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

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1 PROJECT DETAILS

1.1 Summary Description of the Project

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

The project seeks to protect 40,637 ha 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 3,768,645 tCO_2 will be reduced over a minimum of 30-year period, with an annual average of 121,569 tCO_2.

This will improve the living conditions of the families of the 985 members where the project is being developed, 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.

1.2 Sectoral Scope and Project Type

The project is a grouped project 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

According to the VCS Standard v4.3, the project is aligned with VERRA eligibility requirements:

- The project must fall under the six AFOLU project categories eligible under the VCS Program. Eligible AFOLU project categories: afforestation, reforestation, and revegetation (ARR), agricultural land management (ALM), improved forest management (IFM), reduced emissions from deforestation and degradation (REDD), avoided conversion of grasslands and shrublands (ACoGS), and wetland restoration and conservation (WRC). The project is under the category of reduced emissions from deforestation and degradation (REDD),
- Where projects are located within a jurisdiction covered by a jurisdictional REDD+ program, project proponents shall follow the requirements in this document and the requirements related to nested projects set out in the VCS Program document Jurisdictional and Nested REDD+ Requirements. The project is not located within any jurisdictional REDD+, thus, not applicable.
- Where an implementation partner is acting in partnership with the project proponent, the implementation partner shall be identified in the project description. The implementation partner shall identify its roles and responsibilities with respect to the project, including but not limited to, implementation, management and monitoring of the project, over the project crediting period. All the partners and participants are transparently listed in the PD (sections 1.4 and 1.5).
- Activities that convert native ecosystems to generate GHG credits are not eligible under the VCS Program. Evidence shall be provided in the project description that any ARR, ALM, WRC or ACoGS project areas were not cleared of native ecosystems to create GHG credits. Such proof is not required where such clearing or conversion took place at least 10 years prior to the proposed project start date. The onus is upon the project proponent to demonstrate this, failing which the project shall not be eligible REDD. The project area included in this project was not cleared of native ecosystems in the last 10 years, thus, in accordance with this eligibility requirement.
- Activities that drain native ecosystems or degrade hydrological functions to generate GHG credits are not eligible under the VCS Program. Evidence shall be provided in the project description that any AFOLU project area was drained or converted to create GHG credits REDD. Not applicable in this project.
- The project proponent shall demonstrate that project activities that lead to the intended GHG benefit have been implemented during each verification period in accordance with the project design. The activities included in the Theory of change will be verified during the crediting period.
- This project does not convert native ecosystems to generate GHG. The project does not include ARR activities. The project does not have conversion of native ecosystems in the leakage management area, as the sustainable actions to be developed occurred only in areas deforested previous to the project start date.
- Where REDD project activities occur on wetlands, the project shall adhere to both the respective project requirements, unless the expected emissions from the soil organic carbon pool or change in the soil organic carbon pool in the project scenario is deemed below the minimum or can be conservatively excluded; The project does not occur on wetlands, as it is described in the following sections.

Eligibility Criteria

- Eligibility

As a grouped project, and according to the VCS Standard V.4.3 in its 3.5.8 to 3.5.13 and 3.5.15 items, new partners (instances) might be added to the project, as long as they fulfilled these conditions.

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 region there are other areas, whose owners have not been identified, but which could meet the requirements in the next years.

Recognizing activity instance as: at least one hectare of forest (according to Colombia official definition[1]), 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 in the PD.
- The land must be inside the reference region, preferably on the leakage belt area, and by this fulfill 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.
- The new areas of forest (minimum 1 ha) will be using same measures and technologies as described in the PD monitoring plans.
- Committees will take 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 Community Action Boards (CAB).

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

- Scalability Limits for the Grouped Projects

Following the previous mentioned criteria, the project will only include areas within the reference region. Assuming all possible areas were included 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 increased 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.

[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.

- 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 Reference Region, 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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1.6 Ownership

According to Section 3.6.1 of the VCS Standard, v4.3, ALLCOT as the project proponent demonstrates ownership in the following manner:

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

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

The Project proponent has designed and implemented an internal Standardized Operational Procedure describing the national regulatory context in Colombia with Id 2084_01 in the framework of land ownership and tenure. The Procedure shall be transparently shared with the partners of the project.

The general contract signed by ALLCOT with the Associations and Community Actions Boards (CAB), as well as the ones signed by the owners with the Associations and CABs adhering to the general one, includes among ALLCOT obligations all the ones described by the standard as project proponent characteristics.

On the amendment realized to the contracts, second clause, adds to the original fourth one, “ALLCOT will be the Project Proponent and representative of the REDD Conservation project REDD+ Sur del Meta”.

1.7 Project Start Date

The project starts actions to reduce deforestation on 18/01/2020. This date corresponds to the date where the workshops started on the field with the representatives of the different associations with the aim of empowering them and increasing the awareness of the protection of the forest.

1.8 Project Crediting Period

18/01/2020 to 17/01/2050 - 30 years of total crediting period.

18/01/2020 to 17/01/2050 – 30 years of total benefits assessment period.

Even though activities started in 2018 with the initial contacts, presentation of the opportunity, decision making process and signature of the first contracts, Allcot investment decision was made in January 2019. During the year 2019, due to the COVID situation, different social investments were done to reinforce the health system and assure food security in the area. Due to COVID restriction, ALLCOT could not travel, all the activities were done remotely, and the implementation of the Theory of