal Workshops on Sustainable Actions and Benefit Sharing can be found at Annex 2.3.7 Stakeholder consultation.

2.3 Environmental Impact

Summarize any environmental impact assessments carried out with respect to the project, where applicable.

2.4 Public Comments

Demonstrate how due account of all and any comments received during the public comment period has been taken. Include details on any updates to the project design or demonstrate the insignificance or irrelevance of comments.

2.5 AFOLU-Specific Safeguards

- Stakeholder identification

The stakeholder identification and analysis process was based on a stakeholder mapping and analysis tool developed by ALLCOT, which allows the process of characterizing the stakeholders that may affect or be affected by the project, taking into account variables such as their location, status, main requirements, expectations, degree of influence, level of interest, and phase of the project of greatest interest, resulting in a typology and elements to develop a communication strategy appropriate for each group. (Annex2.1.8_ 211103_CO_StakeholderMappingSurdelMeta).

Stakeholder analysis is an ongoing process, evolving as new stakeholders are introduced to the Project. As a grouped project, and according to the VCS Standard V.4.1 in its 3.5.9 and 3.5.15 items, new partners might be added into the project, as long as they fulfilled these conditions.

- The person, who wants to be part of the project must provide documentation on legal ownership of the land, according to the process described on the PD.
- The land must be inside the reference area, preferably on the leakage belt area, and by this fulfil the baseline used in the project, described on this PD
- The land must comply with the additionality based on financial and technology barriers.
- The new areas of forest (minimum 1 ha) will be using same measures and technologies as described on the PD monitoring plans.
- Committees will have the final decision on the inclusion, considering each candidate and their willingness to comply with the agreements.

- The new partner must sign the accession contract to the master agreement with any of the existent associations or CAB.
- New CABs or associations must have lands fulfilling the previous requirements or be presented by a group of minimum 1000 ha partners, that will sign under their contract.

The preliminary analysis identified the various stakeholder interests and the influence these groups may have on the project. The analysis helped to gradually improve the communication and engagement strategies of the various stakeholders at different stages of project development.

- *Project leaders and partner organizations*

Among the stakeholders identified in the first place are the leaders promoting the project, since the initiative originated thanks to the manifest interest of two social leaders of the municipalities of Vista Hermosa and Puerto Rico, who had participated in 2014 and 2015 in institutional spaces where they learned about the REDD+ mechanism, and who were convincing the community to reduce deforestation, hoping to get a similar project: Mr. Alex Yamid Ramirez in Vista Hermosa and Mr. José Uirío Pachón in Puerto Rico. Given their interest and the fact that the State did not reach their territories with these projects, they saw in private companies an opportunity for financing and technical support for the development of a project within the framework of voluntary carbon markets.

It was thus thanks to these leaders that contact was made, since the beginning of 2018, with the first associations of peasant producers in the municipality of Vista Hermosa and with an association in Puerto Rico, with whom ALLCOT, after almost a year of negotiations, signed the first commercial agreements in December 2018.

In Puerto Rico with the National Association of Peasant Users (ANUC) and 39 Community Action Boards. In Vista Hermosa with the Association of Small and Medium Agricultural Farmers of the Güejar Sector (ASOPROGÜJAR) and the Agroindustrial Association of Cocoa Growers of Vista Hermosa (AGROCAVIS).

In May 2019, the first outreach meetings were held with municipal authorities, mayors' offices, municipal councils and municipal councils, and subsequently, leaders of the social organizations identified in these two municipalities were contacted. In June 2020, contracts were formalized with one association and eight community action boards in Puerto Concordia, and four associations and eight boards in Puerto Lleras. Once they learned about the project's approach and progress, these organizations expressed their interest in participating and representing the families that decided to join the project. Currently, 22 CAB remain as partners in Puerto Rico and 5 in Puerto Concordia.

In Puerto Concordia with the Association of Peasant Producers of the Lower Ariari (ASOCAMPROARIARI, by its acronym in Spanish) and the community action boards of the villages of Aguas Claras, El Salitre, La Florida, Lindenal, Palomas, Progreso, Santa Lucía and Chaparrito in Puerto Concordia. In Puerto Lleras with the El Hatice Dairy Association (ASOHATICO, by its acronym in Spanish), Association of peasant producers (ASOCAMPROVIC, by its acronym in Spanish), Association of Agricultural Producers of Cunimía (AGROCUM, by its acronym in Spanish), Association of Community Action Boards (ASOJUNTAS, by its acronym in Spanish) and the community action boards of the villages of Agualinda, Argentina, Canadá, Casibare, Chinata, El Cairo, Villa la Paz and El Caribe in Puerto Lleras.

In the four municipalities, local teams were formed with members of the same organizations and project partners to support the socialization process, linking families and geo-referencing of properties.

Table 4. Associations that act on behalf of the member families of the project

MUNICIPALITY	ASSOCIATION
Vista Hermosa	ASOPROGÜJAR Association of small and medium agricultural farmers of the sector of the Güejar
	AGROCAVIS Agroindustrial Association of cocoa farmers of Vista Hermosa, Meta
Puerto Concordia	ASOCAMPROARIARI Association of peasant producers of the Bajo ariary
Puerto Rico	ANUC National Association of Peasant Users
	ASOFRAPRICOM Association of agrotourism farms of Puerto Rico Meta
Puerto Lleras	ASOHATICO Dairy the Hático
	ASOCAMPROVIC Association of Peasant Defenders of the Environment, Agriculture and Livestock of the Alto San Vicente
	AGROCUM Association of Agricultural Producers of Cunimía
	ASOJUNTAS Association of Community Action Boards of Puerto Lleras

Community action boards that are members of the project in the municipalities of Puerto Rico, Puerto Concordia and Puerto Lleras.

Table 5. Community action boards that are members of the project

N. °	Puerto Rico	Puerto Concordia	Puerto Lleras
1	JAC Bajo Fundadores	JAC Vereda Aguas Claras	JAC Agualinda
2	JAC Caño Alfa	JAC Vereda El Salitre	JAC Argentina
3	JAC Caño Blanco	JAC Vereda La Florida	JAC Canadá
4	JAC Bocas de Caño Danta	JAC Vereda Lindenal	JAC Casibare
5	JAC El Oasis	JAC Vereda Progreso	JAC Chinata
6	JAC Islas de Caño Negro		JAC El Cairo
7	JAC La Argelia		JAC Villa La Paz
8	JAC La Lindosa		JAC El Caribe

N°	Puerto Rico	Puerto Concordia	Puerto Ileras
9	JAC La Pradera		
10	JAC La Rivera		
11	JAC La Sultana		
12	JAC La Venada		
13	JAC Las Colinas		
14	JAC Miravalles		
15	JAC Puerto Chispas		
16	JAC Puerto Toledo		
17	JAC San Pedro		
18	JAC San Rafael		
19	JAC Santa Lucía		
20	JAC Sausalito		
21	JAC El Darien		
22	JAC El Jordán		

- **Public national, regional and local institutions**

Among the key institutional actors are the regulatory bodies, such as the Ministry of the Environment and Sustainable Development at the national level and the Corporación Autónoma Regional para el Desarrollo Sostenible de La Macarena Cormacarena, the regional environmental authority.

The Ministry of Environment and Sustainable Development, as the regulatory entity, defines the environmental and climate change policy in Colombia and establishes the administrative procedures to develop climate change mitigation projects in the country.

Cormacarena, as the environmental authority in the Department of Meta, is responsible for the administration and control of renewable natural resources and is also in charge of promoting scientific research and technology transfer, subject to the special regime provided for in the aforementioned Law and its bylaws, and is mainly empowered to promote the conservation and sustainable use of renewable natural resources and the environment. Cormacarena, as environmental authority, leads the Green Business Node, the Climate Change Node and the Forestry Board in the department of Meta.

On the other hand, IDEAM is the institution in charge of managing the National Registry for the Reduction of Greenhouse Gas Emissions-RENARE- according to the guidelines of the Ministry of Environment and Sustainable Development, as established in both Law 1931 of 2018, and Resolution 1447 of 2018.

- **Territorial entities**

Territorial entities are governors' offices at the departmental level and mayors' offices at the municipal level.

- **Other social organizations**

In addition to the project's partner organizations, there are other social organizations present in the territory, such as the various associations of community action boards that exist in all the municipalities, and numerous associations of cattle ranchers and cocoa and fruit growers that, like the project's partner organizations, originated in alternative development programs, indigenous communities. In the medium term, these organizations could become allies of the project to consolidate productive linkages. Annex 2.1.8_ IDENTIFICACIÓN DE ACTORES PROYECTO REDD.

- **Community participation risks**

Taking into account the context in which the project is developed, some participation risks have been identified with the partner organizations:

1. A low capacity for participation and incidence of the owners/landowners who contribute less forest.
2. Influence of large landowners and absentee landowners in decision-making instances to the detriment of the interests of the majority and the most vulnerable.
3. Concentration of power in traditional leaders due to the lack of new leadership.
4. Corruption and diversion of resources.
5. Stigmatization and targeting of leaders by illegal groups.

In order to guarantee access to information and participation of all members of the partner community, especially small landowners, the project contemplates a governance scheme, a communication strategy and a mechanism to address complaints and claims.

At the beginning of implementation, governance mechanisms will be formalized to ensure the flow of information, social control and the effective participation of all project partners, especially the most vulnerable groups.

In addition, new leadership will be strengthened to promote the rotation of leaders and the oversight committees will be strengthened so that they can effectively exercise social control over the project and monitor compliance with safeguards.

- **Free, prior informed consent**

During the process of consolidating the process, several meetings were held, in order to inform possible partners, about the mechanism REDD+, the contract figure, rights and obligations, which are fully explain on the framework contract and adherence contract. Part of the framework contract demands a general meeting approving the signature.

Regarding other stakeholders, specially the government ones, meetings presenting the program, explaining the reach and goals of it were made. The main risk was always focused on double

accountability or doubling efforts, which will be addressed by continuous up-dates, open channels of communication and the respect for the decision of the landowners.

Special case occurs with the indigenous reservation. Even though invitations to informing meetings were sent through majors, they have not participated on the process. A proper channel of communication and monitoring will be developed in order to acknowledge and sort out any kind of negative impacts of the project upon them.

Supporting documents of this are under Annex 2.5.3 free, prior and informed consent and Annex 2.3.7 stakeholders consultation.

- **Feedback and grievance redress procedure**

ALLCOT has developed a specific procedure for receiving and responding to Questions, Complaints, Claims and Suggestions (PQRS) that seeks to ensure that at all times there is a channel available to resolve concerns, disagreements and complaints from users and stakeholders, seeking to strengthen services, stakeholder satisfaction and continuous improvement, within the framework of the REDD+ Sur del Meta project.

The objective of the procedure is to define the channels, activities and controls necessary to respond in a timely and satisfactory manner to the PQRS that might arise from the project activities (identification, design, validation, registration, implementation and verification).

In the following link you can find the procedure in the Annex 3.2.12_201015_CO_PROCEDIMIENTOPQRS_v1

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Title of the methodology to be used: VCS Methodology for Avoided Unplanned Deforestation (VM0015 v1.1, December 2012).

Tools and Modules applicable to the project:

- Tools
 - a) VCS approved VT0001 Tool for demonstration and assessment of additionality in VCS AFOLU project activities.
 - b) VCS AFOLU non-permanence risk tool: VCS version 3.2.
 - c) Climate, Community and Biodiversity Standards (CCBS) 3rd edition. VM0015 methodology applicability conditions.
- Modules evaluated:
 - a) VMD0001 VMD0001 REDD methodological module: estimation of carbon stocks in the above- and below ground biomass in live tree and non-tree pools (cp-ab), version 1.1:

- b) VMD0007 Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation (BL-UP), version 3.2:

3.2 Applicability of Methodology

The following are the applicability conditions of the VM0015 Methodology, excluding avoided degradation. Next to each condition is the explication applicable to the project:

Tool or Module	Applicability conditions	Compliance
VT0001 Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities, v3.0	<p>AFOLU activities the same or similar to the proposed project activity on the land within the proposed project boundary performed with or without being registered as the VCS AFOLU project shall not lead to violation of any applicable law even if the law is not enforced</p> <p>The use of this tool to determine additionality requires the baseline methodology to provide for a stepwise approach justifying the determination of the most plausible baseline scenario. Project proponent(s) proposing new baseline methodologies shall ensure consistency between the determination of a baseline scenario and the determination of additionality of a project activity.</p>	<p>According to Environmental Determinants by Law 388 of 1997, the regions declared as Environmental determinants must prevail over any other type of use, going against it will be considered illegal. Decree Law 1989 of 1989 creates the Especial Area of Management of Macarena. This area is governed by the Renewable Natural Resources Code and Decree 622 of 1977. There the permitted activities are indicated, such as: conservation, research for conservation, research, education, recreation, culture, recovery and control. This decree includes the forbidden actions on these types of areas, declaring: Article 30: "To develop agricultural or industrial activities, including hotel, mining and oil activities".</p>
VMD0001 Estimation of carbon stocks in the above- and belowground biomass in live tree and non-tree pools (CP-AB), v1.1	<p>This module is applicable to all forest types and age classes. Inclusion of the aboveground tree biomass pool as part of the project boundary is mandatory as per the framework module REDD-MF.</p> <p>Non-tree aboveground biomass must be included as part of the project boundary if the following applicability criteria are met (per framework module REDD-MF):</p> <ul style="list-style-type: none"> Stocks of non-tree aboveground biomass are 	<p>Considering that within the limits of the Project according to the structure of the VM0015 methodology in the PART 2 - METHODOLOGY STEPS FOR EX-ANTE ESTIMATION OF GHG EMISSION REDUCTIONS, STEP 1: DEFINITION OF BOUNDARIES. Section 1.3 Carbon pools, the Carbon Pools Included within the boundary of the proposed AUD project activity are:</p>

Tool or Module	Applicability conditions	Compliance
	<p>greater in the baseline than in the project scenario, and</p> <ul style="list-style-type: none"> Non-tree aboveground biomass is determined to be significant (using the T-SIG module). Belowground (tree and non-tree) biomass are not required for inclusion in the project boundary because omission is conservative. 	<p>- Above-ground Tree Biomass (is mandatory as per the framework module REDD-MF.)</p> <p>- Below-ground Tree Biomass (considered as significant and decided to include as the relation Above-ground biomass - Below ground biomass)</p> <p>Below-ground Tree Biomass is not included, since there are no quantification records on forests within the Project Spatial Boundary for the ex-ante estimation and construction of the baseline, so it is conservatively excluded, skipping in this sense the use of the T-GIS module.</p> <p>Finally, the application of VMD0001 REDD in the project is considered imminent, given that it contemplates all types of forests regardless of their age. And that two stocks are contemplated, aboveground forest biomass and belowground forest biomass.</p>
<p>VMD0007 Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation (BL-UP), v3.3)</p>	<p>The module is applicable for estimating baseline emissions from unplanned deforestation (conversion of Forest land to non-forest land in the baseline case). The following conditions must be met to apply this module. The forest landscape configuration can be mosaic, transition or frontier.</p> <p>The module must be applied to all project activities where the baseline agents of</p>	<p>This module was considered applicable for estimating baseline emissions, firstly because the activities focus on unplanned deforestation. Second, in the baseline activities as indicated by the module in its application conditions, it is identified that the deforestation agents generate transformation of forests for agricultural and livestock purposes, as well as</p>

Tool or Module	Applicability conditions	Compliance
	<p>deforestation: (i) clear the land for settlements, crop production (agriculturalist), ranching or aquaculture, where such clearing for crop production, ranching or aquaculture does not amount to large scale industrial agri/aquaculture activities;(ii) have no documented and Uncontested legal right to deforest the land for these purposes; and (iii) are either resident in the region or immigrants.</p> <p>Where pre-project, unsustainable fuelwood collection is occurring within the project boundaries, Modules BL-DFW and LK-DFW must be used to determine potential leakage.</p>	<p>there is no evidence, nor are there permits registered with the Environmental Authority (CORMACARENA) for the conversion of these forests to agricultural-livestock production areas, and finally, it is identified that the actors causing deforestation are inhabitants of the area in the workshops conducted with the community and registered as participants in the project.</p>

3.3 Project Boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Biomass burning	CO ₂	Excluded	Counted as change in carbon stock.
		CH ₄	Excluded	Potential emissions are insignificant because, although burning woody biomass for cooking purposes is not considered a significant source of emissions, it produces less CH ₄ emissions than if Natural Gas (which is mainly formed by Methane-CH ₄) or other fossil fuels were used for the same activity, therefore its exclusion or omission will not cause an overestimation of the net reductions of anthropogenic GHG emissions. This is in line with VM0015 methodology, section 1.4 "Sources of GHG emissions", Page 29. VMD0013, Version 1.2 Sectoral Scope 14: Procedure. Inclusion of fire in the baseline is always optional.
		N ₂ O	Excluded	Potential emissions are insignificant from burning woody biomass for cooking.

Source		Gas	Included?	Justification/Explanation	
		Other			
	Death Organic matter	CO ₂	Excluded	Potential emissions are not taken into account for the project.	
		CH ₄	Excluded	Potential emissions are not taken into account for the project.	
		N ₂ O	Excluded	Potential emissions are not taken into account for the project.	
		Other			
	Biomass	CO ₂	Excluded	Potential emissions taken into account for the project	
		CH ₄	Excluded	Potential emissions are not taken into account for the project.	
		N ₂ O	Excluded	Potential emissions are not taken into account for the project.	
		Other			
	Livestock emissions	CO ₂	Excluded	According to methodology VM0015, section 1.4 “Sources of GHG emissions”, Table 4. “Sources and GHG included or excluded within the boundary of the proposed AUD project activity” CO ₂ emissions from livestock operations are excluded because they are not a significant source of emissions.	
		CH ₄	Excluded	Excluded as it does not result in a significant overestimation of net anthropogenic GHG emission reductions from the AUD project activity.	
		N ₂ O	Excluded	Excluded as it does not result in a significant overestimation of net anthropogenic GHG emission reductions from the AUD project activity. As well as its measurement or monitoring method, there is no reference in the absence of official information or an officially approved calculation methodology for Colombia.	
			Other		
	Project	Biomass burning	CO ₂	Excluded	Counted as change in carbon stock
CH ₄			Excluded	Potential emissions are insignificant because, although burning woody biomass for cooking	

Source		Gas	Included?	Justification/Explanation
				purposes is not considered a significant source of emissions, it produces less CH4 emissions than if Natural Gas (which is mainly formed by Methane-CH4) or other fossil fuels were used for the same activity, therefore its exclusion or omission will not cause an overestimation of the net reductions of anthropogenic GHG emissions.
		N2O	Excluded	Potential emissions are insignificant from burning woody biomass for cooking
		Other		
	Dead organic matter	CO2	Excluded	Potential emissions are not taken into account for the project
		CH4	Excluded	Potential emissions are not taken into account for the project
		N2O	Excluded	Potential emissions are not taken into account for the project
		Other		
	Biomass	CO2	Excluded	Potential emissions taken into account for the project
CH4		Excluded	Potential emissions are not taken into account for the project	
N2O		Excluded	Potential emissions are not taken into account for the project	
Other				
Livestock emissions	CO2	Excluded	According to methodology VM0015, section 1.4 “Sources of GHG emissions”, Table 4. “Sources and GHG included or excluded within the boundary of the proposed AUD project activity” CO2 emissions from livestock operations are excluded because they are not a significant source of emissions.	
	CH4	Excluded	Excluded as it does not result in a significant overestimation of net anthropogenic GHG emission reductions from the AUD project activity.	
	N2O	Excluded	Excluded as it does not result in a significant overestimation of net anthropogenic GHG emission reductions from the AUD project activity. As well as its measurement or monitoring method, there is no reference in the absence of official information or an officially approved calculation methodology for Colombia.	
	Other			

According to the VM0015 Methodology, in its **PART 2 - METHODOLOGY STEPS FOR EX-ANTE ESTIMATION OF GHG EMISSION REDUCTIONS**, there are nine (9) steps to the calculation of ex ante net anthropogenic GHG emission reductions. Taking into account that the Project description template contemplates a particular structure for the completion of the information, the development of Part 2 of the Methodology will be done in a sectioned way, following the structure of the template. The nine (9) steps to be developed are the following:

- Step 1. Definition of the boundaries of the proposed AUD project activity: spatial boundaries, temporal boundaries, carbon pools and sources of greenhouse gas
- Step 2. Analysis of historical land-use and land-cover change in the reference region going back about 10-15 years from present.
- Step 3. Analysis of agents, drivers and underlying causes of deforestation, and sequencing of the typical chain of events leading to land-use and land-cover change.
- Step 4. Projection of the annual areas and location of deforestation in the reference region in the without project case.
- Step 5. Identification of forest classes in the areas that will be deforested under the baseline scenario and of post-deforestation land-use classes in the project area.
- Step 6. Estimation of baseline carbon stock changes and, where forest fires are included in the baseline assessment, of non-CO2 emissions from biomass burning.
- Step 7. Ex ante estimation of actual carbon stock changes and non-CO2 emissions under the project scenario.
- Step 8. Ex ante estimation of leakage associated to leakage prevention measures and activity displacement.
- Step 9. Ex ante calculation of net anthropogenic GHG emission reductions.

Therefore, following the structure of the CVS template, and according to the steps of the VM0015 Methodology, the definition of the project boundaries will be carried out taking into consideration the *"Step 1. Definition of the boundaries of the proposed AUD project activity: spatial boundaries, temporal boundaries, carbon pools and sources of greenhouse gas"*.

STEP 1 - Definition of the boundaries of the proposed AUD project activity

The purpose of this step is to define the following categories of project boundaries (according to the Methodology VM0015):

Spatial boundaries

The following shows the location of the project and the different actors that are part of the project area, which includes the participation of the municipalities of Puerto Rico, Puerto Lleras, Puerto Concordia, and Vistahermosa in the Department of Meta.

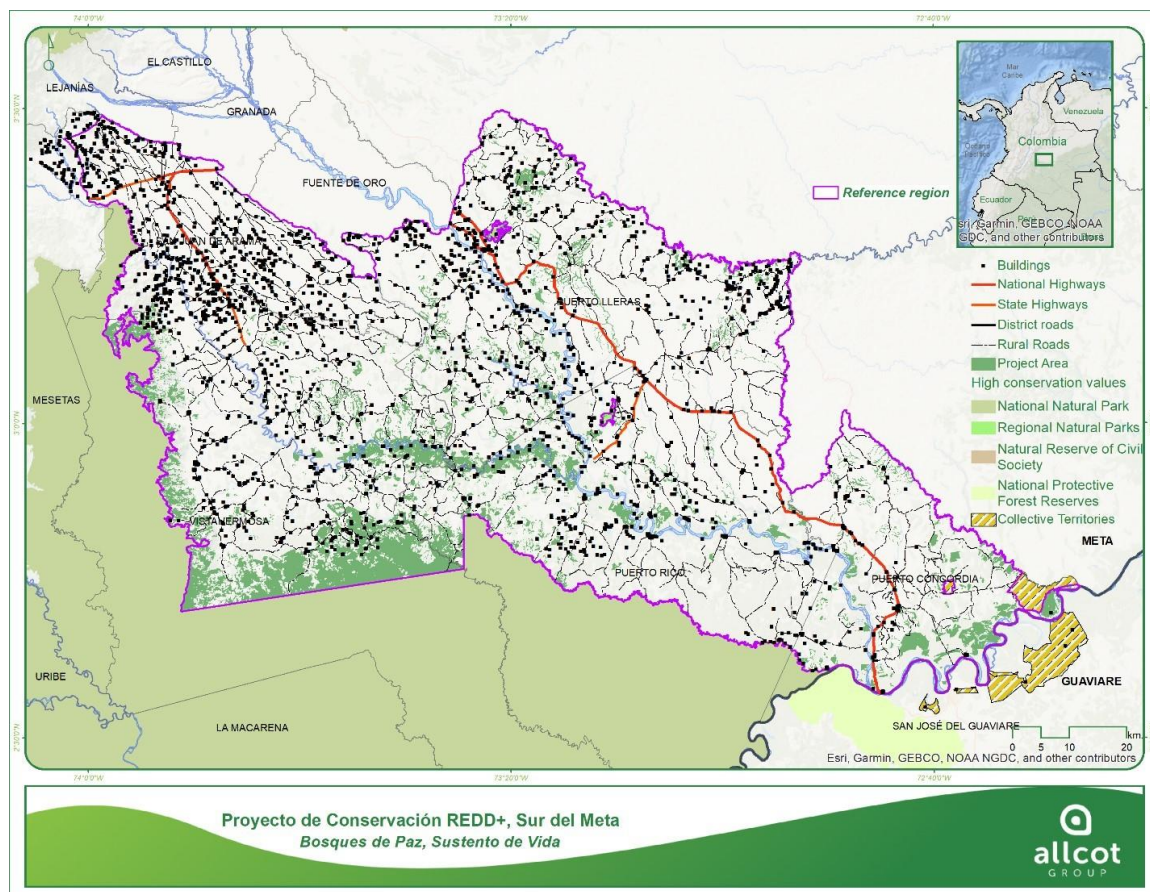


Figure 15. Constructions, roads, reservation areas, indigenous reservations and project area

Source: ALLCOT 2021

For the definition of the boundaries, we followed the categories presented in step 1 of the VM0015 methodology, the definitions presented in the VMD0020 tool as well as its recommendation to describe and justify the criteria used for the definition of boundaries, the appropriate use of spatial information sources for each criterion, verifiable information that complies with the latest version of the VM0015 Methodology for avoided unplanned standards.

- Reference Region:

As indicated in aspect 2.1.5 Physical Parameters (G1.3), spatial variables were mainly taken into account for the generation of the geographic boundary of the project's reference region. The information used for the process is based on spatial geographic information with coverage of the area of interest where the project idea was initially sketched.

For the delimitation of the reference region, the starting point was the municipalities with the greatest potential in the area of interest in the department of Meta, where latent threats were identified on the forested areas and remnants due to logging and burning activities for the conversion to savannahs and clean pastures for the development of high impact extensive cattle ranching activities. And in which it was possible to perceive the community's interest in participating in a REDD+ project. As a result, the municipalities of Puerto Lleras, Puerto Concordia, Puerto Rico, San Juan de Arama and Vistahermosa were selected. Using the boundaries of the DANE political division, a polygon containing the selected municipalities was generated. The socioeconomic characteristics of the reference region

and the characterization of the agents obey what is described in numeral 3.1.4 Baseline Scenario in STEP 2 - Analysis of historical land-use and land-cover change, according to the VM0015 methodology.

On an ongoing basis, areas with any environmental or ethnic regulations that represented some difficulty for the development of project activities or simply did not express interest in participating were taken into consideration. In the case of the indigenous reserves, to the southeast in the municipality of Puerto Concordia, the "La Sal" reserve was subtracted from the polygon initially generated, as they said they were not interested in participating in the project. And towards the south, in the municipalities of Vistahermosa, Puerto Rico, and a very small part of the municipality of Puerto Concordia, the National Natural Park "Sierra de la Macarena" was subtracted, given that currently through the National Natural Parks of Colombia and the Ministry of Environment, entities responsible for administering and providing guidelines for the management of these protected areas, there are no guidelines related to the participation of National Natural Parks in REDD+ projects. For the municipalities of Puerto Lleras and Puerto Rico, two Regional Natural Parks were subtracted, "Laguna de Lomalinda" and "Laguna San Vicente", respectively.

Finally, taking into account the characteristics of the forests present in the area, and consequently, the national references for existing carbon contents, the study conducted by IDEAM, 2010 was identified for the Estimation of current (2010) carbon stocks stored in the aboveground biomass in natural forests in Colombia, which is based on the determination of carbon stocks per hectare for forests by life zones of Holdridge (1965) adapted for Colombia by IDEAM (2005). Thus, in the northwestern part of the polygon, in the municipality of San Juan de Arama, part of the life zones were excluded, to finally have two life zones within the Project Region, humid tropical forest (bh-T) and very humid premontane forest (bmh-PM).

The area of the reference region corresponds to 904,074 hectares. Consistent with the methodology, the reference region compared to the project area is 11.7 times the project area; the magnitude of this ratio leaves the door open to expand the number of project partners, and the area itself, without having to modify the Reference Region to keep a ratio of 2 to 3 times the Reference Region to the Project Area.

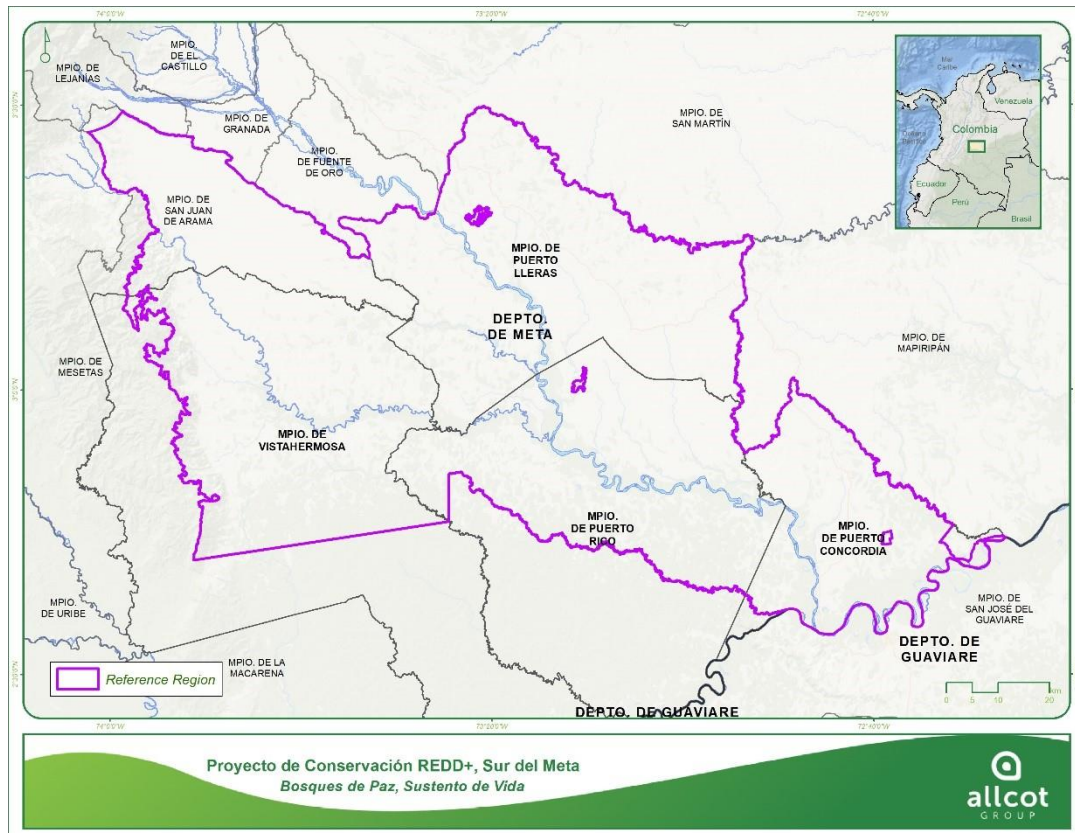


Figure 16. Project boundary – Reference region

Source: ALLCOT, 2021

- **Project Area**

The project area, was defined by two factors the first the presence or absence of forest, and the second and no less important by project partners, who provide areas of their land for project development. The name of each discreet area, as well as coordinates, legal status and agreement signed is included in the Project Data Base Annex. The total hectares for this area are 77,161.8

Likewise, for the definition of the forest as part of the project area, a visit was made to each property of the adherent partners, and using GPS navigators, reference points were taken for the construction of the forest polygons that each partner intended to include in the project. With the information obtained from the reference points in the field, in the office, together with the Forest/Non Forest layer, the delimitation of the forested areas was carried out, in addition to this and according to the official definition of "Forest" of the SMByC, together with Sentinel images, additional polygons were delimited that were excluded from the Forest/Non Forest layer but presented an area equal to or greater than 1 ha, coverage of more than 30% and trees with a height greater than 5 meters.

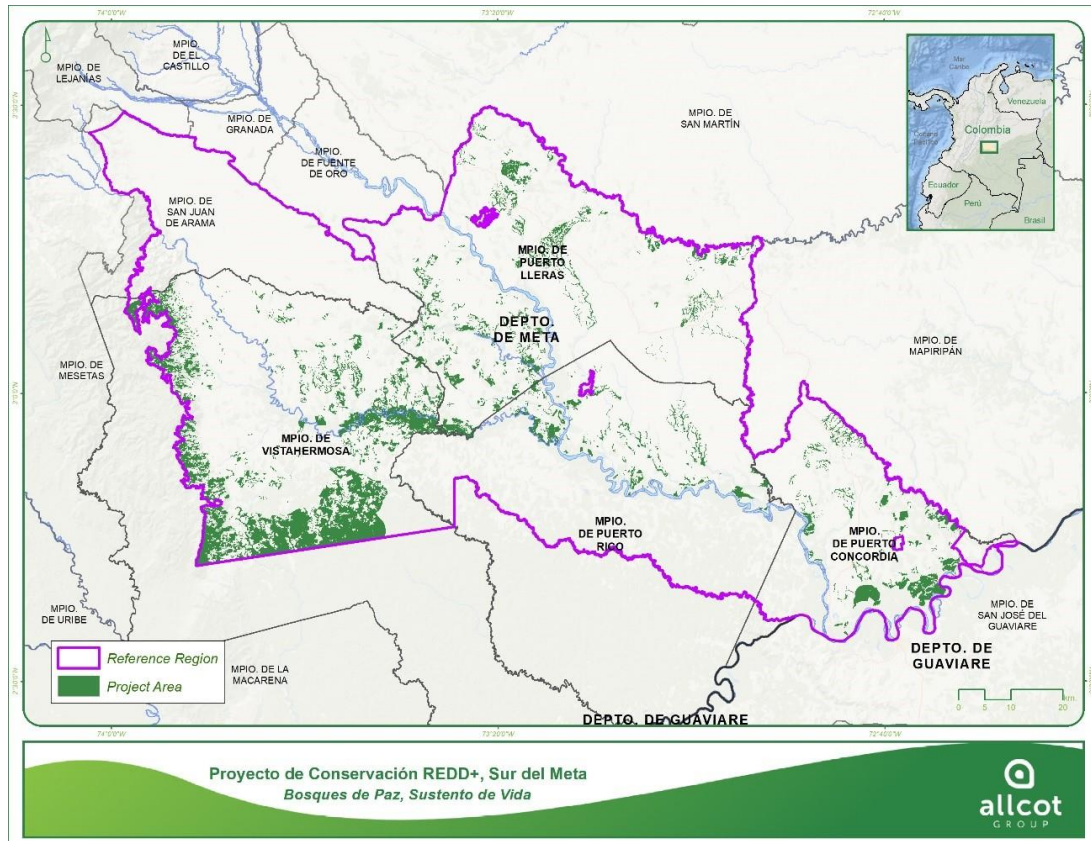


Figure 17. Project boundary – Project area

Source: ALLCOT, 2021

- **Leakage Belt**

The leakage belt is the area of the project, where even with the presence of the project, deforestation could be displaced; The leakage belt was determined using a mobility analysis delimited by the forest areas delimited by the reference region different from those registered by the project partners.

After seeing some of the stakeholders, the reference region, the project area, and the leakage belt of the project are shown below. The total areas for this area is 196,045 hectares. It should be considered that as and when the scope of the project allows, when there is more enrollment of forest areas with new adhering partners, the leakage belt area should be reduced.

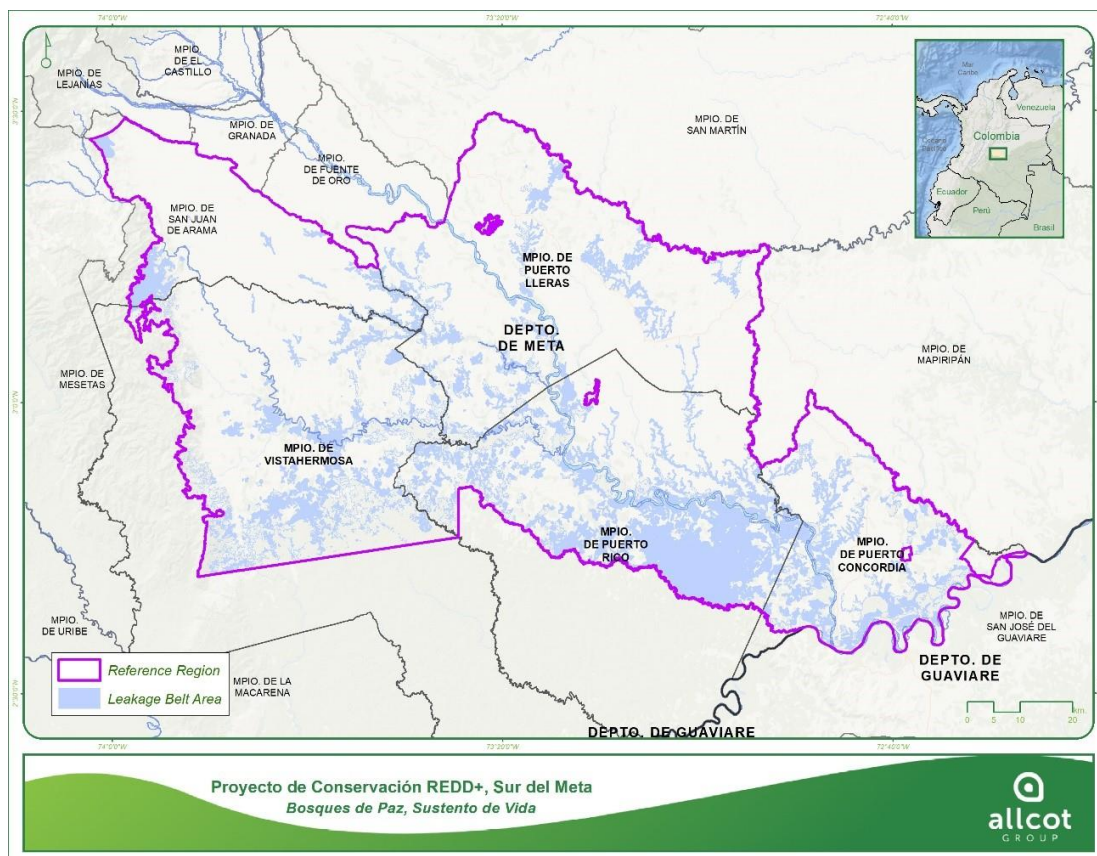


Figure 18. Project boundary – Leakage belt

Source: ALLCOT, 2021

3.4 Baseline Scenario

- **STEP 2 - Analysis of historical land-use and land-cover change**

Following the guidelines of the VM0015 methodology, prior to the identification of baseline scenarios, the identification of current land use and land cover conditions and the analysis of LU/LC change during the historical reference period within the reference region and the project area are performed. For this purpose, the methodology contemplates as a second step (STEP 2: ANALYSIS OF HISTORICAL LAND-USE AND LAND-COVER CHANGE) after the definition of the project boundaries, a historical analysis of land use and land cover change.

The development of the Step 2: Analysis of Historical Land-Use and Land-Cover Change according to the VM0015 methodology includes the following sub-steps:

- a) Collection of appropriate data sources;
- b) Definition of land use and land cover classes;
- c) Definition of land use and land cover change categories;
- d) Analysis of historical land use and land cover changes; and

e) Evaluation of map accuracy

In continuity with the above, the following is the development of the methodological sub-steps for the historical analysis of land use and land cover change:

With the sub-steps established, each of these sub-steps is developed below for the construction of the project baseline through the analysis of historical land use and land cover change.

a) Compilation of appropriate data sources

Landsat 7 and 8 data were searched and downloaded through Earth Explorer. The downloaded images have a spatial resolution of 30 meters and a temporal resolution of 16 days. At the same time, we consulted satellite image mosaics from Google Earth Engine for Sentinel-1 and Sentinel-2 satellites, with variable spatial resolution of 10 to 20 meters. The downloaded inputs, understanding that Landsat images are the main elements for the interpretation and generation of land cover maps, and Google Earth Engine images are only a secondary support element, are presented in detail below.

Table 6. Images used to generate land cover

Vector (Satellite or airplane)	Sensor	Resolution		Coverage	Acquisition date	Scene or point identifier	
		Spatial	Espectral	(Km²)	(DD/MM/AAAA)	Path/Latitude	Row/Longitude
Landsat 7	ETM	30	11	3,576.61	01/23/2010	7	58
Landsat 7	ETM	30	11	3,576.61	02/08/2010	7	58
Landsat 7	ETM	30	11	453.05	01/23/2010	8	58
Landsat 8	OLI	30	11	333,536.41	31/03/2014	7	58
Landsat 8	OLI	30	11	82,754.29	26/06/2014	8	58
Landsat 8	OLI	30	11	357,798.92	22/02/2018	7	58
Landsat 8	OLI	30	11	206,611.25	17/03/2018	8	58
Landsat 8	OLI	30	11	279,650.98	23/12/2018	8	58
Landsat 8	OLI	30	11	486,262.24	30/12/2018	8	58

Source: ALLCOT 2021

b) Definition of land use and land cover classes

The land use and land cover classes identified in the reference region at the project start date correspond to the level two classes of the CORINE Land Cover Legend for Colombia:

Table 7. List of all land use and land cover classes existing at the project start date within the reference region

Class Identifier		Trend in Carbon stock ¹⁵	Presence in ¹⁶	Baseline activity ¹⁷			Description (including criteria for unambiguous boundary definition)
ID _{cl}	Name			LG	FW	CP	
1	Urban fabric	Constant	RR	N	N	N	Urbanized areas include the territories covered by urban infrastructure and all those green spaces and communication networks associated with them, which make up an urban fabric.
2	Permanent Crops	increasing	RR	N	N	N	Includes land dedicated to crops whose vegetative cycle is longer than one year, producing several harvests without the need for replanting; this category includes herbaceous crops such as sugar cane, sugarcane, banana and plantain; bush crops such as coffee and cocoa; and tree crops such as African palm and fruit trees.
3	Pastures	increasing	RR	N	N	N	This cover includes land occupied by clean pastures with a percentage of cover greater than 70%; management practices (clearing, liming and/or fertilization, etc.) and the level of technology used prevent the presence or development of other covers.
4	Transient Crops	increasing	RR	N	N	N	It includes areas occupied by crops with a vegetative cycle of less than one year, or even only a few months, such as cereals, tubers, oilseeds, most vegetables and some species of open-air flowers.

¹⁵ Note if “decreasing”, “constant”, “increasing”

¹⁶ RR = Reference region, LK = Leakage belt, LM = Leakage management Areas, PA = Project area

¹⁷ LG = Logging, FW = Fuel-wood collection; CP = Charcoal Production (yes/no)

Class Identifier		Trend in Carbon stock ¹⁵	Presence in ¹⁶	Baseline activity ¹⁷			Description (including criteria for unambiguous boundary definition)
ID _{cl}	Name			LG	FW	CP	
5	Heterogeneous agricultural áreas	increasing	RR	N	N	N	These are units that bring together two or more agricultural and natural cover classes, arranged in an intricate pattern of geometric mosaics that make it difficult to separate them into individual covers; the geometric arrangements are related to the small size of the properties, the local soil conditions, the management practices used and the local forms of land tenure.
6	Forest	decreasing	RR	Y	Y	N	Land occupied mainly by trees that may contain shrubs, palms, guaduas, grasses and lianas, with a minimum canopy density of 30%, a minimum in situ canopy height of 5 meters at the time of identification and a minimum area of 5 meters.
7	Scrub and/or herbaceous associations	decreasing	RR	N	N	N	It comprises a group of natural vegetation covers and product of natural succession, whose growth habit is shrubby and herbaceous, developed on different substrates and altitudinal levels, with little or no anthropic intervention.
8	Open spaces with little or no vegetation	Constant	RR	N	N	N	Includes those territories in which there is little or no vegetation cover, composed mainly of bare and burned soils, as well as sandy cover and rocky outcrops.
9	Inland wetlands	Constant	RR	N	N	N	Wetlands refer to the different types of flood zones, swamps and waterlogged lands where the water table is temporarily or permanently at ground level..

Class Identifier		Trend in Carbon stock ¹⁵	Presence in ¹⁶	Baseline activity ¹⁷			Description (including criteria for unambiguous boundary definition)
<i>ID_{cl}</i>	Name			LG	FW	CP	
10	Inland Waters	Constant	RR	N	N	N	Permanent, intermittent and seasonal bodies of water that include lakes, ponds, marshes, natural or artificial freshwater (non-saline) reservoirs and ponds, reservoirs and moving bodies of water, such as rivers and canals.

Source: ALLCOT 2021

c) Definition of land use and land cover change categories

According to the VM0015 methodology, all categories of LU/LC change that could occur within the project area and the leakage belt during the project crediting period were identified, both in the baseline and in the project case. The first approximation, is made with the Potential Land Use and Land Cover Change Matrix.

Table 8. Potential land use and land cover change matrix

<i>ID_{cl}</i>			Initial LU/LC class									
			I1	I2	I3	I4	I5	I6	I7	I8	I9	I10
			Urban fabric	Permanent Crops	Pastures	Transient Crops	Heterogeneous agricultural areas	Forest	Scrub and/or herbaceous associations	Open spaces with little or no vegetation	Inland wetlands	Inland Waters
Final LU/LC classes	F1	Urban fabric	I1/F1	I2/F1	I3/F1	I4/F1	I5/F1	I6/F1	I7/F1	I8/F1	I9/F1	I10/F1
	F2	Permanent Crops	I1/F2	I2/F2	I3/F2	I4/F2	I5/F2	I6/F2	I7/F2	I8/F2	I9/F2	I10/F2
	F3	Pastures	I1/F3	I2/F3	I3/F3	I4/F3	I5/F3	I6/F3	I7/F3	I8/F3	I9/F3	I10/F3
	F4	Transient Crops	I1/F4	I2/F4	I3/F4	I4/F4	I5/F4	I6/F4	I7/F4	I8/F4	I9/F4	I10/F4
	F5	Heterogeneous agricultural areas	I1/F5	I2/F5	I3/F5	I4/F5	I5/F5	I6/F5	I7/F5	I8/F5	I9/F5	I10/F5

<i>ID_{cl}</i>			<i>Initial LU/LC class</i>									
			<i>I1</i>	<i>I2</i>	<i>I3</i>	<i>I4</i>	<i>I5</i>	<i>I6</i>	<i>I7</i>	<i>I8</i>	<i>I9</i>	<i>I10</i>
			<i>Urban fabric</i>	<i>Permanent Crops</i>	<i>Pastures</i>	<i>Transient Crops</i>	<i>Heterogeneous agricultural areas</i>	<i>Forest</i>	<i>Scrub and/or herbaceous associations</i>	<i>Open spaces with little or no vegetation</i>	<i>Inland wetlands</i>	<i>Inland Waters</i>
	F6	Forest	<i>I1/F6</i>	<i>I2/F6</i>	<i>I3/F6</i>	<i>I4/F6</i>	<i>I5/F6</i>	<i>I6/F6</i>	<i>I7/F6</i>	<i>I8/F6</i>	<i>I9/F6</i>	<i>I10/F6</i>
	F7	Scrub and/or herbaceous associations	<i>I1/F7</i>	<i>I2/F7</i>	<i>I3/F7</i>	<i>I4/F7</i>	<i>I5/F7</i>	<i>I6/F7</i>	<i>I7/F7</i>	<i>I8/F7</i>	<i>I9/F7</i>	<i>I10/F7</i>
	F8	Open spaces with little or no vegetation	<i>I1/F8</i>	<i>I2/F8</i>	<i>I3/F8</i>	<i>I4/F8</i>	<i>I5/F8</i>	<i>I6/F8</i>	<i>I7/F8</i>	<i>I8/F8</i>	<i>I9/F8</i>	<i>I10/F8</i>
	F9	Inland wetlands	<i>I1/F9</i>	<i>I2/F9</i>	<i>I3/F9</i>	<i>I4/F9</i>	<i>I5/F9</i>	<i>I6/F9</i>	<i>I7/F9</i>	<i>I8/F9</i>	<i>I9/F9</i>	<i>I10/F9</i>
	F10	Inland waters	<i>I1/F10</i>	<i>I2/F10</i>	<i>I3/F10</i>	<i>I4/F10</i>	<i>I5/F10</i>	<i>I6/F10</i>	<i>I7/F10</i>	<i>I8/F10</i>	<i>I9/F10</i>	<i>I10/F10</i>

Source: ALLCOT 2021

It is possible to identify some potential changes that may not exist in the future because, due to the logic of the cover, it is not feasible to generate a change from one specific cover to another. For example, it is not very likely or feasible for an urban cover to become a forest or pastureland.

This is followed by a list of land use and land cover change categories. It conceptually presents the possible transitions and/or changes that the forest has historically had to other land covers, and which may occur in the future in a baseline scenario without a project.

Table 9. List of land use and land cover change categories

<i>ID_{ct}</i>	Name	Trend in Carbon stock	Presence in	Activity in the baseline case			Trend in Carbon stock	Presence in	Activity in the project case		
				L G	F W	C P			L G	F W	C P
I6/F1	Forest /Urban fabric	decreasing	RR	Y	Y	N	decreasing	RR	Y	Y	N

I6/F2	Forest /Permanent Crops	decreasing	RR	Y	Y	N	decreasing	RR	Y	Y	N
I6/F3	Forest /Pastures	decreasing	RR	Y	Y	N	decreasing	RR	Y	Y	N
I6/F4	Forest /Transient Crops	decreasing	RR	Y	Y	N	decreasing	RR	Y	Y	N
I6/F5	Forest /Heterogeneous agricultural areas	decreasing	RR	Y	Y	N	decreasing	RR	Y	Y	N
I6/F6	Forest /Forest	constant	RR	Y	Y	N	constant	RR	Y	Y	N
I6/F7	Forest /Scrub and/or herbaceous associations	decreasing	RR	Y	Y	N	decreasing	RR	Y	Y	N
I6/F8	Forest /Open spaces with little or no vegetation	decreasing	RR	Y	Y	N	decreasing	RR	Y	Y	N
I6/F9	Forest /Inland wetlands	decreasing	RR	N	N	N	decreasing	RR	N	N	N
I6/F10	Forest /Inland Waters	decreasing	RR	N	N	N	decreasing	RR	N	N	N

Source: ALLCOT, 2021

d) Analysis of historical land use and land cover changes

With the inputs obtained from the compilation of appropriate data sources, the land cover interpretation process was carried out.

The forest for the year 2010, the forest area corresponded to 36.4%, with 329,805 ha, for the reference region for the project, while for the year 2018, corresponds to areas with forest to 31.04% of the total area of the reference region.

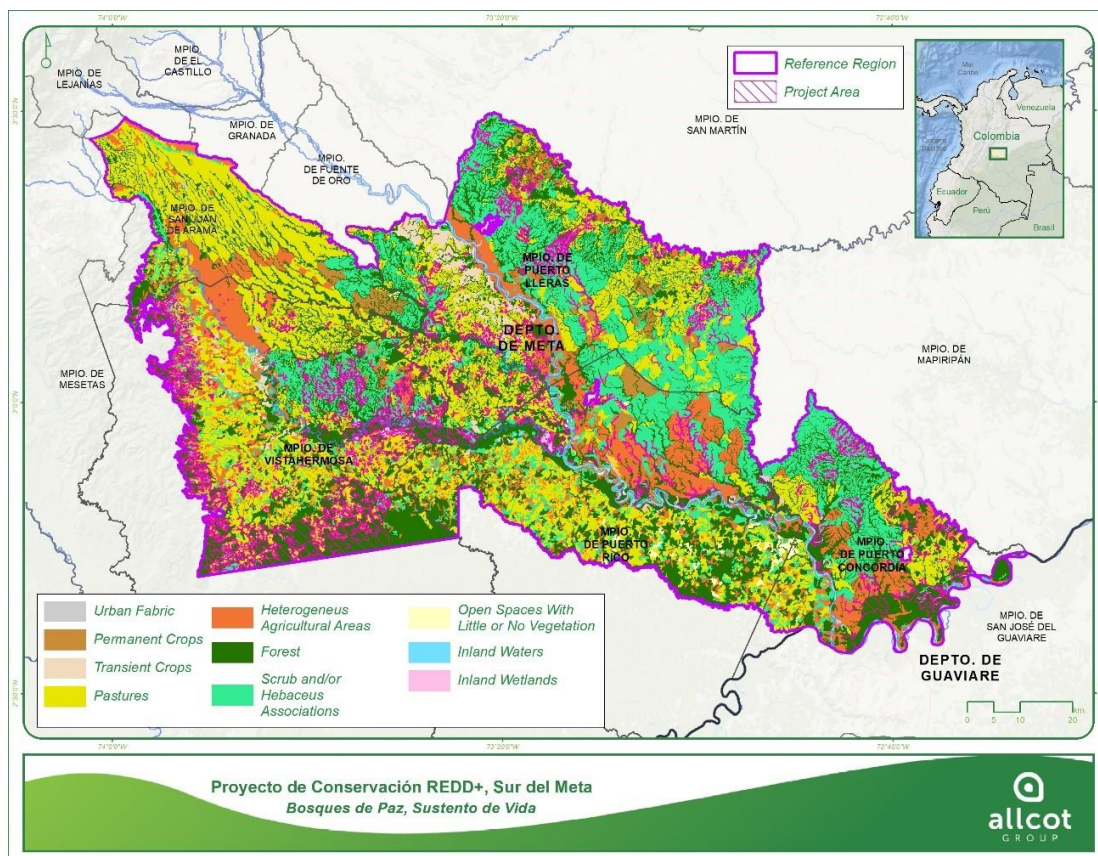


Figure 19. Land cover map, CORINE Land Cover 2018

Source: ALLCOT, 2021

Table 10. Historic land cover classes for the Reference Region

CODE	CORINE Land Cover Classes	Year 2010	Year 2014	Year 2018
		AREA hectares	AREA hectares	AREA hectares
11	Urban fabric	498	579	611
21	Transient Crops	10,527	20,203	12,471
22	Permanent Crops	2,568	5,108	13,899
23	Pastures	241,054	253,816	259,641
24	Heterogeneous agricultural areas	114,998	121,873	127,662
31	Forest	329,805	295,712	280,65
32	Scrub and/or herbaceous associations	186,258	187,407	189,984
33	Open spaces with little or no vegetation	3,303	902	6,332
41	Inland wetlands	2,904	2,75	2,904
51	Inland Waters	12,16	15,724	9,92

Source: ALLCOT 2021

From the forest cover maps, the deforestation process between the three periods analyzed is evident. Between the years 2010 to 2014, 34,093 hectares were lost while for the period 2014

Figure 20. Deforestation map 2010-2018

Source: ALLCOT, 2021

With the information from the LU/LC maps, deforestation maps of the Reference Region were generated for the three periods analyzed. With this information, the areas of change were determined, and the changes that have been generated from forest cover to other types of cover within the reference period were identified. The following is presented for the 2010-2018 period, based on the fact that the area corresponding to forest in 2010 was 329,805 ha, and for 2018 it is 280,650 ha, with the understanding that the difference between the forest area of these two periods provides information on the net loss of forest, i.e., it accounts for both forest loss and the accounting of new forest areas, which over time and according to the characteristics of the cover are interpreted on the map as forest.

Table 11. Change forest to other cover matrix 2010 - 2018 reference region

CLC Classes Year 2010	Área ha
Transient Crops	853
Permanent Crops	93

CLC Classes Year 2010	Área ha
Pastures	18,436
Heterogeneous agricultural areas	17,296
Scrub and/or herbaceous associations	721
Open spaces with little or no vegetation	15,958
Inland wetlands	122
Inland Waters	423
TOTAL	53,902

Source: ALLCOT, 2021

Of the 53,902 ha of forest transformed between 2010 and 2018. If we take into consideration the areas that by 2018 were interpreted as forests, their surface corresponds to 4,747 ha; whose difference allows us to determine the net loss of forest, of 49,155 ha, value expressed above.

Taking into account the existence of information from the Forest and Carbon Monitoring System - SMBYC of the IDEAM corresponding to Forest/Non Forest and which is of an official nature with geographic coverage for all of Colombia. And, understanding the cover dynamics analyzed above, it was considered prudent to use this information for the analysis of forest cover variability because the Forest/Non Forest layer is generated from a semi-mapped classification process of Landsat and Sentinel images with a pixel size of 30 meters and from the year 2012 has an annual temporality, This will allow the project to construct a broad analysis of forest changes for the years 2005, 2010, and from 2012 to 2018 (annually) within the historical baseline for the Reference Region (Table 12).

Table 12. Forest/Non Forest baseline for the Reference Region. 2005-2018

Year	Area in Forest (ha)	Area in Non Forest (ha)	Area in No Information (ha)
2005	326,111	577,194	769
2010	306,394	591,571	6,109
2012	298,260	594,019	11,795
2013	289,462	614,250	361
2014	287,591	616,298	184
2015	284,543	619,026	505
2016	281,319	622,747	8
2017	273,854	630,212	8
2018	264,468	639,268	338

Source: Allcot 2021

To take into consideration, from this moment and onwards, taking into account the classification of life zones of Holdridge for Colombia, and according to the definition of forest of IDEAM, 2012, there are two types of forests for the Reference Region, the humid tropical and the very humid pre monatané. It should be noted that the estimation of carbon content in Colombia takes into account a stratification of forests by Holdridge life zones, and will be the reference for the calculations of carbon content for the Reference Region of this project.

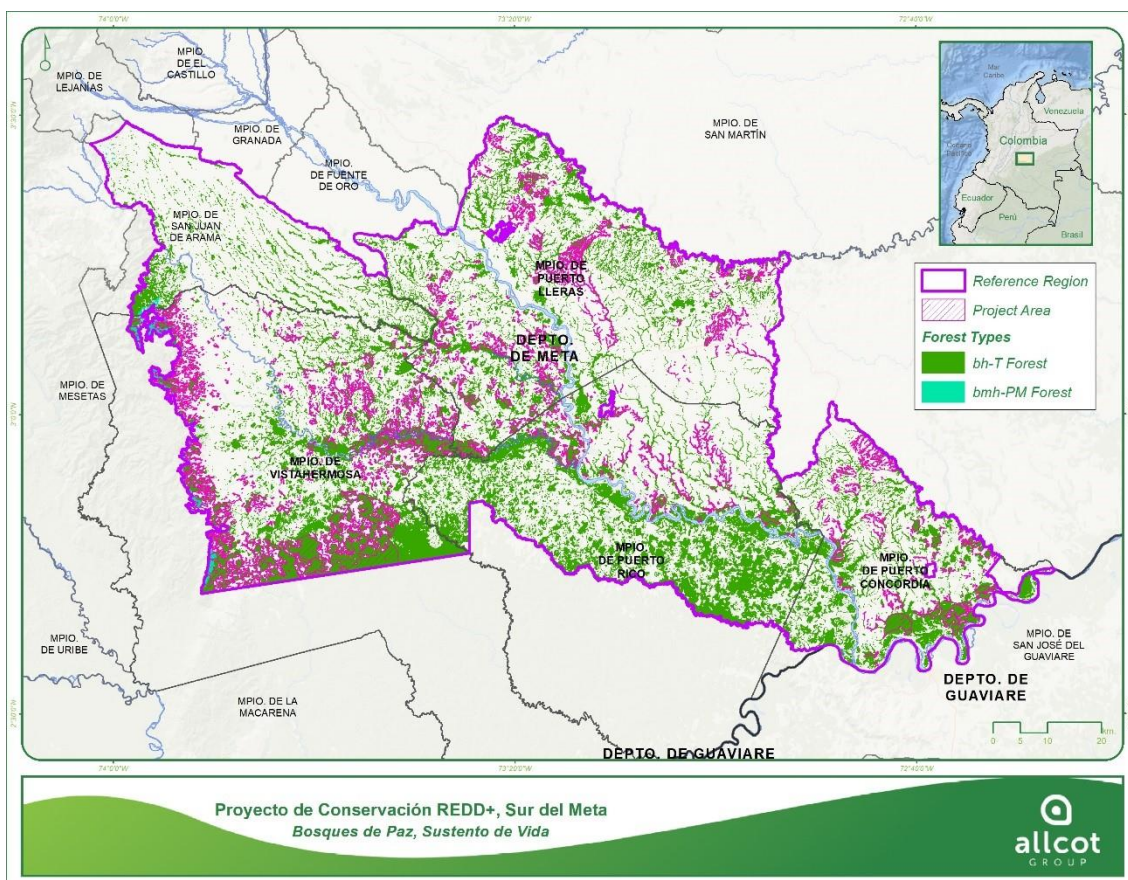


Figure 21. Map of forest by Holdridge Life Zonas 2018

Source: ALLCOT, 2021

In consideration of the forest types according to the Holdridge life zones for the reference region, the results for the years 2005, 2010 and 2012 to 2018 are presented in the Table 13.

Table 13. Forest/Non Forest baseline for the Reference Region by Forest type. 2005-2018

Year	Forest Type	Area in Forest (ha)	Area in Non Forest (ha)	Area in No Information (ha)
2005	bh-T	321,036	574,974	587
	bmh-PM	5,075	2,220	183
2010	bh-T	302,160	589,291	5,145
	bmh-PM	4,233	2,281	964
2012	bh-T	294,072	591,870	10,654
	bmh-PM	4,188	2,149	1,141
2013	bh-T	284,628	611,644	324
	bmh-PM	4,834	2,606	38
2014	bh-T	282,724	613,688	184
	bmh-PM	4,868	2,610	0

Year	Forest Type	Area in Forest (ha)	Area in Non Forest (ha)	Area in No Information (ha)
2015	bh-T	279,764	616,396	436
	bmh-PM	4,780	2,630	69
2016	bh-T	276,490	620,105	1
	bmh-PM	4,829	2,642	7
2017	bh-T	269,079	627,516	1
	bmh-PM	4,775	2,696	7
2018	bh-T	259,727	636,533	335
	bmh-PM	4,741	2,735	2

Source: Allcot 2021

e) Map accuracy assessment

As a method for validating the thematic accuracy of the land cover layers for the three analysis periods, a preliminary statistical analysis of concordance was proposed using the n X n dimension confusion matrix method, in which the agreements and disagreements between the interpreted information and the reference information are counted; where the main diagonal of the matrix will indicate the existing agreements between the interpreted land cover and the reference information. For this, it is recommended to use ArcGIS tools to optimize the process, random points were created to study the accuracy of the classification, with which a confusion matrix was created to evaluate the correspondence between the classification and the validation points.

The following is the result of the confusion matrix, obtained for this project, as a result of the process described above. As a result of the land cover and land use analysis, satellite inputs and reference information were used for three periods: 2010, 2014 and 2018. For the years 2010, 2014 and 2018, the coverage layers made by SINCHI covering 80% of the reference region were used as a base and the missing area was completed with visual interpretation. Annexed is the validation support of the 2018 layer through the confusion matrix, which yielded an overall accuracy of 95%. The base layer taken for the whole process is the 2018 layer. Each of these layers has the coverage and use attributes defined for this project.

Table 14. Result of the confusion matrix for the Project, changes from forest to other land cover

ID	ClassValue	C_11	C_21	C_22	C_23	C_24	C_31	C_32	C_33	C_41	C_51	Total	U_Accuracy	Kappa
1	C_11	1215	0	3	72	176	14	18	0	0	2	1500	0.81	0
2	C_21	0	349	0	432	401	71	233	8	3	3	1500	0.23	0
3	C_22	0	0	1242	68	67	105	17	0	0	1	1500	0.83	0
4	C_23	0	7	14	1205	101	80	82	10	1	0	1500	0.80	0
5	C_24	0	29	166	301	832	71	89	5	5	2	1500	0.55	0
6	C_31	0	1	10	54	70	1260	85	2	16	2	1500	0.84	0

ID	ClassValue	C_11	C_21	C_22	C_23	C_24	C_31	C_32	C_33	C_41	C_51	Total	U_Accuracy	Kappa
7	C_32	0	4	25	343	96	147	831	33	18	3	1500	0.55	0
8	C_33	0	0	0	27	52	11	40	1128	0	242	1500	0.75	0
9	C_41	0	0	0	0	103	93	315	0	903	86	1500	0.60	0
10	C_51	2	2	3	20	71	108	12	81	22	1179	1500	0.79	0
11	Total	1217	392	1463	2522	1969	1960	1722	1267	968	1520	15000	0.00	0
12	P_Accuracy	0.998	0.890	0.849	0.478	0.423	0.643	0.483	0.890	0.933	0.776	0.000	0.68	0
13	Kappa	0	0	0	0	0	0	0	0	0	0	0	0.00	0.640

Source: ALLCOT 2021

STEP 3 - Analysis of agents, drivers and underlying causes of deforestation and its probable future development

In continuity with the development of the methodology, the next step consists of STEP 3: ANALYSIS OF AGENTS, DRIVERS AND UNDERLYING CAUSES OF DEFORESTATION AND ITS PROBABLE FUTURE DEVELOPMENT. This analysis is carried out through the following five sub-stages:

- Identification of agents of deforestation;
- Identification of deforestation drivers;
- Identification of underlying causes;
- Analysis of chain of events leading to deforestation; and
- Conclusion

Therefore, the development of step 3 of the methodology is presented below, addressing each of the sub-steps it contemplates.

- Identification of agents of deforestation:

For each main agent

Aspect	Description
Name of the main agent group or agent	
Brief description of the main social, economic, cultural and other relevant features of each main agent group	
Brief assessment of the most likely development of the population size of the identified main agent groups in the reference region, project area and leakage belt	

Statistics on historical deforestation attributable to each main agent group in the reference region, project area and leakage belt	
---	--

b) Identification of deforestation drivers:

For each identified agent group, analyze factors that drive their land-use decisions. The goal is to identify the immediate causes of deforestation.

Two sets of driver variables have to be distinguished:

- c) Driver variables explaining the quantity (hectares) of deforestation (to be used in step 4.1 and 4.3, as appropriate), such as:

- Prices of agricultural products;

23 See Angelsen and Kaimowitz (1999) and Chomiz et al. (2006) for comprehensive analysis of deforestation agents and drivers.

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- Costs of agricultural inputs;
 - Population density;
 - Rural wages;
 - Etc.
- d) Driver variables explaining the location of deforestation, also called “predisposing factors” (de Jong, 2007) (to be used in step 4.2), such as:
- Access to forests (such as vicinity to existing roads, railroads, navigable rivers and coastal lines);
 - Slope;
 - Proximity to markets;
 - Proximity to existing or industrial facilities (e.g. sawmills, pulp and paper mills, agricultural products processing facilities, etc.);
 - Proximity to forest edges;
 - Proximity to existing settlements;
 - Spatial variables indicating availability within the forest of land with good ecological conditions to expand agricultural activities, such as soil fertility and rainfall;
 - Management category of the land (e.g. national park, indigenous reserve, etc.);
 - Etc.

For each of these two sets of variables:

- 1) List the 1 to 5 key driver variables and provide any relevant source of information that provides evidence that the identified variables have been a driver for deforestation during the historical reference period.
- 2) Briefly describe for each main agent group identified in step 3.1 how the key driver variables have and will most likely impact on each agent group’s decision to deforest.
- 3) For each identified key driver variable provide information about its likely future development²⁴, by providing any relevant source of information.

4) For each identified driver variable briefly describe the project measures that will be implemented to address them³³, if applicable.

e) Identification of underlying causes

The agents' characteristics and decisions are themselves determined by broader forces, the underlying causes of deforestation, such as:

- Land-use policies and their enforcement;
- Population pressure;
- Poverty and wealth;
- War and other types of conflicts;
- Property regime;
- Etc.

1) List the 1 to 5 key underlying causes and cite any relevant source of information that provides evidence that the identified variables have been an underlying cause for deforestation during the historical reference period.

2) Briefly describe how each key underlying cause has determined and will most likely determine the key drivers identified in step 3.2 and the decisions of the main agent groups identified in step 3.1.

3) For each identified key underlying cause provide information about its likely future development, by citing any relevant source of information.

4) For each identified underlying cause describe the project measures that will be implemented to address them, if applicable.

f) Analysis of chain of events leading to deforestation

Based on the historical evidence collected, analyze the relations between main agent groups, key drivers and underlying causes and explain the sequence of events that typically has lead and most likely will lead to deforestation. Consult local experts, literature and other sources of information, as necessary. Briefly summarize the results of this analysis in the PD.

g) Conclusion

The analysis of step 3 must conclude with a statement about whether the available evidence about the most likely future deforestation trend within the reference region and project area is:

☐ Inconclusive or

☐ Conclusive.

“Conclusive” evidence in this methodology means that the hypothesized relationships between agent groups, driver variables, underlying causes and historical levels of deforestation can be verified at hand of statistical tests, literature studies, or other verifiable sources of information,

such as documented information provided by local experts, communities, deforestation agents and other groups with good knowledge about the project area and the reference region.

To arrive at an overall “conclusive” conclusion when multiple agents and drivers are present, the evidence obtained for each of them must lead to a “conclusive” decision for all.

When the evidence is conclusive, state whether the weight of the available evidence suggests that the overall trend in future baseline deforestation rates will be:

- Decreasing;
- About constant;
- Increasing.

Then proceed to step 4.

When the evidence is inconclusive and the historical deforestation trend has been decreasing or about constant, additional analysis must be carried out under step 3, such as more literature reviews, expert consultations, and, as the case may be, additional field surveys, until conclusive evidence on the most likely future deforestation trend is found, otherwise it will not be possible to continue with the next steps of the methodology. If the historical deforestation trend has been increasing and the evidence is inconclusive, the deforestation rate to be used in the projections will be the average historical rate see:

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step 4.1.1). Alternatively, additional analysis could be carried out under step 3 until finding conclusive evidence.

Where different strata have been considered in the analysis, a conclusion and statement of trend is needed for each stratum. For a conservative baseline projection, the project proponent shall consider that in all the scenarios the agents and drivers of the deforestation activities are realistic and conservative, based on published and reliable data, and consistent with existing concrete actions and enforced laws avoiding deforestation, such as effective surveillance and law enforcement.

STEP 4 - Projection of future deforestation

Taking into account the criteria established by the methodology for the projection of future deforestation in sub-step 4. 1 Projection of the quantity of future deforestation; if a jurisdiction (national or subnational government) has adopted a reference deforestation rate registered in the VCS or UNFCCC (and endorsed by the VCS) that is applicable to the reference region, project area and leakage belt in accordance with the most recent VCS JNR requirements, the adopted rate should be used and no further analysis is required in this sub-step. Since the described condition is not applicable for the development of the present project, for the selection of the baseline approach (4.1.1) the Modeling approach is used. With this approach, the rate of baseline deforestation will be estimated using a model that expresses deforestation as a function of driver

variables selected by the project proponents. Considering that the Reference Region proposed for the project is not stratified and is continuous, it is determined that according to the methodology it is not appropriate to fill out table 8 of section 4.1 Projection of the quantity of future deforestation. And once the proposed steps have been completed, the results of future deforestation will be presented according to the methodology in tables 9.

Taking into account the proposed approach. The Quantitative and spatial projection of future deforestation was determined using Terrset's Land Change Modeler.

Land change prediction in Terrset's Land Change Modeler module is an empirical process that proceeds step by step from 1) Change Analysis, to 2) Transition Potential Modeler (deforestation risk maps), to 3) change prediction, in this case, deforestation projection.

The development of the risk map with the Terrset software starts by calculating the potential of the terrain for change, which in the end will show us how much forest can be lost in a defined time from defined factor maps.

The following is a list Table 15. of the factor maps generated (28) for the modeling process. The table presented is in accordance with the methodology in section 4.2.2 Preparation of deforestation risk maps (Table 15).

Table 15. List of factors analyzed in the Sur del Meta project

Factors Map		Source	Represented variable		Meaning of the categories or pixel heat		Other maps and variables used to create the factor map		Algorithms or equation used	Comments
ID	File name		Unit	Description	Rank	Meaning	ID	File name		
1	Dist_Forest2010	The study	meters	Distance of forests in 2010 with respect to the rest of the reference region	0 – 3048	Area in which each pixel is represented in the reference region in relation to the closest distance to a forest pixel present in 2010	1	Forest_2010	Distance (IDRISI)	In most of the reference region the pixels have short distances to the forests
2	Dist_Forest2014	The study	Meters	Distance of forests in 2010 with respect to the rest of the reference region	0 – 3825	Area in which each pixel is represented in the reference region in relation to the closest distance to a forest pixel present in the year 2021	2	Forest_2014	Distance (IDRISI)	It is especially observed areas in the west of the reference region where the distance to the forests has increased

Factors Map		Source	Represented variable		Meaning of the categories or pixel heat		Other maps and variables used to create the factor map		Algorithm or equation used	Comments
ID	File name		Unit	Description	Rank	Meaning	ID	File name		
										over 3 kilometers
3	Dist_Pasture2010	The study	Meters	Distance of forests in 2010 with respect to the rest of the reference region	0 – 14313	Surface that presents the value of each pixel in relation to the distance to the nearest grass pixel	3	Pasture_2010	Distance (IDRISI)	It is observed that the greatest distances to pastures are found in the Puerto Concordia sector
4	Dist_Vias	IGAC	Meters	Distance of the road network with respect to the rest of the reference region	0 – 12151	Distance in meters to the tracks	4	Tracks	Rasterización de capas Distance (IDRISI)	Covers a study area larger than the reference region but the cut is made to it. Source maps taken from the official cartography of the IGAC.
5	Dist_Asentamientos	IGAC	Meters	Distance to the most representative settlements in the reference region	0 – 50990	Distance in meters to urban areas	5	Township	Layer rasterization Distance (IDRISI)	Covers a study area larger than the reference area. Source map taken from IGAC and urban areas from DANE Geostatistical Framework.
6	Dist_Agro2014	The study	Meters	Distance to the areas occupied by agricultural territories in 2014	0 – 15673	Distance in meters to areas where there are permanent agricultural crops, transitory or heterogeneous	6	Agro2014	Layer rasterization Distance (IDRISI)	It is observed that this variable has lower values in the southern sector of the reference region

Factors Map		Source	Represented variable		Meaning of the categories or pixel heat		Other maps and variables used to create the factor map		Algorithms or equation used	Comments
ID	File name		Unit	Description	Rank	Meaning	ID	File name		
						agricultural areas				
7	Dist_Houses	The study	Meters	Distance to the constructions present in the basic cartography	0 – 14077	Distance in meters to buildings	7	Natural National Parks	Layer rasterization Distance (IDRISI)	Covers a study area larger than the reference area and the cut is made to it.

Source: ALLCOT, 2021

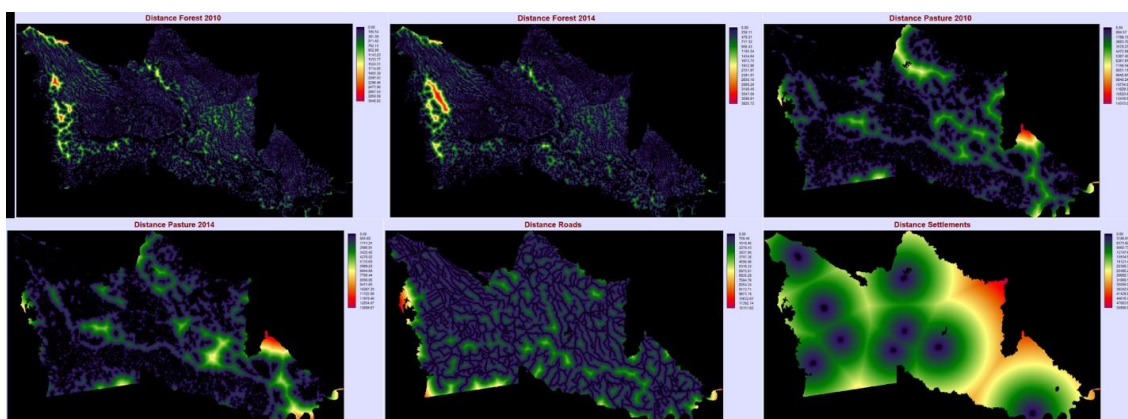


Figure 22. Variables used in modeling

- Selecting the most accurate deforestation risk map

According to the development, the significance test was performed for each of the explanatory variables of the deforestation process. Table 24 shows above the 7 variables evaluated with their respective weights for the training period, the significance of each of the variables resulting from an exploratory analysis of the variables in this case Cramer's V (Table 16), in order to find in an easier way the best statistical arrangement for the modeling, identifying the correlated variables and explaining better the reality in the modeling process.

Table 16. Variables involved in modeling

ID	Variable	Significance
1	Distance to forest in 2010	0.39
2	Distance to forest in 2014	0.39
3	Distance to pastures in 2010	0.18
4	Distance to the tracks	0.15

ID	Variable	Significance
5	Distance to settlements	0.07
6	Distance to agricultural territories	0.11
7	Distance Constructions	0.12

Source: ALLCOT, 2021

Dist_Agro2014

...

Cover Class :	Cramer's V :	P Value :
Overall V	0.1172	0.0000
Sin informacion	0.2026	0.0000
No bosque	0.2026	0.0000
Bosque	0.0000	1.0000

Dist_Asentamiento

...

Cover Class :	Cramer's V :	P Value :
Overall V	0.0725	0.0000
Sin informacion	0.1231	0.0000
No bosque	0.1230	0.0000
Bosque	0.0000	1.0000

Dist_Pasture2010

...

Cover Class :	Cramer's V :	P Value :
Overall V	0.1813	0.0000
Sin informacion	0.3137	0.0000
No bosque	0.3136	0.0000
Bosque	0.0000	1.0000

Distance_Pastos_2014

...

Cover Class :	Cramer's V :	P Value :
Overall V	0.0758	0.0000
Sin informacion	0.1306	0.0000
No bosque	0.1305	0.0000
Bosque	0.0000	1.0000

Dist_Forest2010

...

Cover Class :	Cramer's V :	P Value :
Overall V	0.3958	0.0000
Sin informacion	0.6855	0.0000
No bosque	0.6854	0.0000
Bosque	0.0000	1.0000

Dist_Forest2014

...

Cover Class :	Cramer's V :	P Value :
Overall V	0.3913	0.0000
Sin informacion	0.6778	0.0000
No bosque	0.6776	0.0000
Bosque	0.0000	1.0000

Distance_Vias

...

Cover Class :	Cramer's V :	P Value :
Overall V	0.1526	0.0000
Sin informacion	0.2640	0.0000
No bosque	0.2639	0.0000
Bosque	0.0000	1.0000

Figure 23. Results of the Cramer's V Test for the variables analyzed for modeling

ID	Variable	Significance
1	Distance to forest in 2010	0.39
2	Distance to forest in 2014	0.39
3	Distance to pastures in 2010	0.18

4	Distance to the tracks	0.15
5	Distance to settlements	0.07
6	Distance to agricultural territories	0.11
7	Distance Constructions	0.12

Source: ALLCOT, 2021

The combination of variables that shows better performance are the following:

- Distance to Forest in 2010
- Distance to Forest in 2014
- Distance to Pastures in 2010
- Distance to Roads

With these variables, the transition model was generated to generate the change matrix (Figure 30) with which to make deforestation projections.

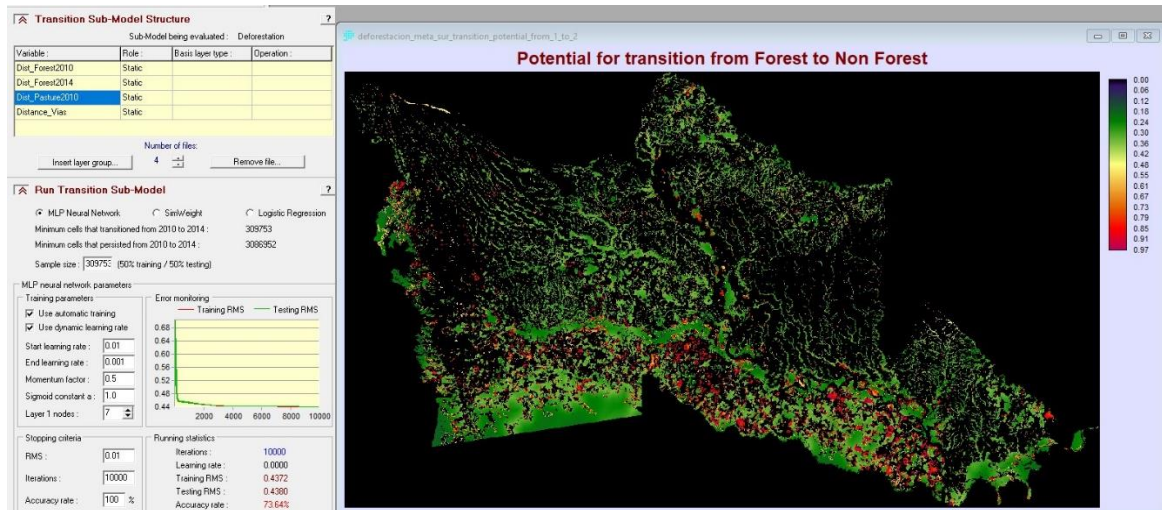


Figure 24. Results of the MLP Model used for the projection of deforestation

Source: Allcot 2021

Transition Probabilities Grid			
Given :	Probability of changing to :		
	Bosque	No bosque	Sin informaci
Bosque	0.4648	0.5349	0.0003
No bosque	0.0695	0.9305	0.0000
Sin informacion	0.2282	0.7717	0.0001

Figure 25. Deforestation transition matrix

Source: Allcot 2021

The spatial model was developed with the MPL algorithm (neural networks) where the transition potential (risk map) was determined through neighborhood relationships between deforested areas and their correlation with the established factor maps. As a result, a "hard" projection was obtained that contains the specific prediction of those pixels that will present the conversion from forest to non-forest. The latter took into account a markov matrix, generated from the deforestation between the two analyzed periods 2014 - 2018. The spatial model developed had the following parameters (Table 17).

Table 17. Modeling parameters

ITEM	Parameter
Training period	Forest Non Forest Layers 2010-2014
Validation period	Forest layer not Forest 2018
Transition	Forest to No Forest.
Software	TerrSET (LCM)
Variables	Continuous
Type of variables	Static
Location model	MLP
Minimun cells that transitioned from 2010 to 2014	309753
Minimun cells that persisted from 2010 to 2014	3085952
Simple size per class	309753
Quantity model	Markov chains
Final year prediction	2048
Quality Model	Sensitivity analysis (TerrSET)

Source: Allcot 2021

The model was run several times (10000) making changes between the factor maps in order to ensure the best calibration results (RMS), and on the other hand, confirming the model using the 2018 layer. The values obtained according with the best combinations made was **73.3%**:

Validation is the process of evaluating how closely the model replicates deforestation patterns, countering a simulated Non-forest Forest scenario with a real one (Hagen, 2002; Memarian et al., 2014; Pontius, 2000; Pontius & Spencer, 2005). In this exercise, the model was also validated with the forest-Non forest map for 2018 made by IDEAM and is shown in the figure below.

Table 18. Results of the validation of the model

Category	Hectares	Legend
0	1,781,178	
1	21,627	1 2 1 - False Alarms
2	1,335	2 2 1 - Misses
3	151	3 3 1 - Misses

Category	Hectares	Legend
4	19,949	1 1 2 - Misses
5	4,441	1 2 2 - Hits
6	26	3 3 2 - Misses
7	165	1 1 3 - Misses
8	79	1 2 3 - False Alarms
9	93	2 2 3 - Misses

Source: Allcot 2021

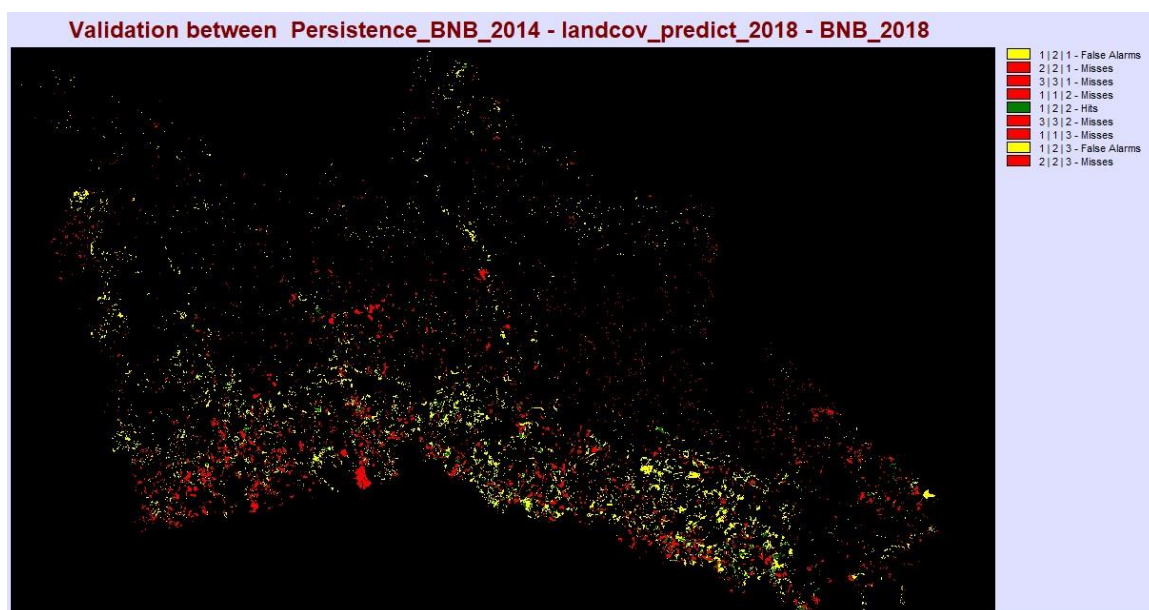


Figure 26. Model validation

Source: Allcot 2021

To complete the analysis, the non-forest area of each model was validated for the year of validation 2018. For this year, according to the SMByC layer.

As a result, we have a transition or risk map that indicates the percentage of change or the ease of a forest pixel to change to a non-forest pixel. The following figure shows the red zones that have the highest risk of change over time, which are located mainly in the area near the main streams, road axes and non-forest zones.

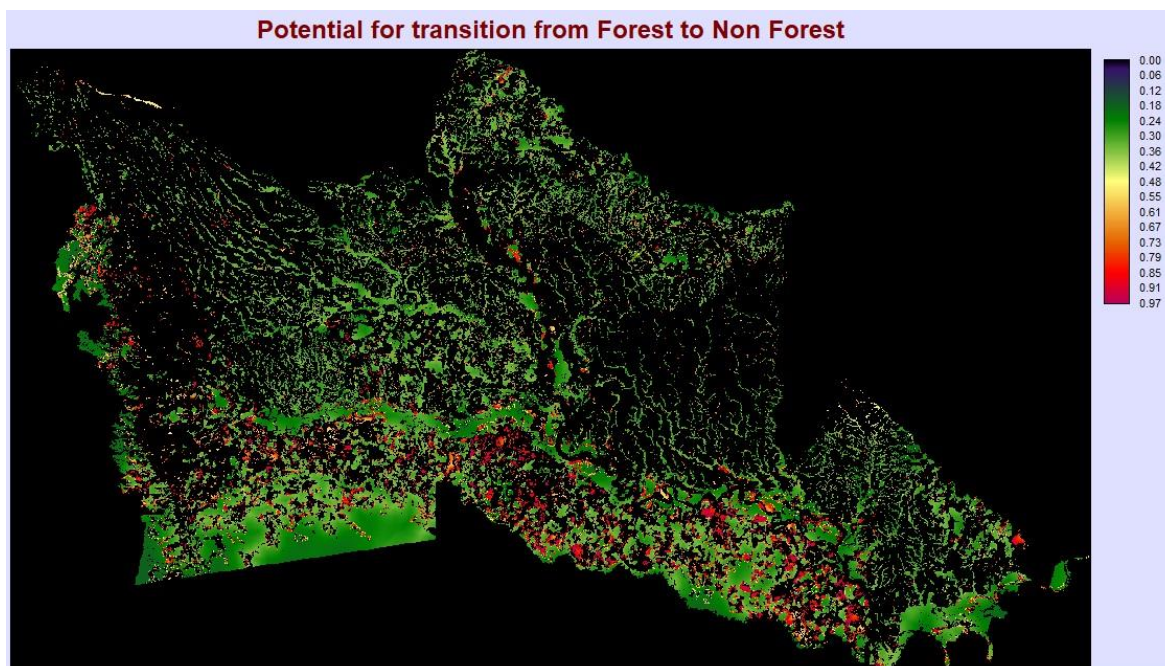


Figure 27. Deforestation risk 2010-2014 model

Source: Allcot 2021

As established in the methodology for step 4, the results information for future deforestation is presented following the structure in Table 9 for the reference region (9a), project area (9b) and leakage belt (9c). The information is presented in the Table 19.

Table 19. Projected deforestation for the Reference Region. Years 2018-2030 (9a)

Project year t	Stratum <i>i</i> in the reference region	Total	
	1	annual	cumulative
	<i>ABSLRR Forest (ha)</i>	<i>ABSLRR_t (ha)</i>	<i>ABSLRR (ha)</i>
2018	6,037	6,037	6,037
2019	6,290	6,290	12,327
2020	5,976	5,976	18,303
2021	5,757	5,757	24,060
2022	5,621	5,621	29,681
2023	5,631	5,631	35,311
2024	5,282	5,282	40,593
2025	5,159	5,159	45,753
2026	5,038	5,038	50,791
2027	5,049	5,049	55,840

Project year t	Stratum i in the reference region	Total	
	1	annual	cumulative
	<i>ABSLRR Forest (ha)</i>	<i>ABSLRR_t (ha)</i>	<i>ABSLRR (ha)</i>
2028	4,738	4,738	60,578
2029	4,627	4,627	65,205
2030	4,506	4,506	69,711
2031	4,539	4,539	74,250
2032	4,247	4,247	78,497
2033	4,149	4,149	82,646
2034	4,051	4,051	86,697
2035	4,059	4,059	90,756
2036	3,808	3,808	94,563
2037	3,721	3,721	98,285
2038	3,630	3,630	101,915
2039	3,640	3,640	105,555
2040	3,413	3,413	108,968
2041	3,337	3,337	112,305
2042	3,256	3,256	115,561
2043	3,263	3,263	118,824
2044	3,061	3,061	121,885
2045	2,990	2,990	124,875
2046	2,921	2,921	127,795
2047	2,924	2,924	130,720
2048	2,749	2,749	133,469

Source: Allcot 2021

Table 20. Projected deforestation for the Project Area. Years 2018-2030 (9b)

Project year t	Stratum i in the reference region	Total	
	1	annual	cumulative
	<i>ABSLRR Forest (ha)</i>	<i>ABSLRR_t (ha)</i>	<i>ABSLRR (ha)</i>
2018	928	928	928
2019	978	978	1,906
2020	938	938	2,844
2021	817	817	3,661
2022	909	909	4,570
2023	956	956	5,526

Project year t	Stratum i in the reference region	Total	
	1	annual	cumulative
	ABSLRR Forest (ha)	ABSLRR _t (ha)	ABSLRR (ha)
2024	1,010	1,010	6,536
2025	1,006	1,006	7,542
2026	783	783	8,325
2027	771	771	9,096
2028	731	731	9,827
2029	722	722	10,549
2030	724	724	11,274
2031	749	749	12,023
2032	717	717	12,740
2033	707	707	13,447
2034	705	705	14,152
2035	722	722	14,874
2036	673	673	15,547
2037	690	690	16,238
2038	710	710	16,948
2039	709	709	17,657
2040	663	663	18,320
2041	660	660	18,979
2042	659	659	19,638
2043	684	684	20,322
2044	673	673	20,994
2045	662	662	21,656
2046	650	650	22,306
2047	658	658	22,964
2048	621	621	23,585

Source: ALLCOT, 2021

Table 21. Projected deforestation for the Leakage Belt. Years 2018-2030 (9c)

Project year t	Stratum i in the reference region	Total	
	1	annual	cumulative
	ABSLRR Forest (ha)	ABSLRR _t (ha)	ABSLRR (ha)
2018	2,392	2,392	2,392
2019	2,733	2,733	5,126
2020	2,540	2,540	7,666
2021	2,096	2,096	9,761
2022	2,045	2,045	11,807

Project year t	Stratum i in the reference region	Total	
	1	annual	cumulative
	ABSLRR Forest (ha)	ABSLRR _t (ha)	ABSLRR (ha)
2023	2,241	2,241	14,048
2024	2,383	2,383	16,431
2025	1,818	1,818	18,249
2026	1,897	1,897	20,146
2027	1,903	1,903	22,049
2028	1,842	1,842	23,892
2029	1,815	1,815	25,706
2030	1,789	1,789	27,495
2031	1,820	1,820	29,316
2032	1,703	1,703	31,019
2033	1,648	1,648	32,666
2034	1,639	1,639	34,305
2035	1,643	1,643	35,948
2036	1,562	1,562	37,510
2037	1,510	1,510	39,021
2038	1,506	1,506	40,526
2039	1,516	1,516	42,042
2040	1,416	1,416	43,458
2041	1,379	1,379	44,837
2042	1,333	1,333	46,169
2043	1,314	1,314	47,483
2044	1,209	1,209	48,692
2045	1,183	1,183	49,875
2046	1,151	1,151	51,026
2047	1,175	1,175	52,201
2048	1,108	1,108	53,309

Source: ALLCOT, 2021

STEP 5 - Definition of the land-use and land-cover change component of the baseline

In consideration of what is indicated by VM0015 methodology in step 5 for the Calculation of baseline activity data per forest class, it should be taken into account that as indicated in step 2 the LU/LC maps of the years 2010-2014-2018 are of reference for the generation and understanding of the dynamics of change in the reference region, and having so many classes obeying the Corine Land Cover Law for Colombia its use for the modeling of future deforestation areas constitutes a high difficulty to achieve a model with adequate accuracy. Therefore, in section 3.1.4 Baseline Scenario - STEP 2 - Analysis of historical land-use and land-cover change it is indicated that the IDEAM Forest/Non Forest information will be used, and as indicated in

step 4 this same information was used to produce the annual reference deforestation maps for each future year.

Therefore, using for each forest class the polygons that would be deforested each year in the absence of the AUD project activity, the number of hectares of each forest class that would be deforested in the future was generated. The results of this analysis are presented as indicated in the methodology following the structure of table 11 in tables Table 22., Table 23., y Table 24. for the Reference Region (11a), Project Area (11b) and Leakage (11c).

Table 22. Area deforested per forest class icl within the reference region. Years 2018-2048 (11a)

Area deforested per forest class icl within the reference region			Total baseline deforestation in the reference region	
ID _{icl}	Deforested bh-T	Deforested bmh-PM	ABSLRRt annual	ABSLRR Cumulative
Name	Tropical humid forest	Very humid Premontane forest		
Project year t	ha	ha	ha	ha
2018	5.938	99	6.037	6.037
2019	6.174	116	6.290	12.327
2020	5.751	226	5.976	18.303
2021	5.663	94	5.757	24.060
2022	5.554	66	5.621	29.681
2023	5.552	79	5.631	35.311
2024	5.140	142	5.282	40.593
2025	5.066	93	5.159	45.753
2026	5.019	19	5.038	50.791
2027	5.032	17	5.049	55.840
2028	4.728	10	4.738	60.578
2029	4.620	7	4.627	65.205
2030	4.496	10	4.506	69.711
2031	4.527	12	4.539	74.250
2032	4.236	11	4.247	78.497
2033	4.140	9	4.149	82.646
2034	4.040	10	4.051	86.697
2035	4.047	12	4.059	90.756
2036	3.798	10	3.808	94.563
2037	3.713	8	3.721	98.285
2038	3.619	11	3.630	101.915
2039	3.631	9	3.640	105.555
2040	3.407	6	3.413	108.968
2041	3.333	3	3.337	112.305
2042	3.252	3	3.256	115.561

Area deforested per forest class icl within the reference region			Total baseline deforestation in the reference region	
ID _{icl}	Deforested bh-T	Deforested bmh-PM		
Name	Tropical humid forest	Very humid Premontane forest	ABSLRRt annual	ABSLRR Cumulative
Project year t	ha	ha	ha	ha
2043	3.259	4	3.263	118.824
2044	3.057	4	3.061	121.885
2045	2.985	4	2.990	124.875
2046	2.916	4	2.921	127.795
2047	2.920	4	2.924	130.720
2048	2.746	4	2.749	133.469

Source: ALLCOT, 2021

Table 23. Area deforested per forest class icl within the project area. Years 2018-2048 (11b)

Area deforested per forest class icl within the project area			Total baseline deforestation in the reference region	
ID _{icl}	Deforested bh-T	Deforested bmh-PM		
Name	Tropical humid forest	Very humid Premontane forest	ABSLRRt annual	ABSLRR Cumulative
Project year t	ha	ha	ha	ha
2018	867	61	928	928
2019	908	70	978	1.906
2020	817	121	938	2.844
2021	758	60	817	3.661
2022	867	41	909	4.570
2023	897	59	956	5.526
2024	908	103	1.010	6.536
2025	935	71	1.006	7.542
2026	778	5	783	8.325
2027	765	6	771	9.096
2028	728	3	731	9.827
2029	718	4	722	10.549
2030	719	5	724	11.274
2031	742	6	749	12.023
2032	710	7	717	12.740
2033	701	6	707	13.447
2034	700	6	705	14.152
2035	716	6	722	14.874
2036	669	5	673	15.547

Area deforested per forest class icl within the project area			Total baseline deforestation in the reference region	
Idicl	Deforested bh-T	Deforested bmh-PM		
Name	Tropical humid forest	Very humid Premontane forest	ABSLRRt annual	ABSLRR Cumulative
Project year t	ha	ha	ha	ha
2037	686	4	690	16.238
2038	705	5	710	16.948
2039	704	5	709	17.657
2040	658	5	663	18.320
2041	656	3	660	18.979
2042	656	3	659	19.638
2043	679	4	684	20.322
2044	669	4	673	20.994
2045	658	4	662	21.656
2046	646	4	650	22.306
2047	654	4	658	22.964
2048	617	4	621	23.585

Source: ALLCOT, 2021

Table 24. Area deforested per forest class icl within the leakage belt area. Years 2018-2048 (11c)

Area deforested per forest class icl within the leakage belt area			Total baseline deforestation in the reference region	
Idicl	Deforested bh-T	Deforested bmh-PM		
Name	Tropical humid forest	Very humid Premontane forest	ABSLRRt annual	ABSLRR Cumulative
Project year t	ha	ha	ha	ha
2018	2.366	27	2.392	2.392
2019	2.715	19	2.733	5.126
2020	2.487	53	2.540	7.666
2021	2.063	33	2.096	9.761
2022	2.023	23	2.045	11.807
2023	2.224	17	2.241	14.048
2024	2.349	34	2.383	16.431
2025	1.796	21	1.818	18.249
2026	1.883	14	1.897	20.146
2027	1.892	11	1.903	22.049
2028	1.836	7	1.842	23.892
2029	1.812	3	1.815	25.706
2030	1.784	5	1.789	27.495
2031	1.815	5	1.820	29.316

Area deforested per forest class icl within the leakage belt area			Total baseline deforestation in the reference region	
Idicl	Deforested bh-T	Deforested bmh-PM		
Name	Tropical humid forest	Very humid Premontane forest	ABSLRRt annual	ABSLRR Cumulative
Project year t	ha	ha	ha	ha
2032	1.699	4	1.703	31.019
2033	1.645	2	1.648	32.666
2034	1.634	4	1.639	34.305
2035	1.637	6	1.643	35.948
2036	1.557	5	1.562	37.510
2037	1.506	4	1.510	39.021
2038	1.501	5	1.506	40.526
2039	1.512	3	1.516	42.042
2040	1.415	1	1.416	43.458
2041	1.379	0	1.379	44.837
2042	1.333	0	1.333	46.169
2043	1.314	0	1.314	47.483
2044	1.209	0	1.209	48.692
2045	1.182	0	1.183	49.875
2046	1.151	0	1.151	51.026
2047	1.175	0	1.175	52.201
2048	1.108	0	1.108	53.309

Source: ALLCOT, 2021

In sub-step 5. 2 Calculation of baseline activity data per post-deforestation forest class taking into account that the information used for the modeling of historical deforestation and/or forest loss in the baseline is the same used for the modeling of future deforestation and corresponds to the Forest/Non Forest information, the classes that compose these layers on an annual basis have only three classes "Forest" (according to the definition of Forest for Colombia), "No Forest" (all areas that are not within the definition of Forest) and No Information (being cloud areas or capture errors of the satellite images used for the semi-automated interpretation). Therefore, Table 12 of the methodology does not apply, and additionally, it should be noted that the method used corresponds to Method 2: Modeling and therefore the classes resulting from the analysis only consider as "deforestation" the change from forest to non-forest areas. Thus, tables 13 are filled out as indicated in the methodology, as shown below. For Reference Region (13a), Project Area (13b) and Leakage belt area (13c)

Table 25. Area established after deforestation per zone within the reference region. Years 2018-2048 (13a)

Area established after deforestation per zone within the reference region			Total baseline deforestation in the reference region	
IDz	Deforested bh-T	Deforested bmh-PM		
Name	Tropical humid forest	Very humid Premontane forest	ABSLRRt annual	ABSLRR Cumulative
Project year t	ha	ha	ha	ha
2018	5.938	99	6.037	6.037
2019	6.174	116	6.290	12.327
2020	5.751	226	5.976	18.303
2021	5.663	94	5.757	24.060
2022	5.554	66	5.621	29.681
2023	5.552	79	5.631	35.311
2024	5.140	142	5.282	40.593
2025	5.066	93	5.159	45.753
2026	5.019	19	5.038	50.791
2027	5.032	17	5.049	55.840
2028	4.728	10	4.738	60.578
2029	4.620	7	4.627	65.205
2030	4.496	10	4.506	69.711
2031	4.527	12	4.539	74.250
2032	4.236	11	4.247	78.497
2033	4.140	9	4.149	82.646
2034	4.040	10	4.051	86.697
2035	4.047	12	4.059	90.756
2036	3.798	10	3.808	94.563
2037	3.713	8	3.721	98.285
2038	3.619	11	3.630	101.915
2039	3.631	9	3.640	105.555
2040	3.407	6	3.413	108.968
2041	3.333	3	3.337	112.305
2042	3.252	3	3.256	115.561
2043	3.259	4	3.263	118.824
2044	3.057	4	3.061	121.885
2045	2.985	4	2.990	124.875
2046	2.916	4	2.921	127.795
2047	2.920	4	2.924	130.720
2048	2.746	4	2.749	133.469

Source: ALLCOT, 2021

Table 26. Area established after deforestation per zone within the project area. Years 2018-2048
(13b)

Area established after deforestation per zone within the project area			Total baseline deforestation in the project area	
Idicl	Deforested bh-T	Deforested bmh-PM		
Name	Tropical humid forest	Very humid Premontane forest	ABSLRRt annual	ABSLRR Cumulative
Project year t	ha	ha	ha	ha
2018	867	61	928	928
2019	908	70	978	1.906
2020	817	121	938	2.844
2021	758	60	817	3.661
2022	867	41	909	4.570
2023	897	59	956	5.526
2024	908	103	1.010	6.536
2025	935	71	1.006	7.542
2026	778	5	783	8.325
2027	765	6	771	9.096
2028	728	3	731	9.827
2029	718	4	722	10.549
2030	719	5	724	11.274
2031	742	6	749	12.023
2032	710	7	717	12.740
2033	701	6	707	13.447
2034	700	6	705	14.152
2035	716	6	722	14.874
2036	669	5	673	15.547
2037	686	4	690	16.238
2038	705	5	710	16.948
2039	704	5	709	17.657
2040	658	5	663	18.320
2041	656	3	660	18.979
2042	656	3	659	19.638
2043	679	4	684	20.322
2044	669	4	673	20.994
2045	658	4	662	21.656
2046	646	4	650	22.306
2047	654	4	658	22.964

ALLCOT, Allcot 2021

Table 27. Area established after deforestation per zone within the leakage belt area. Years 2018-2048 (13c)

Area deforested per forest class icl within the leakage belt area			Total baseline deforestation in the reference region	
Idicl	Deforested bh-T	Deforested bmh-PM	ABSLRRt annual	ABSLRR Cumulative
Name	Tropical humid forest	Very humid Premontane forest		
Project year t	ha	ha	ha	ha
2018	2.366	27	2.392	2.392
2019	2.715	19	2.733	5.126
2020	2.487	53	2.540	7.666
2021	2.063	33	2.096	9.761
2022	2.023	23	2.045	11.807
2023	2.224	17	2.241	14.048
2024	2.349	34	2.383	16.431
2025	1.796	21	1.818	18.249
2026	1.883	14	1.897	20.146
2027	1.892	11	1.903	22.049
2028	1.836	7	1.842	23.892
2029	1.812	3	1.815	25.706
2030	1.784	5	1.789	27.495
2031	1.815	5	1.820	29.316
2032	1.699	4	1.703	31.019
2033	1.645	2	1.648	32.666
2034	1.634	4	1.639	34.305
2035	1.637	6	1.643	35.948
2036	1.557	5	1.562	37.510
2037	1.506	4	1.510	39.021
2038	1.501	5	1.506	40.526
2039	1.512	3	1.516	42.042
2040	1.415	1	1.416	43.458
2041	1.379	0	1.379	44.837
2042	1.333	0	1.333	46.169
2043	1.314	0	1.314	47.483
2044	1.209	0	1.209	48.692
2045	1.182	0	1.183	49.875
2046	1.151	0	1.151	51.026
2047	1.175	0	1.175	52.201
2048	1.108	0	1.108	53.309

Source: ALLCOT, 2021

Consistent with VM0015 methodology, in step 5, in sub-step 5.3 Calculation of baseline activity data per LU/LC change category, taking into account that the Calculation of baseline activity data per post-deforestation forest class corresponds to Method 2: Modeling. The objective of this sub-step is to identify the LU/LC change categories (ct) and the level of activity data for each of these

categories. However, as indicated above, the possible post-deforestation classes correspond only to those that change from forest to non-forest, i.e. to the so-called "deforestation", therefore, following this premise, tables 14 are filled out for the reference region (14a), project area (14b) and leakage belt area (14c).

Table 28. Activity data per LU/LC category ct within the reference region. Years 2018-2048 (14a)

Activity data per LU/LC category ct within the reference region					Total baseline deforestation in the reference region	
ID _{ct}	1	2	...	l _{ct}	ABSLRR _t	ABSLRR
Name >	Tropical humid forest	Very humid Premontane forest			annual	cumulative
Project year t	ha	ha	ha	ha	ha	ha
2018	5.938	99			6.037	6.037
2019	6.174	116			6.290	12.327
2020	5.751	226			5.976	18.303
2021	5.663	94			5.757	24.060
2022	5.554	66			5.621	29.681
2023	5.552	79			5.631	35.311
2024	5.140	142			5.282	40.593
2025	5.066	93			5.159	45.753
2026	5.019	19			5.038	50.791
2027	5.032	17			5.049	55.840
2028	4.728	10			4.738	60.578
2029	4.620	7			4.627	65.205
2030	4.496	10			4.506	69.711
2031	4.527	12			4.539	74.250
2032	4.236	11			4.247	78.497
2033	4.140	9			4.149	82.646
2034	4.040	10			4.051	86.697
2035	4.047	12			4.059	90.756
2036	3.798	10			3.808	94.563
2037	3.713	8			3.721	98.285
2038	3.619	11			3.630	101.915
2039	3.631	9			3.640	105.555
2040	3.407	6			3.413	108.968
2041	3.333	3			3.337	112.305
2042	3.252	3			3.256	115.561
2043	3.259	4			3.263	118.824
2044	3.057	4			3.061	121.885
2045	2.985	4			2.990	124.875
2046	2.916	4			2.921	127.795
2047	2.920	4			2.924	130.720

Activity data per LU/LC category ct within the reference region					Total baseline deforestation in the reference region	
IDct	1	2	...	lct		
Name >	Tropical humid forest	Very humid Premontane forest			ABSLRR _t	ABSLRR
					annual	cumulative
Project year t	ha	ha	ha	ha	ha	ha
2048	2.746	4			2.749	133.469

Source: ALLCOT, 2021

Table 29. Activity data per LU/LC category ct within the project area. Years 2018-2048 (14b)

Activity data per LU/LC category ct within the project area					Total baseline deforestation in the project area	
IDct	1	2	...	lct		
Name >	Tropical humid forest	Very humid Premontane forest			ABSLRR _t	ABSLRR
					annual	cumulative
Project year t	ha	ha	ha	ha	ha	ha
2018	867	61			928	928
2019	908	70			978	1.906
2020	817	121			938	2.844
2021	758	60			817	3.661
2022	867	41			909	4.570
2023	897	59			956	5.526
2024	908	103			1.010	6.536
2025	935	71			1.006	7.542
2026	778	5			783	8.325
2027	765	6			771	9.096
2028	728	3			731	9.827
2029	718	4			722	10.549
2030	719	5			724	11.274
2031	742	6			749	12.023
2032	710	7			717	12.740
2033	701	6			707	13.447
2034	700	6			705	14.152
2035	716	6			722	14.874
2036	669	5			673	15.547
2037	686	4			690	16.238
2038	705	5			710	16.948
2039	704	5			709	17.657
2040	658	5			663	18.320
2041	656	3			660	18.979
2042	656	3			659	19.638

Activity data per LU/LC category ct within the project area					Total baseline deforestation in the project area	
ID _{ct}	1	2	...	I _{ct}		
Name >	Tropical humid forest	Very humid Premontane forest			ABSLRR _t	ABSLRR
					annual	cumulative
Project year t	ha	ha	ha	ha	ha	ha
2043	679	4			684	20.322
2044	669	4			673	20.994
2045	658	4			662	21.656
2046	646	4			650	22.306
2047	654	4			658	22.964
2048	617	4			621	23.585

Source: ALLCOT, 2021

Table 30. Activity data per LU/LC category ct within the leakage belt area. Years 2018-2048 (14c)

Activity data per LU/LC category ct within the leakage belt area					Total baseline deforestation in the leakage belt area	
ID _{ct}	1	2	...	I _{ct}		
Name >	Tropical humid forest	Very humid Premontane forest			ABSLRR _t	ABSLRR
					annual	cumulative
Project year t	ha	ha	ha	ha	ha	ha
2018	2.366	27			2.392	2.392
2019	2.715	19			2.733	5.126
2020	2.487	53			2.540	7.666
2021	2.063	33			2.096	9.761
2022	2.023	23			2.045	11.807
2023	2.224	17			2.241	14.048
2024	2.349	34			2.383	16.431
2025	1.796	21			1.818	18.249
2026	1.883	14			1.897	20.146
2027	1.892	11			1.903	22.049
2028	1.836	7			1.842	23.892
2029	1.812	3			1.815	25.706
2030	1.784	5			1.789	27.495
2031	1.815	5			1.820	29.316
2032	1.699	4			1.703	31.019
2033	1.645	2			1.648	32.666
2034	1.634	4			1.639	34.305
2035	1.637	6			1.643	35.948
2036	1.557	5			1.562	37.510
2037	1.506	4			1.510	39.021

Activity data per LU/LC category ct within the leakage belt area					Total baseline deforestation in the leakage belt area	
ID _{ct}	1	2	...	l _{ct}		
Name >	Tropical humid forest	Very humid Premontane forest			ABSLRR _t	ABSLRR
					annual	cumulative
Project year t	ha	ha	ha	ha	ha	ha
2038	1.501	5			1.506	40.526
2039	1.512	3			1.516	42.042
2040	1.415	1			1.416	43.458
2041	1.379	0			1.379	44.837
2042	1.333	0			1.333	46.169
2043	1.314	0			1.314	47.483
2044	1.209	0			1.209	48.692
2045	1.182	0			1.183	49.875
2046	1.151	0			1.151	51.026
2047	1.175	0			1.175	52.201
2048	1.108	0			1.108	53.309

Source: ALLCOT, 2021

3.5 Additionality

Based on the identification of current land use and land cover conditions and the analysis of LU/LC change during the historical reference period within the Reference Region. And in continuity with the identification of the baseline scenario for GHG reduction/removal, use will be made of the VT0001 Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities, v3.0. The tool provides a stepwise approach for the determination of baseline and additionality. The steps that make up the tool are as follows:

- STEP 1. Identification of alternative land use scenarios to the AFOLU project activity;
- STEP 2. Investment analysis to determine that the proposed project activity is not the most economically or financially attractive of the identified land use scenarios; or
- STEP 3. Barriers analysis; and
- STEP 4. Common practice analysis.

Thus, the sub-steps of step 1 of the methodology for the construction of the project baseline are developed below:

a) Step 1. Identification of alternative land use scenarios to the proposed VCS AFOLU project activity

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

Based on the identification of current land use and land cover conditions and the analysis of LU/LC change during the historical reference period within the Reference Region, it is possible to determine that the most likely land use scenario in the absence of the Southern Meta, Forests of Peace and Livelihoods of Life project is the expansion of the agricultural frontier and the expansion of the livestock frontier. Evidence of this is the historical dynamics, where there has been an increase in the area of pastures, permanent crops, and heterogeneous agricultural areas between 2010 and 2018, which is comparable to the decrease in forests for these same years.

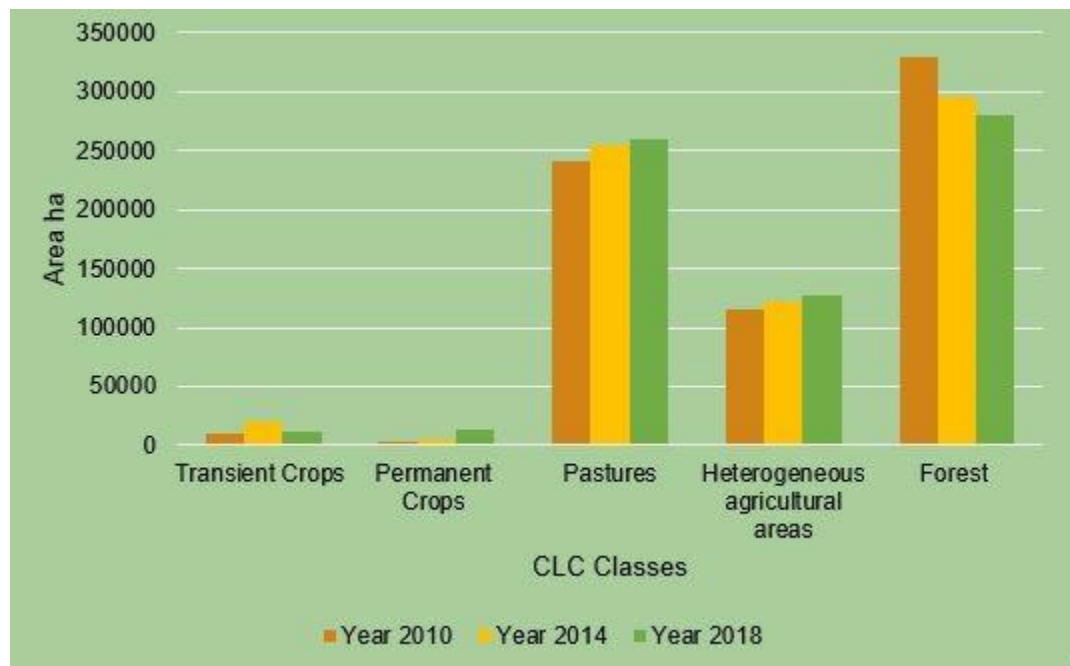


Figure 28. Change on LC/LU

Source: ALLCOT, 2021

Traditional land preparation practices in the region are based on clearing the soil by slashing and burning natural forest areas to create pastures and savannahs for cattle ranching with grass species rich in protein for livestock, or to establish crops with latent economic demand, mainly rice, cacao, rubber, cassava and, more recently, oil palm. However, prior to this practice, in some areas where small remnants of useful or so-called "precious" timber species remain, illegal logging and extraction is carried out prior to logging, burning and spraying.

At the same time, there is a tradition in the area of leaving some areas of forest associated with the drains that help maintain the flow of these springs, which are used to irrigate crops and supply water for livestock. However, in these areas, intensive grazing affects the sprouting of new trees both on the edge and inside these remaining forests, condemning these areas to gradual disappearance.

In consideration of the VT0001 tool, the following is a list of alternative land use scenarios that could have occurred in the area within the proposed project boundaries

Scenario 1: Increase in traditional crops and pastures, increase in extensive cattle ranching, reducing areas of natural forest. The trend identified in the analysis of historical land use and land cover changes remains.

Scenario 2: Transformation of traditional crop areas to other "fashionable" and more profitable crops that are implemented on a large scale, such as oil palm. The trend follows that presented by the Colombian Ministry of Agriculture, which shows that the country's largest palm oil production is concentrated in the eastern zone, where the department of Meta is located, and is expected to grow in the future, as its average income to the producer is above that of other oil crops such as soybean and canola. The implementation of this crop has been linked in the department as a threat to forests and a cause of deforestation. And it has been documented that in 2017 in the municipalities of Puerto Concordia and Puerto Rico there is evidence of palm crops and although there is no reliable evidence of deforestation generated directly by palm crops, it is important to note that the conditions of connectivity, security, price of land, are given for its expansion, and part of this symptom may be the process of massive land accumulation for the purpose of development of this crop in the future.

Scenario 3: The last trend scenario identified corresponds to that related to the return of victims of forced displacement due to the armed conflict in the region. The report, called "Voices of the victims: An approach to the reality of forced displacement in the inspection of Puerto Toledo, municipality of Puerto Rico, Meta, in the period 2005 to 2018" gives a notion of the history of the conflict in the department. The processes of restitution and reparation carried out with the population that has been violated due to the armed conflict, in their process of returning to their homes, not necessarily within the project area, implies that there is a flow of people to the area, which implies an increase in the demand and consumption of goods, the need for employment and income, which can be a factor of pressure on the forests as a means of obtaining income, affecting their surface and structure, causing deforestation.

- Sub-step 1b. Consistency of credible land use scenarios with enforced mandatory applicable laws and regulations

Although Colombia has policies, institutions and instruments for forest resource management, and there is a forest harvesting regime approved in Decree 1791 of 1996 by the Ministry of the Environment, which together with the National Natural Resources Code of the Second Law of 1959, establishes the conditions for natural forest harvesting, the type of management to be carried out and those responsible for the control and monitoring of processes, in the scenarios presented, deforestation is mainly associated with illegal logging without a permit, a forest management plan or an environmental license.

In Scenario 1, there is no prior authorization from the Regional Autonomous Corporation to harvest forests, in addition to deficient monitoring and control of these activities and subsequent mobilization of products.

For Scenario 2, something similar to Scenario 1 occurs, since there is no law or instrument that determines that the establishment of a palm crop must take place in areas other than forests, which implies a change in land use and complete transformation of the forest cover in order to prepare and amend the soil for the development of the crop. In contrast to the restrictions that may exist, there is Law 138 of 1994 "Establishing the Quota for the Promotion of the Oil Palm Agroindustry and creating the Palm Development Fund", as well as the production and market of the oil palm. The production and market for this crop has been directly stimulated by general financing and incentive policies and regulations that have sought to promote agricultural production for growth and stability in the rural sector.

Scenario 3 applies transversally to the initial aspects related to the harvesting regime and its permits. Currently, the process of land restitution and reparation for victims of the armed conflict is regulated by Law 1448 of 2011 "Whereby measures for attention, assistance and comprehensive reparation to the victims of the internal armed conflict are dictated and other provisions are issued" of the Congress

of the Republic. Which establishes mechanisms of integral reparation and that within these it addresses conferring to victims, the economic exploitation of agricultural type on a land of public domain that has such vocation and that is susceptible to be appropriated by individuals; having said this, it is possible to infer that it is not broken down when using the expression "economic exploitation of agricultural type" if in it must be a criterion of environmental sustainability or is indifferent to the development of traditional practices that involve the change of land use in forest areas causing deforestation.

To conclude, in this part of step 1 of the tool it can be said that none of the trend scenarios is in tune with the existing regulations, norms and mandates regarding the regulated use of the forest, and that in the Reference Region, if these scenarios were to occur without the development of the project, the scenarios would almost certainly not be presented in the way described.

- Sub-step 1c. Selection of the baseline scenario

The Baseline Scenario selected corresponds to Scenario 1, given that in the process of developing this project it is the most documented through the collection of information in the field, evidence present in maps, satellite images, official information reports from IDEAM documented since 1990, and in general, supported by the analysis of land use and cover change for the area of interest.

The progressive loss of forest cover due to the expansion of the agricultural and livestock frontier, illegal logging and land speculation make up the baseline scenario. Regarding speculation, it is assumed that land with forest cover is not productive and therefore has no use; a deforested land is worth 5 to 10 times more than the same forested area.

The tropical rainforests of Meta, near Colombia's Macarena mountain range, are known for their high diversity of plants and endemic species. With increasing pressure from degradation and deforestation, these forests have been prioritized for conservation and carbon offsetting through Reducing Emissions from Deforestation and Forest Degradation (REDD+) mechanisms.

As described above, the most recent version of the VCS "Tool for the demonstration and assessment of additionality in VCS agriculture, forestry and other land use (AFOLU) project activities - VT0001", version 3.0, was used for the generation of the baseline scenario analysis and for this additionality analysis. For additionality, we start from step two to step four of this methodology.

b) Step 2. Investment analysis

According to VT0001, the application of this step seeks to determine whether the proposed project activity, without the revenue from the sale of GHG credits, is economically or financially less attractive than at least one other land use scenario.

- Sub-step 2a. Determine appropriate analysis method

It was decided to use a simple cost analysis (Option I) since the Sur del Meta Project is not expected to generate financial or economic benefits other than VCS-related revenues from the sale of GHG credits.

According to economic models of deforestation, the opportunity cost of land determines the land use. For example, as the size of population centers and their demand for food increases, the opportunity cost of nearby forests increases. It is more profitable to transform them to carry out agricultural or livestock activities than to keep them standing. The problem is that since the goods and services provided by the forest do not have a market price and there are positive externalities, this opportunity cost calculation can lead to cutting down forests that are more valuable when standing than the alternative activities that can be carried out.

- Sub-step 2b. – Option I. Apply simple cost analysis

The VM0015 guide shows in its methodologies for the validation of the additionality of the project a guide, where it was chosen to apply the simple cost analysis with the opportunity cost method for the Sur del Meta project, where it is important to identify the economic data associated with the products, production cost value, transportation cost, product value, this part is intended to analyze the costs in an initial phase of the analysis.

- **Methodology**

The spatial analysis for the simple cost analysis with the opportunity cost method includes the following layers that support the spatial modeling process, such as roads, double drainage, urban areas, slopes, cover, land use and forest/non-forest 2018. At this stage of the analysis it is recommended that the spatial level information covers a larger area than the reference zone in order to avoid the statistical edge effect.

By performing a cost-distance analysis of a landscape element, it allows to determine the lowest cost of displacement according to a friction surface (De Smith, Goodchild, & Longley, 2008). In other words, it allows to calculate the least costly route from a given origin, for each of the cells of a study area (Raster). The word cost can be defined in this context as the time to traverse a distance, so the cost of transport is not continuous.

The next phase is the calculation of the transport layer generated from the friction surface, the distance to the consumption centers and the value of moving a ton of product per kilometer. For the production layer, the areas where the product is produced are identified with the coverage and vocation layers, and the production value is assigned the same as the sales value.

The following equation is used to calculate the profitability of the product

$$PPN = S\$n - PCn - CTn$$

Where S\$n is the sales layer of the product from which the production cost PCn and the transportation cost CTn are subtracted, and the result is the profitability obtained per hectare PPN. This process must be repeated for each of the products determined in the first phase.

The final phase begins with the classification of the profitability of each product in order to remove the areas that are not profitable and assign profitability ranges. Subsequently, a sum of the profitable areas of each of the products is made in order to identify the scope of profitability in the territory and end with a reclassification that indicates those areas where the different products can be performed and therefore there is a greater supply of activities to develop that leads to have various levels of profitability. The last part corresponds to cut the areas of higher profitability with the reference region and the forest zones identifying these as the leakage belt.

- **Results**

An economic analysis was carried out to identify the main products in the region with their associated costs in COP, these products can be identified as agents of deforestation, and logging is carried out for the purpose of changing land use. Table 8 shows the list of products, in this case 8 are mentioned, so the profitability process must be carried out independently for each one of them, for the development of the first phase of the project's additionality analysis.

Table 31. List of agricultural and livestock products in the work area

Product	Yield(Ton/ha)	Production cos (COP/ha)	Selling price (COP /Ton/ha)	Transport cost Vista hermosa (COP)
Dual Purpose Livestock	32.4	2,139,708	4,203,615	365,000
Meat and Milk	N/A	2,139,708	991,583	365,000
Dairy Farming	N/A	2,417,156	958,454	365,000
Palm Oil	4	2,800,385	1,755,000	261,000
Banana	19	559,666	1,694,000	261,000
Cassava	19	389,241	877,000	261,000
Coca leaf	7	1,292,571	1,700,000	261,000
Rubber	2.4	3,213,277	1,444,000	261,000
Yellow Corn	3	852,153	801,000	261,000

Source: ENA, DANE 2021

For the development of the spatial phase for the additionality analysis, the information layers were selected, the edge effect was taken into account for the analysis of the information, and this information is adjusted in a final post-process to refine the results. The layers used in this process, and their information source, are listed below.

- Roads, source: Instituto Geográfico Agustín Codazzi - IGAC, GDB Cartografía base, scale 1:100,000; 2019.
- Watercourses, source: Instituto Geográfico Agustín Codazzi - IGAC, GDB Base cartography, scale 1:100,000; 2019.
- DEM 30 meters, source: Instituto Geográfico Agustín Codazzi - IGAC, GDB Base mapping, scale 1:100,000; 2019.
- Slopes, Allcot 2021
- Forest/No forest 2018, source: Forest and Carbon Monitoring System, IDEAM.
- Land Use Vocation, source: Instituto Geográfico Agustín Codazzi - IGAC; 2019.
- Land cover, source: IDEAM 2012..

• Transportation

The road layer was taken as the first part of the transportation cost analysis, the friction surface is generated, which indicates the ease of movement in an area. For this layer the information of slopes, coverage, roads and rivers is used. Each of these is rasterized and graded in ranges from 1 to 10, where areas with low values are those that present greater difficulty to carry out productive activities, while zones closer to 10 have greater ease of accessibility in terms of production.

In the case of road and drainage maps, distance maps are generated using GIS spatial analysis tools, and a reclassification is made by ranges with the established values.

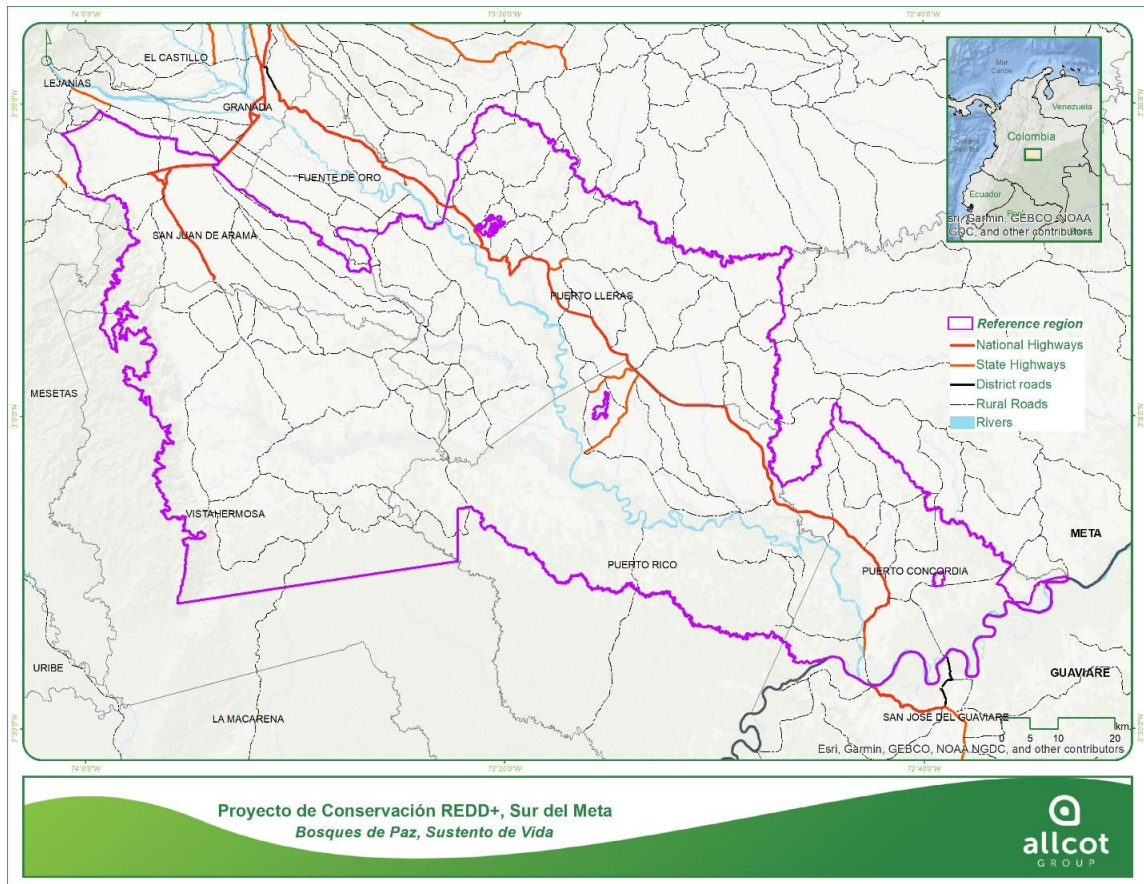


Figure 29. Layer of tracks for the study area

Source: Agustín Codazzi Geographical Institute - IGAC, GDB Base cartography, scale 1: 100,000; 2018

In the road layer, there are some areas with very few roads, such as the areas of the Natural Parks, the upper part of the mountain range and the forested areas of the Amazon region. Rivers play a very important role as they are considered to be mobility axes through which much of the production in remote areas moves. In addition, these streams offer better transportation quality than the road network in these remote areas, which often only have bridle paths or roads in dry weather. Here the Guayabero and Guejar stand out.

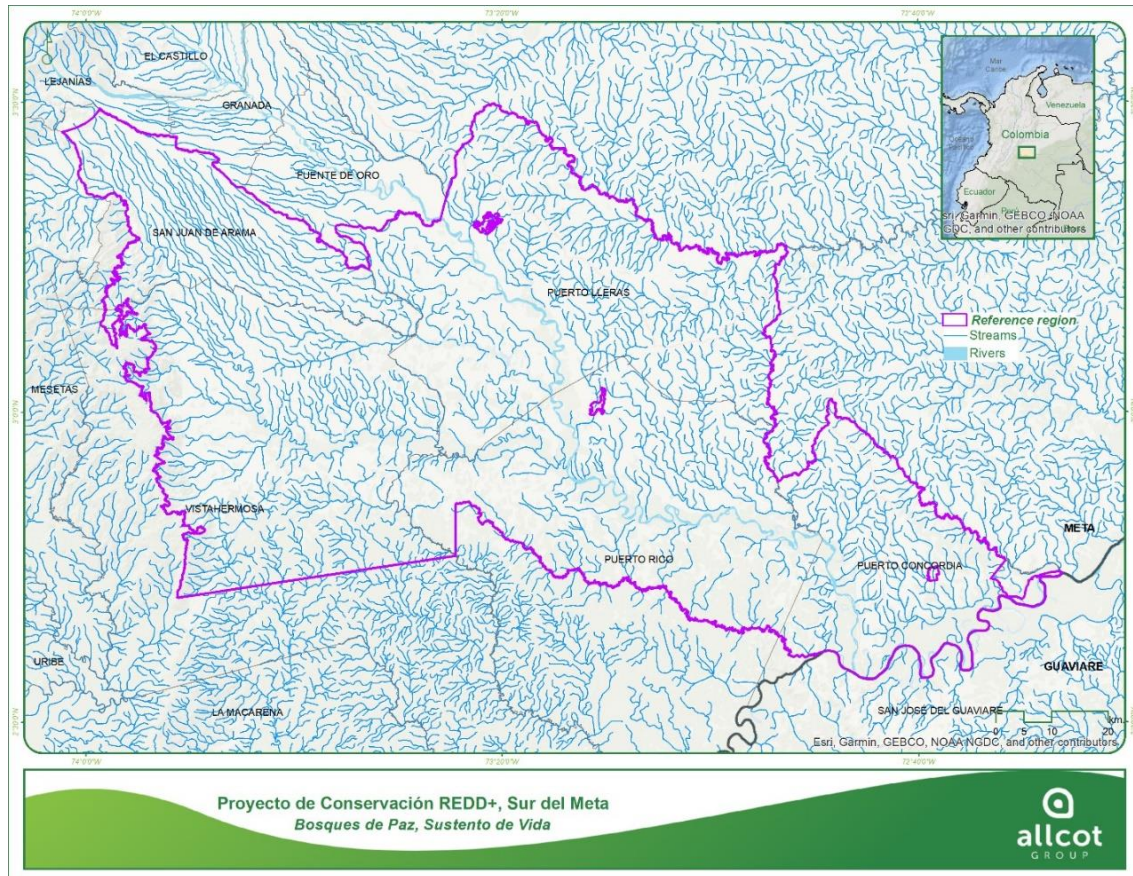


Figure 30. Rivers

Source: Agustín Codazzi Geographical Institute - IGAC, GDB Base cartography, scale 1: 100,000; 2018

The next spatial element is the slope layer generated from the 30 m digital terrain model as a function of the percentage of slope.

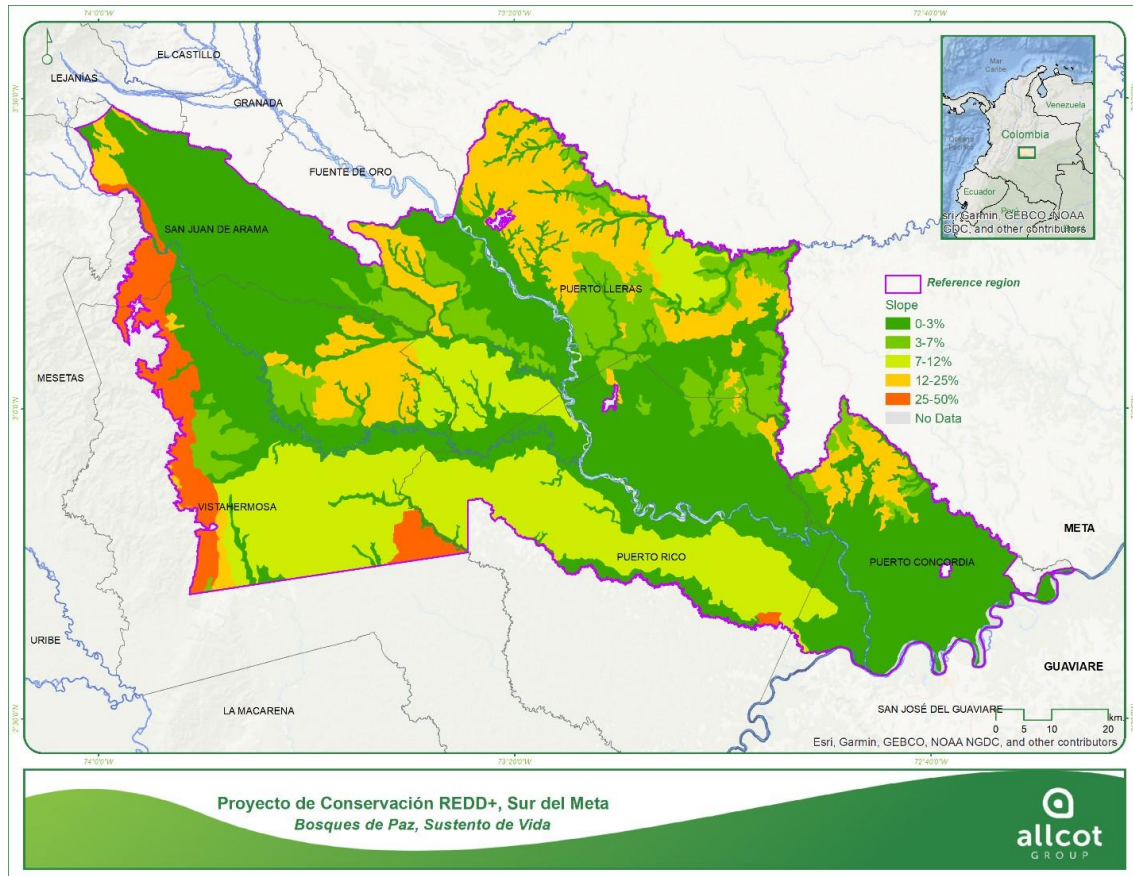


Figure 31. Slopes

Source: ALLCOT, 2021

Finally, the cover layer where displacement is evaluated through the type of material. It is not the same to move in areas of pasture or crops as in areas of forest or herbaceous vegetation that have accessibility limitations.

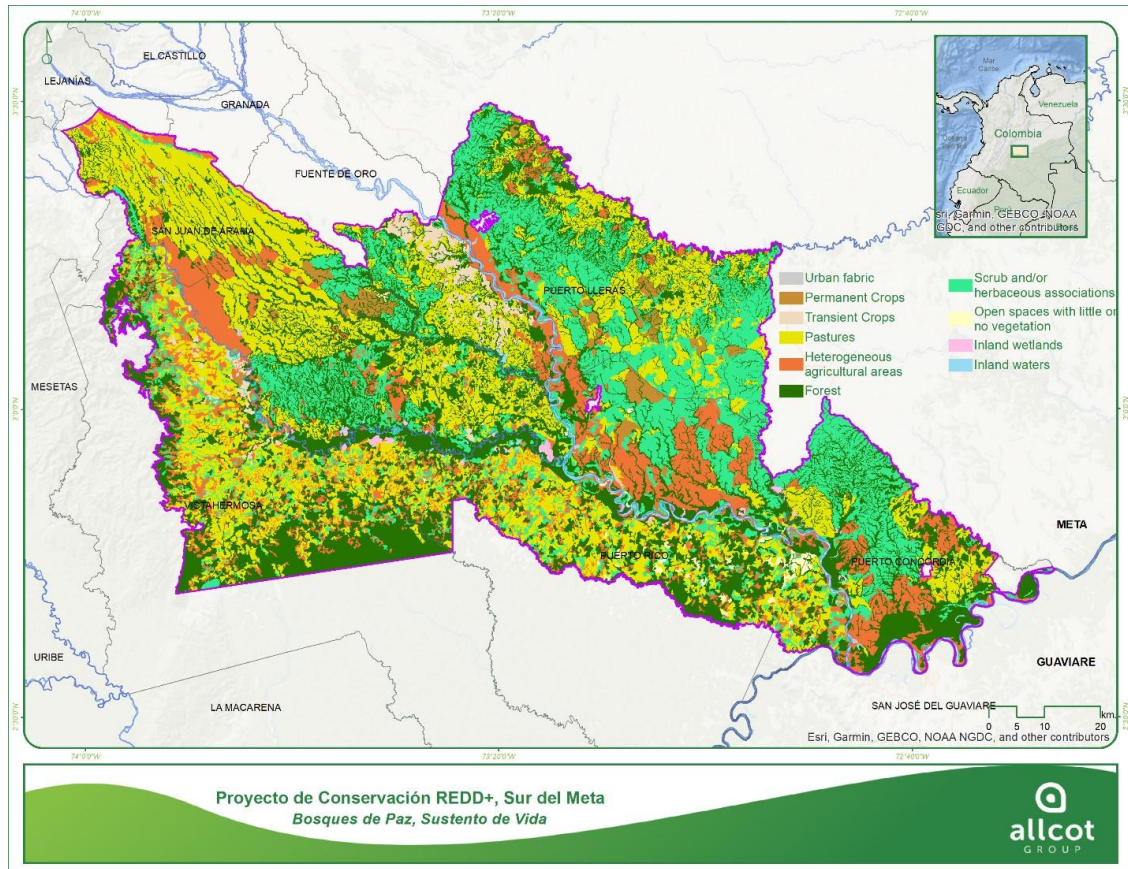
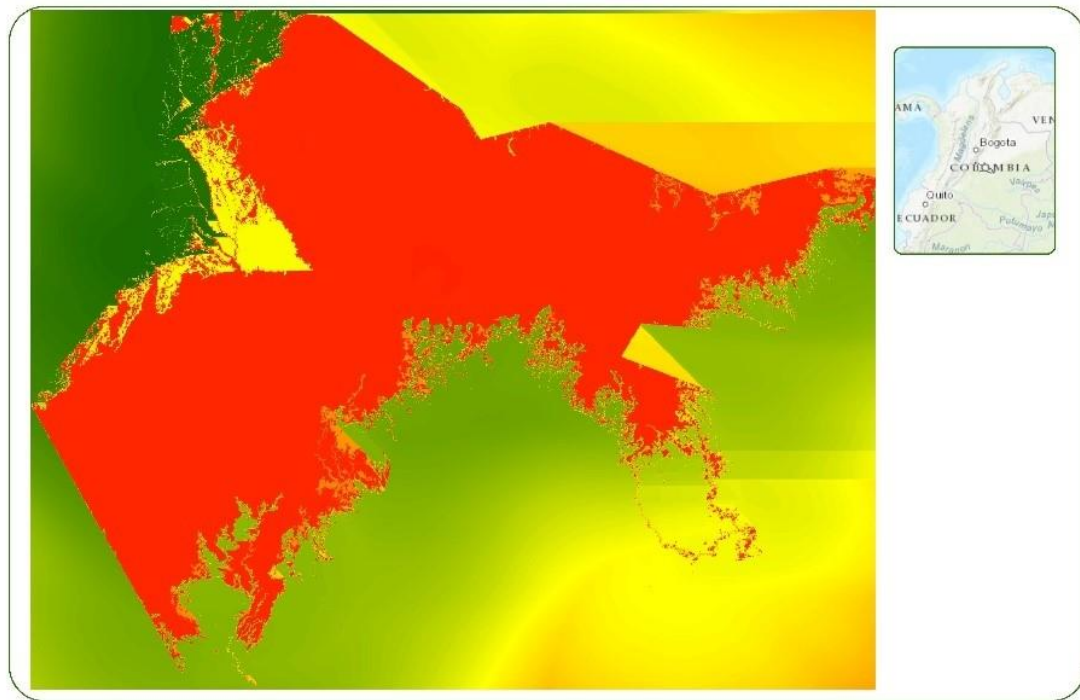


Figure 32. Land Cover
Source: ALLCOT, 2021

Surface of friction follows this formula

$$SF = Slopes * 0.3 + Cover * 0.2 + Roads * 0.25 + Rivers * 0.25$$

The weights were defined by a direct multi-criteria analysis, in which slopes have the highest participation, means of communication such as roads and rivers 25%, and to a lesser extent coverage with 20 %.



Mapa Costo distancia area, Departamento del Meta
Proyecto REED+ "Bosques de Paz; Sustento de Vida"



Figure 33. Friction surface map

Source: Allcot 2021

Subsequently, the transportation cost is associated to each cost-distance layer. For this, the value is taken to meters, since the distance maps are in meters, or a reclassification can be made in kilometers, which was applied in each of the transport layers. The costs presented correspond to those of Puerto Rico to San José del Guaviare, between which there are 120 km. With this data, the value of displacement per km for livestock and oil palm is COP \$ 2,175, while for banana, cassava, corn and coca production is COP\$ 1,237.

- Production costs

This layer was generated from the land cover and land use vocation map where the production zones of each product are assigned the value defined for producing one ton. For example, for cassava a value of COP \$389,241 is assigned.

- Product selling

Based on the previous layer, a defined sales value is assigned for one ton of each product. For example, cassava is assigned a value of COP \$877,000. This process was carried out for each of the products analyzed.

- Product profitability

From the previous layers and using map algebra supported by the formula defined in the methodology, the profitability of each product is calculated. Each layer indicates the profitability value obtained by producing one hectare of product according to the conditions of the territory.

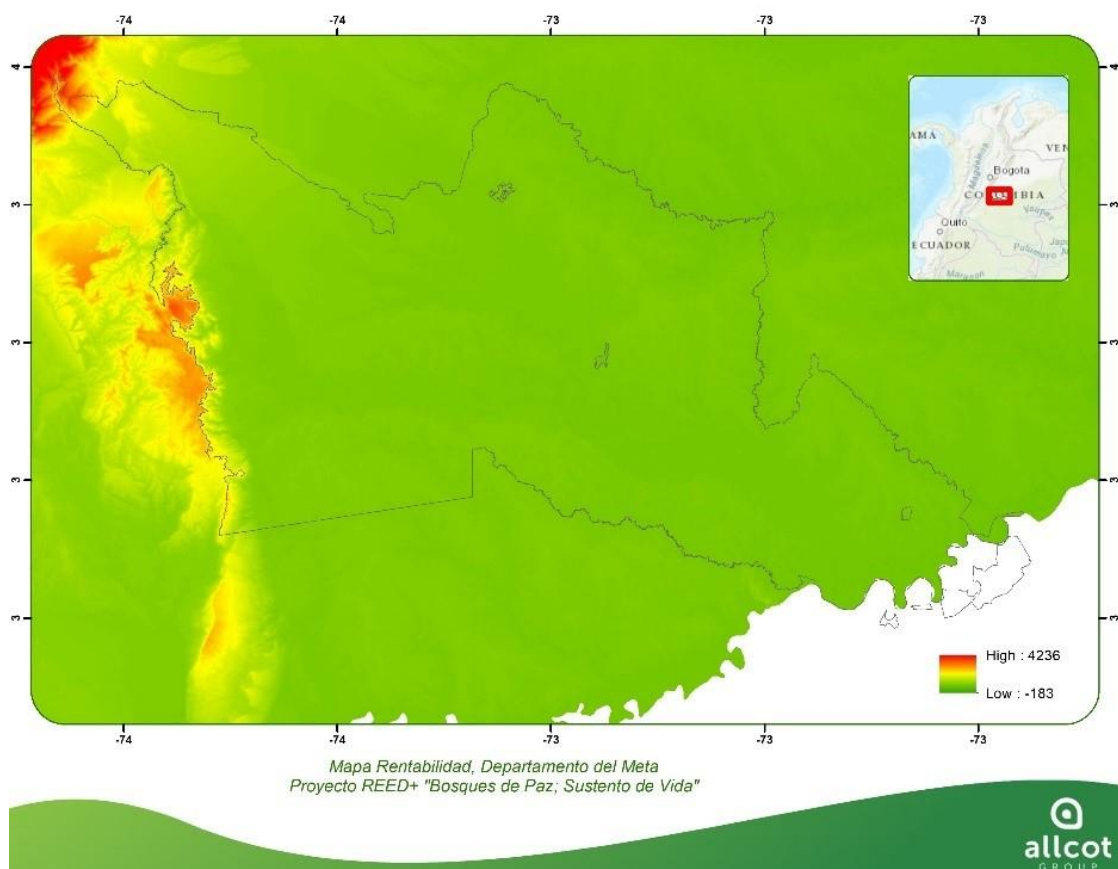


Figure 34. Coca profitability

Source: ALLCOT, 2021

Figure 27 shows that there are areas where livestock production is not profitable, while there are other areas where it is possible to obtain COP \$ 4,200,000 per ton. In coca, values of approximately COP \$400,000 can be reached.

c) Step 3. Barrier analysis

According to tool VT0001, the application of this step seeks to complement the previous step in order to identify whether the project faces barriers that prevent its implementation. The following potential barriers were identified in the analysis carried out from the social appraisal with landowners, JAC and Associations and through the survey of SDG:

Sub-step 3a. Identify barriers that would prevent the implementation of the type of proposed project activity.

b. Investment barriers:

Debt funding is not available for this type of activities/lack of access to credits: People do not have money enough to invest on yield improvement, as this needs technical assistance,

and banks do not include this into their loan lines. Those that include, do not consider tenure as a legal document and do not allow credits.

h) Barriers due to social conditions and land-use practices, inter alia:

Lack of skilled and/or properly trained labor force: The cost of hiring technical assistance cannot be supported by a single farmer.

These barriers are backed up by research like: Situation analysis of sustainable livestock farming in the Meta region and Characterization of the main causes and Causes and agents of deforestation at the national level Period 2005-2015 by IDEAM, MADS and ONUREDD

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

By definition, scenarios 2 and 3 are not looking for improvement on the yield, the solution for that condition and precisely to clear cut forest and open new areas for agriculture and livestock. In this way, they do not need to ask for credits on banks, the new areas will have better soil conditions and therefor the investment will be considerably less.

- **Step 4. Common practice analysis**

As shown on 2.5.13, no other REDD projects have been currently in the area, therefor no actual common practice comparable is included.

In 2014 there was a study call "The feasibility of a REDD+ project in the special management area of the macarena: a bottom-up approach" by USAID which concludes similarly at the results presented by the project.

Vision Amazonia program, even though it is described as a REDD+ program it does not fulfilled must of the requirements of these types of projects/programs. It does not have a discrete area allocation, nor monitoring that links a chain of cause and effect, or theory of change, between the investments and the reductions generated. In addition, the region is still in the beneficiary acquisition stage. For these reasons it is not considered a similar activity.

Thus, as described above, the activities contemplated for the present project constitute an additionality as this project is a pioneering initiative for the department of Meta and the municipalities that form part of its Region and Reference and Project Area.

In conclusion, we can see that given the analysis that has been done, the project is additional. We get to this conclusion following the corresponding steps of the tool VT0001. Firstly, within step two (option I) we argue that the project does not have any other income apart from that of VCS related income.

With this in mind, we also undertake an analysis of the land uses of the project area, in which we find that most of these productive projects are profitable, even with the transport costs included. This statement comes with a caveat, the land uses in this area seem to be profitable but there are many barriers to reach this point, especially for small landowners, which we argue that the project could help overcome. For this reason, we also went through the barrier analysis step.

Within this step, we took a look at barriers, specifically those relating to investment and to social conditions. The main takeaway from this section and from the whole additionality analysis, is that although these productive projects may seem profitable, only few people can access this success and even more in a sustainable manner, leaving many landowners with poor performing productive projects and with a low financial viability. This is because given these barriers, it is a cheaper and

more effective alternative for small landowners to clear cut a new area of forest, with soil in better productive conditions, to implement their agricultural and livestock projects. For this reason, the project plans to help these landowners in overcoming these barriers and reaching that potential productivity, resulting in a greater profitability, without harming the forest.

Lastly, the analysis also includes the section about common practices, but unfortunately, the project does not have a point of reference in this aspect.

Thus, as described above, the activities contemplated for the present project constitute an additionality as this project is a pioneering initiative for the department of Meta and the municipalities that form part of its Region and Reference and Project Area.

3.6 Methodology Deviations

This project did not employ any deviation from the methodology

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

STEP 6 - Estimation of baseline carbon stock changes and non-CO2 emissions

The estimation of the carbon content in the biomass will be carried out using step 6: "Estimation of baseline carbon stock changes and non-CO2 emissions" of the methodology, estimating the average carbon contents for the forest class through the literature.

According to 6.1.1 Estimation of the average carbon stocks of each LU/LC classed in the VM0015 methodology; the average carbon contents by forest classes within the Project area can be obtained from carbon stock data for these classes from published local studies and existing forest and carbon inventories. Or by using additional field measurements for classes for which there is insufficient information.

Taking into account that two types of forests are considered in the reference region, Project area and leakage belt corresponding to Tropical humid forest (bh-T) and Very humid premontane forest (bmh-PM), the report of IDEAM (2011), entitled "Estimation of current (2010) carbon stocks stored in the aboveground biomass in natural forests of Colombia. Stratification, allometry and analytical methods", which presents for the forests in question the values of average aerial biomass together with the average carbon per hectare, which follow the criteria of 6.1.1:

- a) The data are less than 10 years old;
- b) The data are derived from multiple measurement plots;
- c) All species above a minimum diameter are included in the inventories;
- d) The minimum diameter for trees included is 30 cm or less at breast height (DBH);
- e) Data are sampled from good coverage of the classes over which they will be extrapolated.

It should be noted that the information used for the estimation of carbon content is based on the same information used to estimate the forest cover in the Project boundaries. This information is based on the IDEAM forest/non-forest layers, so conservatively the stocks and the methodology of the study is applicable to the instances of this project, and there are no forest classes that do not have insufficient information in the quantification of their carbon contents, therefore it is not necessary to implement the steps described by the methodology in step b) "Collect missing data" of title 6.1.1.

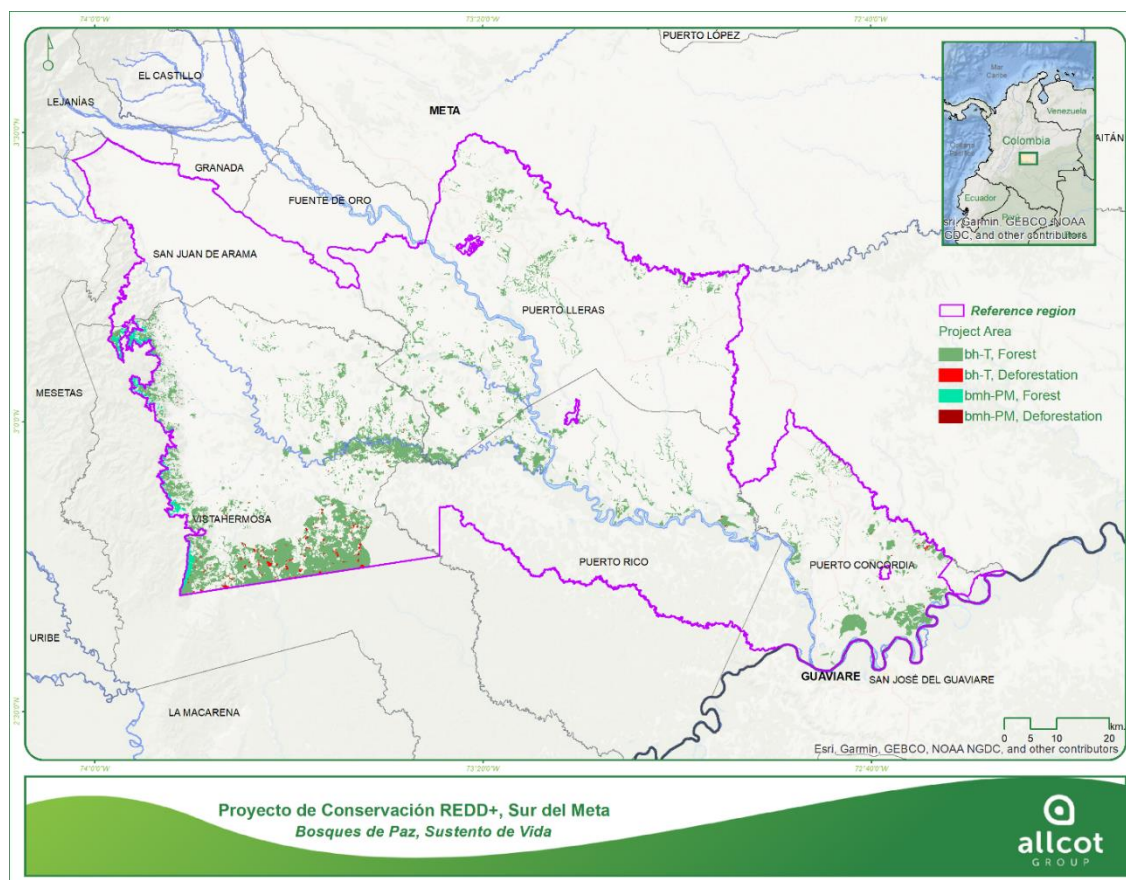


Figure 35 Types of forest by life zones

Source: ALLCOT, 2021

For the tropical humid forest an average aerial biomass of 284.6 tons per hectare with an average carbon content of 132.1 tons per hectare is reported. As for the very humid premontane forest, it presents an average aerial biomass of 172.2 tons per hectare, and a carbon content of 91.5 tons per hectare.

Tipo de bosque	A _i (ha)	C _i (t ha ⁻¹)	C _i (t)	CO ₂ e _i (t)
Bosque muy seco tropical	55.814	49,1	2.739.142	10.052.652
Bosque seco tropical	565.621	48,1	27.200.576	99.826.115
Bosque húmedo tropical	44.343.684	132,1	5.855.813.753	21.490.836.473
Bosque muy húmedo tropical	5.514.120	82,5	454.997.990	1.669.842.622
Bosque pluvial tropical	206.147	86,1	17.750.638	65.144.843
Bosque seco premontano	4.451	70,3	313.110	1.149.114
Bosque húmedo premontano	987.370	57,0	56.326.428	206.717.993
Bosque muy húmedo premontano	2.217.396	91,5	202.820.103	744.349.777
Bosque pluvial premontano	565.600	106,8	60.381.135	221.598.766
Bosque seco montano bajo	19.145	108,0	2.067.865	7.589.066
Bosque húmedo montano bajo	1.357.183	147,5	200.219.644	734.806.094
Bosque muy húmedo montano bajo	1.411.289	130,0	183.530.173	673.555.736
Bosque pluvial montano bajo	109.803	52,6	5.779.565	21.211.004
Bosque húmedo montano	25.713	72,7	1.870.386	6.864.316
Bosque muy húmedo montano	861.919	62,7	54.071.298	198.441.662
Bosque pluvial montano	356.666	53,2	18.980.008	69.656.629
Total	58.601.922	121,9	7.144.861.815	26.221.642.861

The image in Spanish from the original document.

Results of the estimation of current (2010) carbon stocks stored in biomass in natural forests in Colombia. Conventions: A_i = Extent of forest in the country for 2010; C_j = Average carbon by forest type; C_i = Total carbon by forest type; CO₂e_i = Carbon dioxide equivalent by forest type.

Source: Estimación de las reservas actuales (2010) de carbono almacenadas en la biomasa aérea en bosques naturales de Colombia; Estratificación, alometría y métodos analíticos. IDEAM, 2011

For the calculation of belowground carbon content, the ratio of aboveground biomass to belowground biomass will be used with a factor of 0.3. That is, for each ton of aboveground biomass, the belowground biomass corresponds to 30% of the aboveground biomass, 0.3 tons. As indicated by the methodology, the results of the content estimates are reported in Table 15.a (estimated values) of the methodology, presented in Table 15 and Table 16 according the scheme of methodology.

Since the table asks for the information in carbon equivalent contents; carbon dioxide equivalent is the result of multiplying the emitted tons of GHGs by their global warming potential. To convert the amount of carbon stored in natural forests, the IPCC (2003, 2006) recommends multiplying the amount of tons of carbon stored in forests by 3.67. Given that the estimates presented, the time horizon specified for each type of forest corresponds to the 30-year duration of the project.

The equation established for the conversion of total carbon released from deforestation in tons converted to carbon equivalent released from deforestation in tons is as follows:

$$C_{total} \times 3.672 = CO_{2Eq}$$

Thf Cabicl:

$$132.2 \text{ C} \times 3.67 = 484.8 \text{ CO}_{2Eq}$$

$$484.8 \text{ CO}_{2Eq} \times 1.01 = 533.3 \text{ CO}_{2Eq}$$

Thf Cbbicl:

$$484.8 \text{ C} * 0.3 = 145.4 \text{ CO}_{2\text{Eq}}$$

$$145.4 \text{ CO}_{2\text{Eq}} * 1.01 = 159.9 \text{ CO}_{2\text{Eq}}$$

TVhpMf Cab_{icl}:

$$91.5 \text{ C} * 3.67 = 335.8 \text{ CO}_{2\text{Eq}}$$

$$335.8 \text{ CO}_{2\text{Eq}} * 1.01 = 369.4 \text{ CO}_{2\text{Eq}}$$

TVhpMf Cbb_{icl}:

$$335.8 \text{ C} * 0.3 = 100.7 \text{ CO}_{2\text{Eq}}$$

$$100.7 \text{ CO}_{2\text{Eq}} * 1.01 = 110.8 \text{ CO}_{2\text{Eq}}$$

The Table 32. presents carbon stock values on a constant basis for all forest classes since no degradation or enhancement of carbon stocks is contemplated for forest classes within the Project boundary. Stocks in the dead wood biomass carbon pool, litter carbon pool, soil organic carbon pool, harvested wood products carbon pool are omitted, as described in 3.1.3 Emission Sources. As indicated in the methodology for reporting the results of the estimates per hectare for each class, or in the case of this project, forest type, the results should be presented following the structure of Table 15a.

Table 32. Estimated values for carbon stock per hectare of forest classes icl existent in project area and leakage belt (15a)

Project year <i>t</i>	Initial forest class <i>icl</i>					
	Name: Tropical humid forest					
	<i>ID icl:</i> <i>bh-T</i>					
	Average carbon stock per hectare + 90% CI					
	<i>Cab icl</i>		<i>Cbb icl</i>		<i>Ctot icl</i>	
	<i>C stock</i> <i>t CO2 e ha-1</i>	+ 90% CI <i>t CO2 e ha-1</i>	<i>C stock</i> <i>t CO2 e ha-1</i>	+ 90% CI <i>t CO2 e ha-1</i>	<i>C stock</i> <i>t CO2 e ha-1</i>	+ 90% CI <i>t CO2 e ha-1</i>
T0 a 30	484.8	48.5	145.4	14.5	630.2	63.0

Project year <i>t</i>	Initial forest class <i>icl</i>					
	Name: Very humid premontano forest					
	<i>ID icl: bmh-PM</i>					
	Average carbon stock per hectare + 90% CI					
	<i>Cab icl</i>		<i>Cbb icl</i>		<i>Ctot icl</i>	
	<i>C stock t CO2 e ha-1</i>	<i>+ 90% CI t CO2 e ha-1</i>	<i>C stock t CO2 e ha-1</i>	<i>+ 90% CI t CO2 e ha-1</i>	<i>C stock t CO2 e ha-1</i>	<i>+ 90% CI t CO2 e ha-1</i>
T0 a 30	335.8	33.6	100.7	10.1	436.5	43.7

Where:

Cab_{icl} Average carbon stock per hectare in the above-ground biomass carbon pool of class *icl*; *tCO2-e ha-1*

Cbb_{icl} Average carbon stock per hectare in the below-ground biomass carbon pool of class *icl*; *tCO2-e ha-1*

Ctot_{icl} Average carbon stock per hectare in all accounted carbon pools of LU/LC *icl*; *tCO2-e ha-1*

Table 15.b of the methodology is omitted considering that the uncertainty of the total carbon content of each carbon pool evaluated is less than 10% of the average value, as well as the confidence intervals reported by the literature consulted are around 35%.

The calculation of the long-term average carbon stock (30 years) of each of the forest classes contemplated by the Project and on which the individual carbon contents are calculated was carried out. According to the methodology, the results should be presented for each forest type following the format of Table 16 of VM0015. Presented below in Table 33.

Table 33. Average carbon stock long term (30 years) per hectare for each *icl* forest (16)

Project year t	Post deforestation class fcl Name: Bosque húmedo tropical $ID\ icl:$ $bh-T$					
	Average carbon stock per hectare + 90% CI					
	$Cab\ icl$		$Cbb\ icl$		$Ctot\ icl$	
	$C\ stock$ $t\ CO2\ e\ ha^{-1}$	+ 90% CI $t\ CO2\ e\ ha^{-1}$	$C\ stock$ $t\ CO2\ e\ ha^{-1}$	+ 90% CI $t\ CO2\ e\ ha^{-1}$	$C\ stock$ $t\ CO2\ e\ ha^{-1}$	+ 90% CI $t\ CO2\ e\ ha^{-1}$
	T0 a 30	484.8	48.5	145.4	14.5	630.2
Average	484.8	48.5	145.4	14.5	630.2	63.0
Average to be used in calculations	484.8	48.5	145.4	14.5	630.2	63.0

Project year t	Post deforestation class fcl Name: Bosque muy húmedo premontano $ID\ icl$: $bmh-PM$ Average carbon stock per hectare + 90% CI					
	$Cab\ icl$		$Cbb\ icl$		$Ctot\ icl$	
	$C\ stock$ $t\ CO_2\ e\ ha^{-1}$	+ 90% CI $t\ CO_2\ e\ ha^{-1}$	$C\ stock$ $t\ CO_2\ e\ ha^{-1}$	+ 90% CI $t\ CO_2\ e\ ha^{-1}$	$C\ stock$ $t\ CO_2\ e\ ha^{-1}$	+ 90% CI $t\ CO_2\ e\ ha^{-1}$
	TO a 30	335.8	33.6	100.7	10.1	436.5
Average	335.8	33.6	100.7	10.1	436.5	43.7
Average to be used in calculations	335.8	33.6	100.7	10.1	436.5	43.7

Since the values of carbon content are estimated by letter and in the thirty-year horizon indicated in the methodology for projection and calculation of averages, the values are not affected and are presented in summary form.

Following the format of Table 34. of the methodology, the weighted average carbon stock per unit area in the long term (30 years) is presented below, understanding that the analysis approach for the quantification of emissions and base scenario was not approached by zones, only the values for a single zone are presented.

Table 34. Carbon stock average long term per hectare

Zone		Post-deforestation LU/LC-classes fcl				Area weighted long-term (20 years) average carbon stocks per zone z	
		Name:	Bosque húmedo trópico	Name:	Bosque muy húmedo premontano		
		ID_{fcl}	$bh-T$	ID_{fcl}	$bmh-PM$		
		Cab_{fcl}	Cbb_{fcl}	Cab_{fcl}	Cbb_{fcl}	Cab_z	Cbb_z
ID_z	Name	C_{stock} $t\ CO_2\ e\ ha^{-1}$	C_{stock} $t\ CO_2\ e\ ha^{-1}$	C_{stock} $t\ CO_2\ e\ ha^{-1}$	C_{stock} $t\ CO_2\ e\ ha^{-1}$	C_{stock} $t\ CO_2\ e\ ha^{-1}$	C_{stock} $t\ CO_2\ e\ ha^{-1}$
1	Zone 1	484.8	145.4	335.8	100.7	410.3	123.1

The Project does not take into account organic soil carbon, and method 2 was used to model the special future distribution of post-deforestation classes, therefore Tables 18.a and 18.b, 19.a, 19.b and 19.c are not filled in. In the meantime, the resulting future post deforestation classes are presented, for Forest, understanding that the analysis is done using IDEAM Forest/Non Forest

information that only perceives the changes (increase/decrease) on the Forest or Non Forest classes, and that the variation from one year to another allows determining the presence of deforestation.

4.2 Project Emissions

In continuity with the methodology, In the Step 6, for the calculation of baseline stock changes it was decided to apply Method 2 of numeral 6.1. 3, when the activity data are available by categories, thus, as the carbon contents for above and below ground biomass were estimated from the official national information provided by IDEAM for the tropical humid forest and for the very humid premontane forest, as initially mentioned, the calculation of the change in carbon stock change factors for each category is not performed because they are constant for each period and vary only according to the area of change from one year to another; therefore, Table 20 is not filled out. c and proceeds directly to report the changes in carbon stocks for the Reference Region, Project Area and Leakage Belt following the structure of Table 22 according to the methodology.

Likewise, by deciding to use method 2 of section 6.1.3 of the methodology, tables 20.a, 20.b, 21.a, 21.b and 21.c are omitted.

The equation used, therefor, Calculated with Method 2: Activity data per category ct or ctz ¹⁸ is, for reference region, project area and leakage area for the total carbon accountant period fixed:

$$\Delta CabBSLRR = \sum ABSLRR_{ct,t \text{ bht}} * C \text{ stockt CO2 e ha-1}_{bht} + \sum ABSLRR_{ct,t \text{ bhmPM}} * C \text{ stockt CO2 e ha-1}_{bhmPM}$$

$$\Delta CabBSLRR = ((132,362 * 484.8) + (1,107 * 335.8)) + ((132,362 * 145.4) + (1,107 * 100.7))$$

$$\Delta CabBSLRR = 85,473,290 \text{ tCO}_2\text{-e cumulative 30 years}$$

The estimated equivalent carbon contents for above and below ground biomass within the reference region in the reference period are presented below in the Table 35. and Table 36.

Table 35. Carbon stock change factor for above ground biomass in the reference region

Project year t	Activity data per category x Carbon stock change factor for above-ground biomass in the reference region				Total baseline carbon stock change in the reference region	
	ID_{ct}	bh-T	ID_{ct}	bhm-PM	Annual	cumulative
	$ABSLRR_{ct,t}$	$\square Cab_{ct,t}$	$ABSLRR_{ct,t}$	$\square Cab_{ct,t}$	$\square CabBSLRR_t$	$\square CabBSLRR$
	ha	tCO ₂ -e ha-1	ha	tCO ₂ -e ha-1	tCO ₂ -e ha-1	tCO ₂ -e ha-1
2018	5,938	2,912,229	99	29,398	2,941,627	2,941,627
2019	6,174	3,028,142	116	34,355	3,062,497	6,004,124
2020	5,751	2,820,436	226	66,929	2,887,365	8,891,489
2021	5,663	2,777,647	94	27,819	2,805,466	11,696,955
2022	5,554	2,724,236	66	19,698	2,743,934	14,440,889

¹⁸ For conservative purposes only 1,1% has been added explaining the difference encountered on the official data.

Project year t	Activity data per category x Carbon stock change factor for above-ground biomass in the reference region				Total baseline carbon stock change in the reference region	
	ID_{ct}	bh-T	ID_{ct}	bmh-PM	Annual	cumulative
	$ABSLRR_{ct,t}$	$\square Cab_{ct,t}$	$ABSLRR_{ct,t}$	$\square Cab_{ct,t}$	$\square CabBSLRR_t$	$\square CabBSLRR$
	ha	tCO ₂ -e ha-1	ha	tCO ₂ -e ha-1	tCO ₂ -e ha-1	tCO ₂ -e ha-1
2023	5,552	2,722,853	79	23,492	2,746,345	17,187,234
2024	5,140	2,521,050	142	42,055	2,563,105	19,750,339
2025	5,066	2,484,832	93	27,588	2,512,420	22,262,759
2026	5,019	2,461,730	19	5,614	2,467,344	24,730,103
2027	5,032	2,468,005	17	5,118	2,473,122	27,203,225
2028	4,728	2,319,088	10	2,832	2,321,920	29,525,145
2029	4,620	2,265,734	7	2,170	2,267,905	31,793,050
2030	4,496	2,205,290	10	2,933	2,208,223	34,001,273
2031	4,527	2,220,167	12	3,557	2,223,724	36,224,997
2032	4,236	2,077,633	11	3,298	2,080,930	38,305,927
2033	4,140	2,030,470	9	2,682	2,033,153	40,339,080
2034	4,040	1,981,619	10	3,076	1,984,695	42,323,775
2035	4,047	1,984,680	12	3,694	1,988,374	44,312,149
2036	3,798	1,862,584	10	2,997	1,865,580	46,177,730
2037	3,713	1,821,150	8	2,448	1,823,598	48,001,328
2038	3,619	1,775,206	11	3,174	1,778,380	49,779,708
2039	3,631	1,781,018	9	2,556	1,783,574	51,563,282
2040	3,407	1,671,154	6	1,829	1,672,983	53,236,265
2041	3,333	1,634,796	3	1,013	1,635,809	54,872,074
2042	3,252	1,595,194	3	944	1,596,138	56,468,212
2043	3,259	1,598,376	4	1,312	1,599,689	58,067,901
2044	3,057	1,499,557	4	1,118	1,500,675	59,568,576
2045	2,985	1,464,258	4	1,203	1,465,461	61,034,037
2046	2,916	1,430,325	4	1,259	1,431,583	62,465,620
2047	2,920	1,432,227	4	1,273	1,433,500	63,899,120
2048	2,746	1,346,566	4	1,100	1,347,666	65,246,786

Table 36. Carbon stock change factor for below ground biomass in the reference region

Project year t	Activity data per category x Carbon stock change factor for below-ground biomass in the reference region				Total baseline carbon stock change in the reference region	
	ID_{ct}	bh-T	ID_{ct}	bmh-PM	Annual	cumulative
	$ABSLRR_{ct,t}$	$\square Cab_{ct,t}$	$ABSLRR_{ct,t}$	$\square Cab_{ct,t}$	$\square CabBSLRR_t$	$\square CabBSLRR$
	ha	tCO ₂ -e ha-1	ha	tCO ₂ -e ha-1	tCO ₂ -e ha-1	tCO ₂ -e ha-1
2018	5,938	902,791	99	9,113	911,904	911,904
2019	6,174	938,724	116	10,650	949,374	1,861,278
2020	5,751	874,335	226	20,748	895,083	2,756,361
2021	5,663	861,071	94	8,624	869,695	3,626,056

Project year t	Activity data per category x Carbon stock change factor for below-ground biomass in the reference region				Total baseline carbon stock change in the reference region	
	ID_{ct}	bh-T	ID_{ct}	bmh-PM	Annual	cumulative
	$ABSLRR_{ct,t}$	$\square Cab_{ct,t}$	$ABSLRR_{ct,t}$	$\square Cab_{ct,t}$	$\square CabBSLRR_t$	$\square CabBSLRR$
	ha	tCO ₂ -e ha ⁻¹	ha	tCO ₂ -e ha ⁻¹	tCO ₂ -e ha ⁻¹	tCO ₂ -e ha ⁻¹
2022	5,554	844,513	66	6,106	850,620	4,476,676
2023	5,552	844,085	79	7,283	851,367	5,328,043
2024	5,140	781,525	142	13,037	794,563	6,122,605
2025	5,066	770,298	93	8,552	778,850	6,901,455
2026	5,019	763,136	19	1,740	764,877	7,666,332
2027	5,032	765,081	17	1,586	766,668	8,433,000
2028	4,728	718,917	10	878	719,795	9,152,795
2029	4,620	702,378	7	673	703,050	9,855,845
2030	4,496	683,640	10	909	684,549	10,540,395
2031	4,527	688,252	12	1,103	689,354	11,229,749
2032	4,236	644,066	11	1,022	645,088	11,874,837
2033	4,140	629,446	9	831	630,277	12,505,115
2034	4,040	614,302	10	954	615,256	13,120,370
2035	4,047	615,251	12	1,145	616,396	13,736,766
2036	3,798	577,401	10	929	578,330	14,315,096
2037	3,713	564,556	8	759	565,315	14,880,412
2038	3,619	550,314	11	984	551,298	15,431,709
2039	3,631	552,116	9	792	552,908	15,984,617
2040	3,407	518,058	6	567	518,625	16,503,242
2041	3,333	506,787	3	314	507,101	17,010,343
2042	3,252	494,510	3	293	494,803	17,505,146
2043	3,259	495,497	4	407	495,903	18,001,049
2044	3,057	464,863	4	347	465,209	18,466,258
2045	2,985	453,920	4	373	454,293	18,920,551
2046	2,916	443,401	4	390	443,791	19,364,342
2047	2,920	443,990	4	395	444,385	19,808,727
2048	2,746	417,435	4	341	417,776	20,226,504

Regarding the estimated equivalent carbon content for above and belowground biomass within the Project Area in the reference period. These are presented in the Table 37. and Table 38.

$$\Delta CabBSLPA = \sum ABSLPA_{ct,t,bht} * C_{stockt} CO_2 e ha^{-1} bht + \sum ABSLPA_{ct,t,bmhPM} * C_{stockt} CO_2 e ha^{-1} bmhPM$$

$$\Delta CabBSLPA = ((22,892 * 484.8) + (693 * 335.8)) + ((22,892 * 145.4) + (693 * 100.7))$$

$$\Delta CabBSLPA = 14,977,409 \text{ tCO}_2\text{-e cumulative 30 years}$$

Table 37. Carbon stock change factor for above ground biomass in the project area

Project year t	Activity data per category x Carbon stock change factor for above-ground biomass in the project area				Total baseline carbon stock change in the project area	
	ID_{ct}	bh-T	ID_{ct}	bmh-PM	Annual	cumulative
	$ABSLRR_{ct,t}$	$\square Cab_{ct,t}$	$ABSLRR_{ct,t}$	$\square Cab_{ct,t}$	$\square CabBSLRR_t$	$\square CabBSLRR$
	ha	tCO ₂ -e ha ⁻¹	ha	tCO ₂ -e ha ⁻¹	tCO ₂ -e ha ⁻¹	tCO ₂ -e ha ⁻¹
2018	867	425,165	61	18,092	443,257	443,257
2019	908	445,186	70	20,899	466,085	909,342
2020	817	400,569	121	35,945	436,514	1,345,856
2021	758	371,556	60	17,757	389,313	1,735,169
2022	867	425,409	41	12,243	437,652	2,172,821
2023	897	439,855	59	17,627	457,482	2,630,303
2024	908	445,164	103	30,467	475,632	3,105,935
2025	935	458,750	71	21,005	479,755	3,585,690
2026	778	381,456	5	1,465	382,921	3,968,611
2027	765	375,439	6	1,737	377,175	4,345,786
2028	728	357,013	3	863	357,876	4,703,662
2029	718	352,172	4	1,186	353,358	5,057,020
2030	719	352,786	5	1,488	354,275	5,411,295
2031	742	364,099	6	1,921	366,020	5,777,315
2032	710	348,409	7	2,050	350,459	6,127,773
2033	701	343,769	6	1,871	345,639	6,473,413
2034	700	343,086	6	1,657	344,743	6,818,155
2035	716	351,276	6	1,677	352,952	7,171,108
2036	669	328,092	5	1,335	329,427	7,500,535
2037	686	336,532	4	1,211	337,743	7,838,278
2038	705	345,781	5	1,521	347,302	8,185,580
2039	704	345,388	5	1,422	346,810	8,532,391
2040	658	322,834	5	1,339	324,173	8,856,564
2041	656	321,963	3	977	322,940	9,179,504
2042	656	321,603	3	872	322,475	9,501,980
2043	679	333,215	4	1,284	334,499	9,836,478
2044	669	328,101	4	1,102	329,203	10,165,681
2045	658	322,552	4	1,164	323,715	10,489,397
2046	646	316,765	4	1,222	317,987	10,807,384
2047	654	320,572	4	1,270	321,842	11,129,226
2048	617	302,837	4	1,074	303,911	11,433,136

Table 38. Carbon stock change facto below ground biomass in the project area

Project year <i>t</i>	Activity data per category x Carbon stock change factor for below-ground biomass in the project area				Total baseline carbon stock change in the project area	
	<i>ID_{ct}</i>	bh-T	<i>ID_{ct}</i>	bmh-PM	annual	cumulative
	<i>ABSLRR_{ct,t}</i>	$\square Cab_{ct,t}$	<i>ABSLRR_{ct,t}</i>	$\square Cab_{ct,t}$	$\square CabBSLRR_t$	$\square CabBSLRR$
	ha	tCO ₂ -e ha ⁻¹	ha	tCO ₂ -e ha ⁻¹	tCO ₂ -e ha ⁻¹	tCO ₂ -e ha ⁻¹
2018	867	131,801	61	5,608	137,410	137,410
2019	908	138,008	70	6,479	144,486	281,896
2020	817	124,176	121	11,143	135,319	417,215
2021	758	115,182	60	5,505	120,687	537,903
2022	867	131,877	41	3,795	135,672	673,575
2023	897	136,355	59	5,464	141,819	815,394
2024	908	138,001	103	9,445	147,446	962,840
2025	935	142,213	71	6,512	148,724	1,111,564
2026	778	118,251	5	454	118,705	1,230,269
2027	765	116,386	6	538	116,924	1,347,194
2028	728	110,674	3	268	110,942	1,458,135
2029	718	109,173	4	368	109,541	1,567,676
2030	719	109,364	5	461	109,825	1,677,501
2031	742	112,871	6	596	113,466	1,790,968
2032	710	108,007	7	635	108,642	1,899,610
2033	701	106,568	6	580	107,148	2,006,758
2034	700	106,357	6	514	106,870	2,113,628
2035	716	108,895	6	520	109,415	2,223,043
2036	669	101,708	5	414	102,122	2,325,166
2037	686	104,325	4	376	104,700	2,429,866
2038	705	107,192	5	471	107,664	2,537,530
2039	704	107,070	5	441	107,511	2,645,041
2040	658	100,078	5	415	100,494	2,745,535
2041	656	99,809	3	303	100,112	2,845,646
2042	656	99,697	3	270	99,967	2,945,614
2043	679	103,297	4	398	103,695	3,049,308
2044	669	101,711	4	342	102,053	3,151,361
2045	658	99,991	4	361	100,352	3,251,713
2046	646	98,197	4	379	98,576	3,350,289
2047	654	99,377	4	394	99,771	3,450,060
2048	617	93,879	4	333	94,212	3,544,272

Consequently, for the area of the leakage belt, the estimated equivalent carbon contents for above and below ground biomass in the reference period are presented. These are presented in Table 39. and Table 40.

$$\Delta CabBSLLB = \sum ABSLLB_{ct,t\ bht} * C\ stockt\ CO_2\ e\ ha^{-1}_{bht} + \sum ABSLLB_{ct,t\ bmhPM} * C\ stockt\ CO_2\ e\ ha^{-1}_{bmhPM}$$

$$\Delta CabBSLLB = ((53,002 * 484.8) + (307 * 335.8)) + ((53,002 * 145.4) + (307 * 100.7))$$

$$\Delta CabBSLLB = 34,173,081 \text{ tCO}_2\text{-e cumulative 30 years}$$

Table 39. Carbon stock change factor for above ground biomass in the leakage belt

Project year <i>t</i>	Activity data per category x Carbon stock change factor for above-ground biomass in the leakage belt area				Total baseline carbon stock change in the leakage belt area	
	<i>ID_{ct}</i>	bh-T	<i>ID_{ct}</i>	bmh-PM	annual	cumulative
	<i>ABSLRR_{ct,t}</i>	$\square Cab_{ct,t}$	<i>ABSLRR_{ct,t}</i>	$\square Cab_{ct,t}$	$\square CabBSLRR_t$	$\square CabBSLRR$
	ha	tCO ₂ -e ha ⁻¹	ha	tCO ₂ -e ha ⁻¹	tCO ₂ -e ha ⁻¹	tCO ₂ -e ha ⁻¹
2018	2,366	1,160,282	27	7,929	1,168,210	1,168,210
2019	2,715	1,331,483	19	5,515	1,336,998	2,505,208
2020	2,487	1,219,762	53	15,793	1,235,555	3,740,763
2021	2,063	1,011,638	33	9,767	1,021,405	4,762,168
2022	2,023	992,007	23	6,691	998,698	5,760,866
2023	2,224	1,090,937	17	5,039	1,095,976	6,856,842
2024	2,349	1,152,138	34	10,175	1,162,313	8,019,155
2025	1,796	880,945	21	6,340	887,285	8,906,440
2026	1,883	923,395	14	4,193	927,588	9,834,028
2027	1,892	928,050	11	3,314	931,364	10,765,393
2028	1,836	900,424	7	1,958	902,382	11,667,774
2029	1,812	888,715	3	856	889,571	12,557,345
2030	1,784	875,114	5	1,392	876,506	13,433,851
2031	1,815	890,151	5	1,580	891,731	14,325,583
2032	1,699	833,326	4	1,190	834,516	15,160,098
2033	1,645	806,920	2	726	807,645	15,967,744
2034	1,634	801,629	4	1,265	802,894	16,770,637
2035	1,637	802,983	6	1,830	804,813	17,575,450
2036	1,557	763,658	5	1,484	765,142	18,340,592
2037	1,506	738,818	4	1,095	739,912	19,080,505
2038	1,501	736,156	5	1,454	737,610	19,818,115
2039	1,512	741,681	3	1,016	742,697	20,560,811
2040	1,415	693,760	1	438	694,198	21,255,010
2041	1,379	676,104	0	10	676,114	21,931,123
2042	1,333	653,603	0	49	653,653	22,584,776
2043	1,314	644,339	0	30	644,369	23,229,145
2044	1,209	593,014	0	0	593,014	23,822,159
2045	1,182	579,969	0	7	579,976	24,402,134
2046	1,151	564,707	0	2	564,709	24,966,843
2047	1,175	576,217	0	2	576,219	25,543,062
2048	1,108	543,259	0	0	543,259	26,086,322

Table 40. Carbon stock change factor for below ground in the leakage belt

Project year t	Activity data per category x Carbon stock change factor for below-ground biomass in the leakage belt area				Total baseline carbon stock change in the leakage belt area	
	ID_{ct}	bh-T	ID_{ct}	bmh-PM	annual	cumulative
	$ABSLRR_{ct,t}$	$\square Cab_{ct,t}$	$ABSLRR_{ct,t}$	$\square Cab_{ct,t}$	$\square CabBSLRR_t$	$\square CabBSLRR$
	ha	tCO ₂ -e ha ⁻¹	ha	tCO ₂ -e ha ⁻¹	tCO ₂ -e ha ⁻¹	tCO ₂ -e ha ⁻¹
2018	2,366	359,687	27	2,458	362,145	362,145
2019	2,715	412,760	19	1,710	414,469	776,614
2020	2,487	378,126	53	4,896	383,022	1,159,637
2021	2,063	313,608	33	3,028	316,636	1,476,272
2022	2,023	307,522	23	2,074	309,596	1,785,868
2023	2,224	338,190	17	1,562	339,753	2,125,621
2024	2,349	357,163	34	3,154	360,317	2,485,938
2025	1,796	273,093	21	1,966	275,058	2,760,997
2026	1,883	286,253	14	1,300	287,552	3,048,549
2027	1,892	287,695	11	1,027	288,723	3,337,272
2028	1,836	279,131	7	607	279,738	3,617,010
2029	1,812	275,501	3	265	275,767	3,892,777
2030	1,784	271,285	5	431	271,717	4,164,494
2031	1,815	275,947	5	490	276,437	4,440,931
2032	1,699	258,331	4	369	258,700	4,699,630
2033	1,645	250,145	2	225	250,370	4,950,001
2034	1,634	248,505	4	392	248,897	5,198,898
2035	1,637	248,925	6	567	249,492	5,448,390
2036	1,557	236,734	5	460	237,194	5,685,584
2037	1,506	229,033	4	339	229,373	5,914,956
2038	1,501	228,208	5	451	228,659	6,143,616
2039	1,512	229,921	3	315	230,236	6,373,852
2040	1,415	215,066	1	136	215,201	6,589,053
2041	1,379	209,592	0	3	209,595	6,798,648
2042	1,333	202,617	0	15	202,632	7,001,281
2043	1,314	199,745	0	9	199,754	7,201,035
2044	1,209	183,834	0	0	183,834	7,384,869
2045	1,182	179,790	0	2	179,792	7,564,662
2046	1,151	175,059	0	1	175,060	7,739,721
2047	1,175	178,627	0	1	178,628	7,918,349
2048	1,108	168,410	0	0	168,410	8,086,760

After calculating the estimated carbon content for the reference period for each year. The methodology considers the baseline emissions caused by forest burning. However, as mentioned in section 3.1.3 in the Carbon Pools and the explanation, they are omitted from the quantification. This is the reason why tables 23 and 24 are not filled out.

- **STEP 7- Ex ante estimation of actual carbon stock changes and non-CO2 emissions in the project area**

The objective of this step is to provide an ex ante estimate of future changes in carbon stocks and non-CO2 emissions from wildfires in the project ("actual") scenario. Since actual changes in carbon stocks and GHG emissions will be subject to MRV the reason for estimating them at the beginning of a fixed reference period is to help guide the optimal implementation of emission reduction measures and to allow reasonable revenue projections to be made. However, as no deforestation or planned degradation activities are contemplated within the project area and their respective emissions, it is not appropriate to apply this step, and therefore tables 25 to 29 are omitted as required by the methodology.

4.3 Leakage

- **STEP 8 - Ex ante estimation of leakage**

For the development of this project, the ex ante leakage estimation procedure was used, step 8 of VM0015 - Guidelines for ex ante estimation of leakage was applied. Ex ante estimation of the reduction in carbon stocks and increase in greenhouse gas emissions due to leakage prevention measures.

Project activities will not generate significant GHG emissions compared to those existing and determined in the baseline. Tables 30a, b, c, as well as tables 34 and 35 of the vm0015 methodology do not apply to the Project. Similarly, the Project will not implement extensive grazing activities, but rather sustainable livestock activities that represent emissions below the existing baseline emissions in the LMA, so Tables 31, 32 and 33 of the vm0015 methodology do not apply.

GHG emissions from displacement of activities could only be considered leakage if these emissions are within the leakage belt (LK) and occur above baseline projections. A mobility analysis was used to calculate the extent of the project leakage belt and the results of this analysis are presented in section 3.1.3. (As stated in the footnote of the VCS methodology vm0015 "If the agents of deforestation do not participate in leakage prevention activities and project activities, the Displacement Factor will be 100%. When leakage prevention activities are implemented, the factor will be equal to the proportion of baseline agents that are estimated to have the opportunity to participate in leakage prevention activities and project activities", therefore, if all agents have the opportunity to participate in Project activities, the LDF should be zero). Under this assumption, the project intends for the agents to participate in the project activities and the LDF should be zero for this particular case.

In addition, the VM0015 methodology indicates that the amount of leakage will depend on the Leakage Displacement Factor (LDF) which is equal to the proportion of deforestation agents that do not participate in Project activities.

Following these assumptions and putting them into practice, the Meta Sur, Forests of Peace, Livelihoods Project will not generate displacement leakage because the Project activities are

designed to provide all deforestation agents that reach the Project Boundary the opportunity to participate in Project activities.

Among the alternative activities to those that generate deforestation, the fourth line of action of the project contemplates the development of cattle ranching, using sustainable practices in areas that currently constitute pasture or other agricultural cover. The implementation of technical assistance programs for the development of sustainable livestock farming practices seeks to strengthen project partners' knowledge of this activity, as well as cooperative systems and networks. In the long term, to reduce deforestation caused by the expansion of the livestock frontier into forest areas, where the cover is eliminated and transformed in order to take advantage of more areas.

It is relevant to highlight that cattle ranching and praderization for 2017 were considered nationally responsible for 70% of deforestation in Colombia¹⁹, which is associated with the development of these activities in soils with a different vocation than cattle ranching and the existence of a cultural rootedness to establish and develop this type of work, mainly in the region of the eastern plains, where the project is located. Precisely because of this deep-rootedness, sustainable livestock farming was one of the actions selected by the partners to be implemented with the funds derived from the project's carbon credits.

Related to the inherent risk of displacement by livestock practices to other areas of the leakage management belt, as indicated in section 3.2.3 Leakage of section 3.2 Quantification of GHG Emission Reductions and Removals, according to the VM0015 Methodology in step 8, Section 8.1 Ex ante estimation of the decrease in carbon stocks and increase in GHG emissions due to leakage prevention measures, it should be noted that although it is proposed as an alternative activity to cattle ranching, one of the main drivers of deforestation at the national level, its implementation with sustainable practices will involve approximately 50% of the project partners, This implies a maximization of productivity with a lower environmental impact, different from the traditional model (extensive cattle ranching) developed in large areas affecting the diversity of fauna and flora due to the processes of transformation of natural habitats by overgrazing.

Therefore, emissions from livestock activities developed in a sustainable manner through silvopastoral systems, generating landscapes of greater diversity of plant species in the pastures with the implementation of live fences (contributing to the structural connectivity of fauna), shaded areas, conservation of natural water sources, among other benefits, will be significantly lower than those that could be generated in the same areas, if in comparison, traditional livestock activities were developed. Thus, the methodology contemplates as leakage and as indicated in section 3.2.3 "could only be considered leakage if these emissions are within the leakage belt (LK) and occur above the baseline projections". In conclusion, taking into account the above, for

¹⁹ https://cdn.cdp.net/cdp-production/cms/policy_briefings/documents/000/004/038/original/Policy_Brief_Colombia_Nov18_web.pdf?1605770366#:~:text=En%202017%20la%20deforestaci%C3%B3n%20aument%C3%B3,la%20deforestaci%C3%B3n%20en%20el%20pa%C3%ADs.

the present project, conceptually the emissions from sustainable livestock development are below the baseline estimate, compared to those generated by traditional extensive livestock farming and its displacement to forest areas when the productive capacity of the soil is reduced.

Other alternative activities to those that generate deforestation and with which benefits will be transferred include the establishment and production of citrus, avocado, cacao and coffee crops for other areas where the quality of the site permits. Similar to sustainable cattle ranching, conceptually per hectare there will be an increase in productivity with less environmental impact, which is a constant environmental improvement compared to traditional historical practices.

Since the area of the leakage management belt is constituted by the different coverages of the project area within the properties of the adherent partners, in which all the alternative actions to those that generate deforestation will be implemented through the transfer of benefits derived from the sale of carbon credits. Therefore, it is certain that all the partners will participate in the formulated projects, therefore the leakage displacement factor according to the VM0015 Methodology will be zero. Therefore, tables 30 to 35 of the methodology are omitted.

4.4 Net GHG Emission Reductions and Removals

STEP 9 - Ex ante total net anthropogenic GHG emission reductions

As required by the Methodology in step 9 Ex ante total net anthropogenic GHG emission reductions, and in its sub-step 9.1 Significance assessment, the following is performed to determine the significance of each of the changes in carbon stocks and GHG emissions calculated ex ante for the significant sources and pools indicated in section 3.1.3 Project boundary - Carbon pools.

In the case of the Meta Sur, Forests of Peace, Livelihoods Project, in sub-step 9.2 Calculation of ex-ante estimation of total net GHG emissions reductions. The net reduction of anthropogenic GHG emissions from the proposed AUD project activity is calculated as follows using equation 19 of the methodology:

$$\Delta REDDt = (\Delta CBSLPAt + EBBBSLPAt) - (\Delta CPSPAt + EBBPSAt) - (\Delta CLKt - ELKt)$$

$$\Delta REDDt = 14,977,409$$

Equation 1 (19): Ex ante estimation for Project emission reductions.

Where:

$\Delta REDDt$: Net GHG emission reductions by the project in a year t (tCO₂e);

$\Delta CBSLPAt$: Sum of carbon stock change in the base line on the Project area year t (tCO₂e);

$EBBBSLPAt$: Sum of carbon stock change from biomass burning from base line on the Project area year t (tCO₂e);

$\Delta CPSPAt$: Sum of real carbon stock change estimated ex ante in the Project area on the year t (tCO₂e);

EBBPSPAt: Sum of real carbon stock change from biomass burning estimated ex ante in the Project area on the year (tCO₂CO₂e);

ΔCLKt: Sum of net carbon stock change estimated of leakage ex ante in the Project area on the year t (tCO₂CO₂e);

ELKt: Sum of leakage estimated ex ante year t (tCO₂CO₂e);

t: 1, 2, 3 ... T, one year in the crediting period proposed by the project.

As indicated in the methodology in the substep 9.3 the Ex ante calculation of Verified Carbon Units (VCU), consecutively, To estimate the number of VCUs, we used equation 20 of VM0015. The Project Risk Factor parameter was estimated through the VCS AFOLU Non-permanence Risk Tool document, resulting in 22%.

$$VCUt = \Delta REDDt - VBCt$$

$$VBCt = (\Delta CBSLPA_t - \Delta CPSPA_t) * RF_t$$

$$VCUt = 14,997,409 - 3,295,030$$

$$VCUt = 11,682,379$$

Ecuación 2 (20): Number of buffer credits deposited in the VCS buffer at the moment t (t CO₂CO₂-e).
Where:

VCUt: Number of VCUs that can be trade in the moment t (tCO₂CO₂e);

ΔREDDt: net GHG emission reduction ex ante by the project year t (tCO₂CO₂e);

VBCt: number of buffer credit to be on the VCS buffer on time t (t CO₂CO₂-e);

ΔCBSLPA: Sum on carbon stock change on the baseline on the project area in the year t(tCO₂CO₂e);

ΔCPSPA: sum of real carbon stock change estimated ex ante on the project area year t (tCO₂CO₂e);

RFt: risk facto used to calculate VCS buffer credits (%);

t: 1, 2, 3 ... T, one year in the crediting period proposed by the project

In accordance with the methodology, the results are presented following the structure of table 36 of the VM0015 methodology template. It is presented in the Annex Tables, because of its size it is out of the template of this document. Likewise, presents the information obtained for the estimation of net reductions, adding the calculation information of the CUVs penalized by the risk factor of the AFOLU non-permanence risk tool, corresponding to 22%.

According to the methodology, the results are presented following the structure of table 36 of the VM0015 methodology template. It is presented in the Annex "PD Calculation Report", which due to its size is outside the template of this document. Likewise, presents the information obtained for the estimation of net reductions, adding the calculation information of the CUVs penalized by the risk factor of the AFOLU non-permanence risk tool, corresponding to 22%.

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
2019	610,572	610,572	0	610,572
2020	571,833	125,803	0	571,833
2021	510,000	112,200	0	510,000
2022	573,324	126,131	0	573,324
2023	599,301	131,846	0	599,301
2024	623,078	137,077	0	623,078
2025	628,479	138,265	0	628,479
2026	501,626	110,358	0	501,626
2027	494,100	108,702	0	494,100
2028	468,818	103,140	0	468,818
2029	462,899	101,838	0	462,899
2030	464,100	102,102	0	464,100
2031	479,486	105,487	0	479,486
2032	459,101	101,002	0	459,101
2033	452,788	99,613	0	452,788
2034	451,613	99,355	0	451,613
2035	462,368	101,721	0	462,368
2036	431,550	94,941	0	431,550
2037	442,444	97,338	0	442,444
2038	454,965	100,092	0	454,965
2039	454,322	99,951	0	454,322
2040	424,667	93,427	0	424,667

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
2041	423,052	93,071	0	423,052
2042	422,443	92,937	0	422,443
2043	438,193	96,403	0	438,193
2044	431,256	94,876	0	431,256
2045	424,067	93,295	0	424,067
2046	416,563	91,644	0	416,563
2047	421,613	92,755	0	421,613
2048	398,123	87,587	0	398,123
Number of VCUs that can be trade (tCO₂e)				11,229,458

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	Deforestation
Data unit	Hectare (ha)
Description	Forest to no forest maps
Source of data	IDEAM - http://smbyc.ideam.gov.co/MonitoreoBC-WEB/reg/indexLogOn.jsp
Value applied	Number of hectares deforested in the 2010 – 2018 period modeled or projected
Justification of choice of data or description of measurement methods and procedures applied	It is required to know the number of hectares historically deforested, to establish, on a yearly basis model, the number of hectares not deforested thanks to the project
Purpose of Data	<ul style="list-style-type: none"> - Determination of baseline scenario - Calculation of baseline emissions - Calculation of project emissions

	- Calculation of leakage
Comments	

Data / Parameter	CF
Data unit	<i>T</i>
Description	Carbon contained in dry biomass
Source of data	<i>IPCC</i>
Value applied	<i>0.47</i>
Justification of choice of data or description of measurement methods and procedures applied	Value found in scientific literature
Purpose of Data	<ul style="list-style-type: none"> - Determination of baseline scenario - Calculation of baseline emissions - Calculation of project emissions - Calculation of leakage
Comments	

Data / Parameter	ABSLRRt
Data unit	<i>Hectares (ha)</i>
Description	Annual area of baseline deforestation within the RR at year t
Source of data	Calculated, VM0015
Value applied	Table 9a, 11a Annex VM0015 tables
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of the VM0015
Purpose of Data	Calculation of baseline emissions
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLRR
Data unit	<i>Hectares (ha)</i>
Description	Cumulative area of baseline deforestation in the reference region at year t
Source of data	<i>Calculated</i>
Value applied	
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of the VM0015
Purpose of Data	Calculation of baseline emissions
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLPA _t
Data unit	Ha
Description	Annual area of baseline deforestation in the project area at year t
Source of data	<i>Calculated</i>
Value applied	Table 9b, 22a Annex VM0015 tables
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of the VM0015
Purpose of Data	Calculation of baseline emissions
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLPA _{icl,t}
Data unit	Ha
Description	Area of initial (pre-deforestation) forest class icl deforested at time t within the project area in the baseline

Source of data	<i>Calculated</i>
Value applied	Table 22b Annex VM0015 tables
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of VM0015
Purpose of Data	Calculation of baseline emissions
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLPA _{i,t}
Data unit	Ha
Description	Annual baseline deforestation area by forest type in the project area in the year t
Source of data	<i>Calculated</i>
Value applied	Table 9b, 22b Annex VM0015 tables
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of VM0015
Purpose of Data	Calculation of baseline emissions
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLPA
Data unit	Ha
Description	ABSLPA
Source of data	<i>Calculated</i>
Value applied	
Justification of choice of data or description of	Calculated according to requirements of VM0015, by applying land cover map

measurement methods and procedures applied	
Purpose of Data	Calculation of baseline emissions
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLPAz,t
Data unit	Ha
Description	Area of the zone z “deforested” at time t within the project area in the baseline case
Source of data	<i>Calculated</i>
Value applied	
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of VM0015, by applying forest to no forest maps from IDEAM
Purpose of Data	Calculation of baseline emissions
Comments	Calculating net GHG emissions via post-deforestation C-stocks

Data / Parameter	ABSLKt
Data unit	Ha
Description	Annual area of baseline deforestation within the leakage belt at year t
Source of data	<i>Calculated</i>
Value applied	
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of VM0015
Purpose of Data	Calculation of leakage
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLLK _{icl,t}
Data unit	Ha
Description	Area of initial (post-deforestation) forest class fcl deforested at time t within the leakage belt in the baseline case
Source of data	<i>Calculated</i>
Value applied	
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of VM0015, by applying land cover map
Purpose of Data	Calculation of leakage
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLLK _{i,t}
Data unit	Ha
Description	Annual area of deforestation in stratum (i) within the leakage belt at year t
Source of data	<i>Calculated</i>
Value applied	
Justification of choice of data or description of measurement methods and procedures applied	Activity data for calculating GHG emissions. Calculated according to requirements of VM0015
Purpose of Data	Calculation of leakage
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLLK
Data unit	Ha

Description	Cumulative area of baseline deforestation within the leakage belt at year t
Source of data	<i>Calculated</i>
Value applied	
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of VM0015
Purpose of Data	Calculation of leakage
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	CFj
Data unit	<i>Dimensionless</i>
Description	Cumulative area of baseline deforestation within the leakage belt at year t
Source of data	<i>Calculated</i>
Value applied	
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of VM0015
Purpose of Data	Calculation of leakage
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	Cabcl
Data unit	tCO ₂ e ha ⁻¹
Description	Average carbon stock per hectare in the above-ground biomass carbon pool of LU/LC class cl
Source of data	<i>Calculated</i>
Value applied	

Justification of choice of data or description of measurement methods and procedures applied	
Purpose of Data	Calculation of baseline emission
Comments	Emissions factors for estimating GHG emissions from deforestation.

Data / Parameter	Rj
Data unit	Relation factor
Description	Root shoot ratio
Source of data	IPCC/Literature value
Value applied	0.29
Justification of choice of data or description of measurement methods and procedures applied	Default value of 0.29 from IPCC Guidelines for National Greenhouse Gas Inventories. 2006. Table 4.3/Mokany 2006
Purpose of Data	Calculation of baseline emission
Comments	Belowground biomass estimation

Data / Parameter	Cbbcl
Data unit	tCO ₂ e ha ⁻¹
Description	Average carbon stock per hectare in the below-ground biomass carbon pool of LU/LC class cl
Source of data	Calculated, see calculation sheet
Value applied	
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of Data	Calculation of baseline emission

Comments	Emissions factors for estimating GHG emissions from deforestation.
Data / Parameter	C _{tot} (icl)
Data unit	tCO ₂ e ha ⁻¹
Description	Average carbon stock per hectare in the below-ground biomass carbon pool of LU/LC class cl
Source of data	<i>Calculated</i>
Value applied	
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of Data	Calculation of baseline emission
Comments	Emissions factors for estimating GHG emissions from deforestation.

Data / Parameter	C _{tot} l,t
Data unit	tCO ₂ e ha ⁻¹
Description	Average carbon stock of all accounted carbon pools in forest class icl at time t
Source of data	<i>Calculated</i>
Value applied	<i>Deemed de-minimus</i>
Justification of choice of data or description of measurement methods and procedures applied	Significance analysis.
Purpose of Data	Calculation of baseline emission
Comments	N.A.

Data / Parameter	C _{abf} l
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Data unit	tCO ₂ e ha ⁻¹
Description	Average carbon stock per hectare in the above-ground biomass carbon pool of final post-deforestation class fcl
Source of data	<i>Calculated</i>
Value applied	
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of VM0015
Purpose of Data	Calculation of baseline emission
Comments	Calculate GHG emissions from deforestation

Data / Parameter	C _p
Data unit	tCO ₂ e ha ⁻¹
Description	Average carbon stock per hectare in the carbon pool p
Source of data	Table 20.a
Value applied	Table 20.a. Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	Requirements of the VM0015 sec. 6.1.2.
Purpose of Data	Calculation of baseline emission
Comments	Baseline GHG emissions estimates

Data / Parameter	C _{totfcl} , t
Data unit	tCO ₂ e ha ⁻¹
Description	Average carbon stock of all accounted carbon pools in non-forest class fcl at time t;
Source of data	N.A.
Value applied	N.A.

Justification of choice of data or description of measurement methods and procedures applied	Leakage management activities do not decrease carbon stocks.
Purpose of Data	Calculation of baseline emission
Comments	N.A

Data / Parameter	$\Delta C_{ab}ABSLKK$
Data unit	tCO ₂ e
Description	Cumulative baseline carbon stock changes for the above-ground biomass pool in the leakage belt
Source of data	Table 21.c.1, Annex VM0015
Value applied	See Table 21.c.1, Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	GHG accounting in the leakage belt.
Purpose of Data	Calculation of leakage
Comments	N.A.

Data / Parameter	$\Delta C_{bb}ABSLKK$
Data unit	tCO ₂ e ha ⁻¹
Description	Cumulative baseline carbon stock changes for the below-ground biomass pool in the leakage belt
Source of data	Table 21.c.1 Annex VM0015
Value applied	See Table 21.c.1 Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	GHG accounting in the leakage belt
Purpose of Data	Calculation of leakage

Comments	N.A
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Data / Parameter	$\Delta C_{abBSLPA}$
Data unit	tCO ₂ e
Description	Cumulative baseline carbon stock changes for the above-ground biomass pool in the project area
Source of data	Table 21.b.1 Annex VM0015
Value applied	See Table 21.b.1 Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	GHG accounting in the project area.
Purpose of Data	Calculation of baseline emission
Comments	N.A.

Data / Parameter	$\Delta C_{bbABSLPA}$
Data unit	tCO ₂ e
Description	Cumulative baseline carbon stock changes for the below-ground biomass pool in the project area
Source of data	Table 21.b.1 Annex VM0015
Value applied	See Table 21.b.1 Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	GHG accounting in the project area.
Purpose of Data	Calculation of baseline emission
Comments	N.A.

Data / Parameter	ΔC_{ADLK}
Data unit	tCO ₂ e

Description	Cumulative total decrease in carbon stocks due to displaced deforestation
Source of data	Table 34, 35, Annex VM0015
Value applied	See Table 34, 35, Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	GHG accounting from displaced leakage
Purpose of Data	Calculation of leakage
Comments	N.A.

Data / Parameter	ΔCBSLPA
Data unit	tCO ₂ e
Description	Total baseline carbon stock changes in the project area
Source of data	Table 36, Annex VM0015
Value applied	See Table 36, Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	GHG accounting in the project area
Purpose of Data	Calculation of leakage
Comments	N.A.

Data / Parameter	ΔCPSPA
Data unit	tCO ₂ e
Description	Cumulative project carbon stock change within the project area at year t
Source of data	See Tables 27 and 36, Annex VM0015
Value applied	Tables 27 and 36, Annex VM0015
Justification of choice of data or description of	Calculation of net GHG emissions reductions

measurement methods and procedures applied	
Purpose of Data	Calculation of baseline emissions
Comments	N.A.

Data / Parameter	ΔCUDdPA
Data unit	tCO ₂ e
Description	Cumulative actual carbon stock change due to unavoided unplanned deforestation at year t in the project area
Source of data	Table 27, Annex VM0015.
Value applied	Effectiveness index: 40%
Justification of choice of data or description of measurement methods and procedures applied	Measure of project effectiveness
Purpose of Data	Calculation of project emissions
Comments	N.A.

Data / Parameter	ΔREDDt
Data unit	tCO ₂ e
Description	Net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year t
Source of data	See Table 36, Annex VM0015
Value applied	Table 36, Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	The cumulative result of applying the VM0015 methodology
Purpose of Data	Calculation of project emissions
Comments	Final GHG calculations

Data / Parameter	DLF
Data unit	%
Description	Displacement leakage factor
Source of data	Table 34, Annex VM0015
Value applied	5
Justification of choice of data or description of measurement methods and procedures applied	ex-ante leakage
Purpose of Data	Calculation of leakage
Comments	N.A.

Data / Parameter	EI
Data unit	%
Description	ex-ante estimated Effectiveness Index
Source of data	Estimate generated by the project
Value applied	0.40
Justification of choice of data or description of measurement methods and procedures applied	Estimate generated by the project
Purpose of Data	Calculation of project emissions
Comments	N.A.

Data / Parameter	ELK
Data unit	tCO ₂ e
Description	Cumulative sum of ex-ante estimated leakage emissions at year t
Source of data	Table 35, 36 Annex VM0015
Value applied	Table 35, 36 Annex VM0015

Justification of choice of data or description of measurement methods and procedures applied	The cumulative result of applying the VM0015 methodology
Purpose of Data	Calculation of leakage
Comments	N.A.

Data / Parameter	RFt
Data unit	%
Description	Risk factor used to calculate VCS buffer credits
Source of data	VCS Non Permanence Risk analysis
Value applied	22
Justification of choice of data or description of measurement methods and procedures applied	see VCS Non-Permanence Risk Analysis
Purpose of Data	Calculation of project emissions
Comments	N.A.

Data / Parameter	VBCt
Data unit	%
Description	Number of Buffer Credits deposited in the VCS Buffer at time t;
Source of data	Risk factor used to calculate VCS buffer credits
Value applied	22
Justification of choice of data or description of measurement methods and procedures applied	Calculated
Purpose of Data	Buffer calculation
Comments	N.A.

5.2 Data and Parameters Monitored

Data / Parameter	ABSLKt
Data unit	Ha
Description	Annual area of deforestation within the leakage belt at year t
Source of data	Satellite images
Description of measurement methods and procedures to be applied	ALLCOT will be in charged of the climate monitoring according to the methodology VM0015 v1.1. Table 9c, 11c, 13c of Annex VM0015.
Frequency of monitoring/recording	At each verification period
Value applied	0
Monitoring equipment	GIS software
QA/QC procedures to be applied	The methodology for quality control described in the Digital Image Processing Protocol for the quantification of deforestation in Colombia will be used
Purpose of data	Activity data for calculating GHG emissions. Calculated according to requirements of VM0015 v1.1.
Calculation method	Calculation of leakage
Comments	N.A.

Data / Parameter	ABSLPA
Data unit	Ha
Description	Cumulative area of deforestation within the project area at year t
Source of data	Satellite images
Description of measurement methods and procedures to be applied	ALLCOT will be in charged for the climate monitoring according to the methodology VM0015 v1.1. Table 9b, 11b, 13b of Annex VM0015.
Frequency of monitoring/recording	At each verification period

Value applied	0
Monitoring equipment	GIS software
QA/QC procedures to be applied	The methodology for quality control described in the Digital Image Processing Protocol for the quantification of deforestation in Colombia will be used
Purpose of data	Activity data for calculating GHG emissions. Calculated according to requirements of VM0015 v1.1.
Calculation method	Calculation of project emissions
Comments	N.A.

Data / Parameter	ABSLPAt
Data unit	Ha
Description	Annual area of deforestation in the project area at year t
Source of data	Satellite images
Description of measurement methods and procedures to be applied	ALLCOT will be in charge for the climate monitoring according to the methodology VM0015 v1.1. Table 9b, 11b, 13b of Annex VM0015.
Frequency of monitoring/recording	At each verification period
Value applied	0
Monitoring equipment	GIS software
QA/QC procedures to be applied	The methodology for quality control described in the Digital Image Processing Protocol for the quantification of deforestation in Colombia will be used
Purpose of data	Activity data for calculating GHG emissions. Calculated according to requirements of VM0015 v1.1.
Calculation method	Calculation of project emissions

Comments	N.A.
Data / Parameter	ΔCPSPAt
Data unit	t CO ₂ CO ₂ -e
Description	Annual project carbon stock change within the project area at year t
Source of data	Satellite images and carbon stocks
Description of measurement methods and procedures to be applied	<p>ALLCOT will be in charged for the climate monitoring according to the methodology VM0015 v1.1. Table 27 and Table 36, Annex VM0015</p> <p>Additionally, the survey of sample plots is carried out following the methodology for the survey of plots of the National Forest Inventory.</p>
Frequency of monitoring/recording	At each verification period
Value applied	See Table 27 and Table 36, Annex VM0015.
Monitoring equipment	N.A.
QA/QC procedures to be applied	<p>The methodology for quality control described in the Digital Image Processing Protocol for the quantification of deforestation in Colombia will be used.</p> <p>The GPS equipment will be calibrated based on the manufacturer's indications</p>
Purpose of data	Calculation of project emissions
Calculation method	Activity data for calculating GHG emissions reductions.
Comments	N.A.

Data / Parameter	ΔREDD
Data unit	t CO ₂ CO ₂ -e

Description	Cumulative net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity
Source of data	Methodology VM0015 v1.1. Table 36, Annex VM0015
Description of measurement methods and procedures to be applied	According to the methodology VM0015 v1.1. Table 36, Annex VM0015.
Frequency of monitoring/recording	At each verification period
Value applied	See VM0015 v1.1. Table 36, Annex VM0015
Monitoring equipment	N.A.
QA/QC procedures to be applied	QA/QC coordinator
Purpose of data	Calculation of project emissions
Calculation method	$\Delta REDD_t = (\Delta CBSLPAt + EBBBSLPAt) - (\Delta CPSPAt + EBBPSAt) - (\Delta CLKt - ELKt)$
Comments	N.A.

Data / Parameter	$\Delta REDD_t$
Data unit	t CO ₂ e
Description	Net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year t
Source of data	Methodology VM0015 v1.1. Table 36, Annex VM0015
Description of measurement methods and procedures to be applied	According to the methodology VM0015 v1.1. Table 36, Annex VM0015
Frequency of monitoring/recording	At each verification period
Value applied	VM0015 v1.1. Table 36, Annex VM0015

Monitoring equipment	N.A.
QA/QC procedures to be applied	QA/QC coordinator
Purpose of data	Calculation of project emissions
Calculation method	Final GHG calculations
Comments	N.A.

Data / Parameter	RFt
Data unit	%
Description	Risk factor used to calculate VCS buffer credits
Source of data	VCS Non Permanence Risk analysis
Description of measurement methods and procedures to be applied	AFOLU Non permanence Risk Tool v.3.2
Frequency of monitoring/recording	At each verification period
Value applied	22%
Monitoring equipment	N.A.
QA/QC procedures to be applied	N.A.
Purpose of data	Calculation of project transable VCU
Calculation method	N.A.
Comments	Buffer calculation

Data / Parameter	VBCt
Data unit	t CO ₂ CO ₂ -e
Description	Number of Buffer Credits deposited in the VCS Buffer at time t;
Source of data	Methodology VM0015 v1.1. Table 36, Annex VM0015
Description of measurement methods and procedures to be applied	According to the methodology VM0015 v1.1. Table 36, Annex VM0015
Frequency of monitoring/recording	At each verification period
Value applied	See Table 36, Annex VM0015
Monitoring equipment	N.A.
QA/QC procedures to be applied	N.A.
Purpose of data	Calculation of project emissions
Calculation method	N.A.
Comments	Buffer calculation

Data / Parameter	VCUt
Data unit	t CO ₂ CO ₂ -e
Description	Number of Verified Carbon Units (VCUs) to be made available for trade at time t
Source of data	Methodology VM0015 v1.1. Table 36, Annex VM0015
Description of measurement methods and procedures to be applied	According to the methodology VM0015 v1.1. Table 36, Annex VM0015
Frequency of monitoring/recording	At each verification period

Value applied	See VM0015 v1.1. Table 36, Annex VM0015
Monitoring equipment	N.A.
QA/QC procedures to be applied	N.A.
Purpose of data	Calculation of project emissions
Calculation method	N.A.
Comments	<i>Buffer calculation</i>

5.3 Monitoring Plan

The VM0015 methodology was used to monitor the reduction of emissions expected by the project, using as a basis the national deforestation reports generated annually by IDEAM. Given that these reports arrive at the departmental level, the GIS group of Allcot will interpret the images for the four municipalities. It is important to clarify that the image base will be the same used by IDEAM, that is, official sources for Colombia will be used.

The parameters to be considered will be:

- Monitoring of changes in carbon stocks and greenhouse gas emissions for periodic verification.
- Tracking of actual changes in carbon stocks and GHG emissions in the project area and reference region.
- Leakage monitoring.
- Ex post calculation of GHG emission reductions.
- Monitoring of the impacts of natural disturbances and other events identified in the natural risks of the project.

Forest monitoring will be carried out through the establishment of sampling plots, which will obey the technical instructions of the Field Manual for carbon monitoring in natural forests (Ideam, 2014).

The technical team that will carry out the carbon content monitoring will be coordinated by a forestry engineer with proven experience in forest inventories and in field data collection of variables required for carbon content estimates. This professional will have a technical group and an operational support group in the field, all of which will receive the necessary training for the development of the monitoring. This training will be justified and recorded in the monitoring report.

- Satellite image processing and interpretation

Annex 2.6 presents the protocol used in the acquisition, processing and quality assurance of information from satellite images. These images will be used in monitoring for land cover identification and forest condition analysis in the project area.

The protocol describes the image processing, type of bands used, the geometric correction to be performed, Conversion of the data to surface reflectance, Cloud and water masking. In addition, the processing is focused on image classification, in which pixels of a finite number of individual classes or data categories are grouped, based on visualization, digital levels of the data and from the satisfaction of coverage criteria, in this case framed in the Corine Land Cover methodology.

As a method for validating the thematic accuracy of the land cover layers for the three analysis periods, a preliminary statistical analysis of concordance was proposed using the $n \times n$ dimension confusion matrix method, in which the agreements and disagreements between the interpreted information and the reference information are counted; where the main diagonal of the matrix will indicate the existing agreements between the interpreted land cover and the reference information. For this, it is recommended to use ArcGIS tools to optimize the process.

- Definition of mapping units

The definition of the units of analysis for the survey of forest plots for carbon monitoring starts from the identification of the forest types included in the models for the estimation of aboveground biomass and carbon in natural forests (Yepes et al., 2011). Vegetation cover units (IDEAM, 2010) and the climatic classification proposed in Holdridge's methodology (1978) are taken into account. This is considered appropriate for REDD+ projects (Yepes et al., 2011).

The Map of Forest Types is used, which is the result of superimposing the previously identified vegetation the vegetation cover map with the life zones map for Colombia (IDEAM, 2005). Table 36 shows an example of the result of the cartographic analysis used for the first carbon monitoring. Seven (7) forest type units were identified, five (5) in the tropical rainforest (bh- T) and two (2) in the tropical rainforest (bh- T) and two (2) in the very humid premontane forest (bmh-PM).

Table 36 Types of forests identified in the first carbon monitoring

LIFES ZONES	LAND COVER	FOREST TYPES
Tropical rainforest (bh-T)	Open forest	bh-T Open forest
	River forest	bh-T River forest
	Dense forest	bh-T Dense forest
	Fragmented forest	bh-T Fragmented forest
	Morichales	bh-T Morichales
Very humid premontane forest (bmh-PM)	Dense forest	bmh-PM Dense forest
	Fragmented forest	bmh-PM Fragmented forest

- Definition of the type and intensity of sampling

A Probabilistic Sampling will be carried out. A Stratified Random Design will be used, in which the strata correspond to the defined forest types. The samples will be placed in the strata. Strata are defined as subgroups of units of analysis that differ in the characteristics to be analyzed. To define the number of sample elements to be selected from each of the strata, the following

options are used. According to Bai et al.(2013), proportional allocation and optimal allocation can be used. In proportional allocation, the sample size of each stratum is proportional to the size of the stratum that gave rise to it, with respect to the total population. In optimal allocation, the sample size of each stratum is defined by the sampler.

In the selection of the sampling sites, due to the historical reports of the region, safety aspects must be considered.

The sample size and sampling intensity are defined based on the technical considerations of the Protocol for National and Subnational Carbon Estimation (Yepes et al., 2011). This document highlights that, in order to achieve an adequate error in the framework of REDD projects, an error of $\pm 10\%$ is allowed, with 95% confidence. For this reason, two (2) stages are presented below to define the number of sampling units.

The first stage includes the calculation of the theoretical sampling intensity, based on experiences from forest inventories of forest management plans and forest studies in the project's area of influence. In the second stage, the sampling error is progressively calculated until the final number of plots required to reach a 10% admissible error is specified. The calculation of the number of plots will be given by the coefficient of variation, the desired sampling error and the t-Student distribution. The relationship of these variables is given by the following equation.

$$n = \frac{(t_{\alpha/2gl})^2 * (CV\%)^2}{(E\%)^2}$$

$t_{\alpha/2gl}$ = Value of the t - student table with a significance level α with n - 1 degrees of freedom.

CV% = Coefficient of variation associated with pre-sampling stage

E% = Sampling error equal to or less than 10%.

- Location of the plots

The survey of each plot will be carried out in a square shape, using a precision compass, stakes and tape measure. Four stakes will be used to delimit each plot and they will be identified on the base post with the respective code, written with indelible paint.

Once each plot is established, it will be assigned a nomenclature code, and then georeferenced using a calibrated GPS, with which the decimal coordinates (National Origin) of the south western vertex, which corresponds to the base post of the plot, will be recorded. From this vertex the systematic route will be made in a left-right-left and lower-upper-lower direction. In the assembly of the plots and their quadrants, the course, distance and slope correction will be considered with the help of the compass and the analog clinometer.

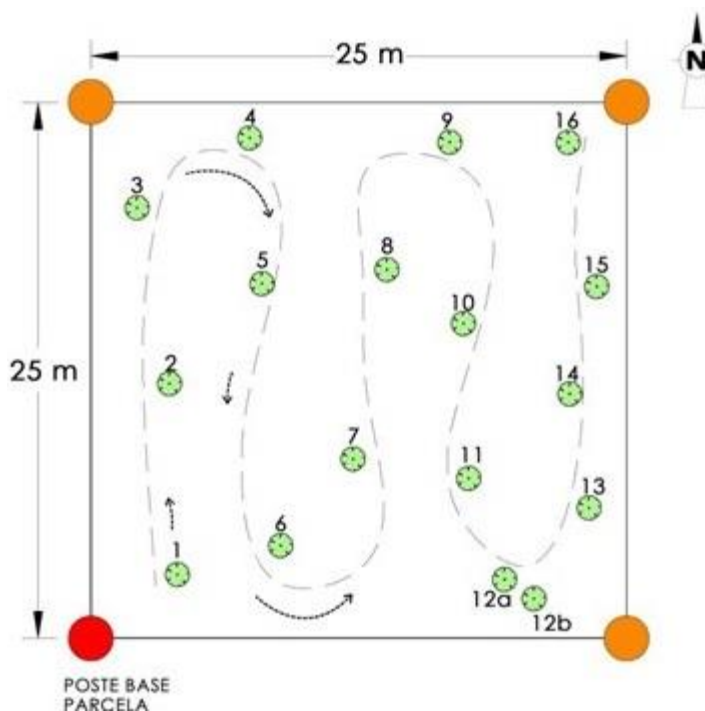


Figure 37. Sequence diagram of the route sequence in the plots

The establishment of the plots within each of the pre-established coverages will be carried out with the help of digital cartography, making adjustments in the field if necessary, and following the recommendations for the establishment of plots in the protocol for National-Subnational Estimation of Biomass-Carbon in Colombia, the Field Manual for Carbon Monitoring in Natural Forests (Peña et al., 2014) and the Field Manual of the National Forest Inventory of Colombia (IDEAM, 2018).

- *Measurement of trees*

In each 25 m x 25 m plot, all tree and palm species with a DBH ≥ 10 cm will be measured. The following variables will be recorded for each individual:

- Numbering
- Common name of the individual.
- Scientific name of the individual.
- Height of palms (m): Distance from the base of the individual to the point where the plume of leaves begins. In the case of palms, the total height is considered to be equivalent to the height of the stem or stipe.
- Total height of trees (m): Vertical distance between the ground and the apical (highest) part of the plant; the total height will be measured at 40% of the individuals, using an analog clinometer. The height of 100% of the trees will be estimated from a measurement of 40% of the individuals; the total height of the remaining 60% will be calculated using regression models that relate the total height to the diameter of the tree, based on data

from 40% (Figure 1-3). The use of these models is suitable for carbon (Yepes et al., 2011) and biomass estimation (VCS, 2012; Yepes et al., 2011).

- f) Tree stem height (m): The height of the stem from its base to the height of the first branch, the total height of 40% of the individuals will be measured, also using an analog clinometer. The height of the trunk of the remaining 60% of the individuals will be calculated by means of a regression that relates the height with the diameter of the tree, from the data of the aforementioned 40%.
- g) DBH (cm): Diameter at breast height (1.3 m above the ground), measured with bark. It will be measured with a diametric tape (Figure 1-3).
- h) Shaft shape and condition: straight, twisted, twisted, bifurcated, decoped, dead, among other options.

The recording of the variables mentioned above will be recorded in the previously prepared field forms, which will also include aspects such as date, person in charge, plot code, forest type, municipality, village, decimal coordinates and altitude of the sampling site.

An agreement has been signed with the district university "Francisco José de Caldas" in the city of Bogotá D.C. The university will carry out and ensure the technical consistency of the required studies. However, ALLCOT will perform verifications of the information generated and will make the necessary adjustments regarding the requirements of the standards.

The information collected in the field of the tree and palm individuals registered in the sampling units will be structured in a final database in Excel to be delivered to ALLCOT, which will be accompanied by a technical memory of the sampling error calculation; likewise, the location points of the surveyed plots will be georeferenced through the use of specialized software in geographic information systems, delivering the information in Shapefile format. The information collected in the field will be digitalized and delivered to ALLCOT on a weekly basis in Excel format. The information will be scanned daily and at the end of the field trip, the physical formats will be delivered.

- Data collection

The capture of information on the forestry component starts with the completion of field forms, which were adjusted to record the relevant information for forest monitoring, with variables such as diameter at breast height, total tree height, regional name and name scientific.

It is necessary to clarify that the use of physical forms is scheduled, because the weather conditions, in addition to the limited internet access in the project area, do not allow the use of electronic devices for the storage of information.

Considering the volume of data to be handled, it is necessary to manage an adequate database for the organization, storage and management of information; Likewise, the handling of a large amount of information makes it necessary to incorporate a mirror database that allows the information captured in the field to be duplicated in order to carry out the respective controls on data capture, ensuring the quality of the original information.

- Information storage

The information recorded in the field forms is marked consecutively, in addition, in the upper part of the forms the data of each plot and the data of the person who filled out each form are recorded, in order to follow up in case to find a fact that is not clear.

These forms are digitized for later analysis, and these files are named with the initial letters of each municipality of the project in which the information was collected, followed by the initials of the type of forest to which it corresponds and finally the consecutive number of each plot. Example:

VH_BD_bhT_56

These correspond to:

VH: Municipality of Vista Hermosa

BD_bhT: Dense Forest_ Tropical humid forest

56: consecutive plot number

The original field forms are filed in the space that Allcot has for documentation protection. The digitized files are located on the project drive and have backup copies on the Allcot server.

- Information analysis

On the digitized files in Excel format, a quality control of the data will be carried out. As a reference, the expertise of the data analyst will be taken, whose professional training will allow him to determine if a data is within the normal ranges. In case of identifying an atypical data, the verification will be carried out on the original forms to make the correction.

The clean data will be unified and the allometric equations will be applied for each type of forest:

Tropical humid forest

$$Biomass = Exp(-1.544182155 + (2.3733 * \ln(D)))$$

Pre Montane wet forest

$$Biomass = Exp(-1.865582155 + (2.3733 * \ln(D)))$$

where:

D: diameter at chest height in centimeters

- Field brigades

To carry out the monitoring, measurement brigades (groups) will be formed, which will be composed of four people:

- A Forest Engineer: this person will be the leader of the group and will be responsible for quality control of the measurements, will accompany the brigade in the field and will record the heights of the trees. He will be in charge of training his working group in relation to measurement and delimitation of plots, measurement and marking of trees. At the end of each day, he will be responsible for carrying out quality control of the recorded data and identifying and

communicating possible inconsistencies to the work group and making the decision to correct, if necessary, the data in the field.

- A technician: will be the person in charge of recording the diameter of the trees and will supervise the work of marking the trees. He will direct the delimitation of the parcels.
- Two field guides: these two people will be from the region, since they will be in charge (under the supervision of the Forest Engineer) of identifying the trees found with the regional name. They will support the technician in the delimitation of the plots.

APPENDIX

Appendix 1: Project Risks Table

Identify Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
Phenomena of natural and anthropic origin	<p>The main climatic risks that partners and ecosystems may be affected by are forest fires, floods and droughts. For its part, the Third National Communication on Climate Change - TCNCC points out "there is evidence of a high risk in the lower Amazon and southern Orinoquía region" in relation to risks due to climate change (Anex Risk analysis)</p> <p>The vulnerability to the climatic impacts generated by human activities are related to the current management practices of the soil, the forest and the productive systems managed in a traditional way related to cultural practices rooted by generations and the lack of governance of the territory.</p>	<p>According to the high risk of climate change, the municipalities of Puerto Lleras, Puerto Rico and Vista Hermosa present a high risk and Puerto Concordia between low and medium, therefore "priority attention should be directed to adaptive management of the territory" according to the TCNCC.</p> <p>Productive reconversion and the implementation of sustainable production systems will be worked on within the project with training activities and capacity building with partners and communities to mitigate the effects of climate change.</p>
Public order and security	<p>With regard to the risks generated by risky conditions for public order and security, this could lead to the suspension of the project in some areas and the objectives, goals and activities set not being met.</p> <p>Biodiversity: When public risk problems are generated, they could have two consequences; One is that in isolated areas, since the owners do not have access to their properties, important areas of forests are preserved, taking into account the guidelines of the groups outside the law to manage the forests sustainably, or two, the logging is intensified given the same conditions of use. access and that people outside the territory buy important</p>	<p>The project activities have social consensus and work has been done with local actors, organizations and formal institutions that act in the territory, therefore the activities of governance, training and productive projects are designed to adapt to changes in climate and social conditions, however, if public order problems arise, risk assessment is carried out, work is focused on low-risk areas and temporary suspension of the project by public order in medium and high risk areas, while identifying solutions with leaders and partners.</p>

Identify Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
	extensions of forests and cut them down for livestock or other uses.	
Leaks, felling of trees	<p>Risk to biodiversity. In this sense, two cases can be presented: 1) the owners will use the areas outside the forests involved in the project for forest exploitation to avoid intervention in these areas.</p> <p>2) The owners will use wood from the project's forest area for activities such as firewood and wood for construction or home improvement.</p>	<p>The monitoring of forest areas linked to the project, for which the Community Action Boards have an important role, will be part of the control of extractions in a manner.</p> <p>Another aspect to take into account as a control measure is that through Decree 1791 of October 4, 1996, which regulates forest use in Colombia, so that owners can extract wood from the areas surrounding the The project must apply for a forest use permit from the resource administrator Corporation, in this case Cormacarena. The Decree classifies the uses as unique, persistent and domestic, the latter are those that are made exclusively to satisfy vital domestic needs without their products being marketed. The norm indicates that a domestic use will not require a use permit and that it is classified as domestic if it does not exceed 20 m3 per year. Therefore, if the logging activities for the consumption of firewood and housing arrangement are transferred to other forests of the owner, it is expected that this will not affect the biodiversity of the forest ecosystem thanks to a sustainable use that is the norm.</p>
Carbon market fluctuations	There are risks in the carbon markets since they can fluctuate and not meet expectations in relation to the	The uncertainty generated by the fluctuation of the carbon markets is solved by guaranteeing the resources

Identify Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
	<p>desired income, which would have the following impacts:</p> <p>In the community since it would continue with the current trend in relation to deforestation and ways of life.</p> <p>In the climate: CO₂ emissions would remain according to the current trend or increase taking into account that there is no mechanism that allows incentives to conservation or a process of governance and cultural change.</p> <p>In biodiversity: the forests and ecosystems present in the region would disappear or be degraded, losing the flora and fauna of the region and environmental goods and services offered by the ecosystem.</p>	<p>during the formulation and implementation until the expected income is received and by formulating projects to manage resources with private companies and cooperation organizations through calls. Sustainable actions do not only expect to be financed with carbon credits.</p> <p>The project has the necessary financial resources before the project reaches breakeven.</p>
Dilation and impact on the implementation of the training program	Difficulties for the implementation of training caused by the pandemic, weather, or public order, which leads to modifying the methodology and schedule of activities.	<p>Structure flexible training programs and methodologies for members according to their resources and availability.</p> <p>The project will maintain communication with the partners informing in time about changes and status.</p>
Corruption	Information manipulation and limitations.	Application of the ALLCOT code of conduct, proper handling of information, limitation of handling of sensitive information
Communication	Channels and mechanisms not adequate enough to guarantee information, communication and participation of all project partners	<p>Establish a communication strategy between several levels in a reciprocal way; ALLCOT, Coordinating Committees, village nuclei, villages and leaders. Having open media, motivated and trained people. socialize and popularize the mechanism for citizen participation and attention.</p>

Identify Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
Non-permanence of results	Emission reductions can be lost, therefore the established commitments are not met, either due to future deforestation or due to natural causes such as forest fires.	Constant training that remembers that this is generated by results, each year it will be measured. The same population is in charge of "valuing" the standing forest. 22% buffer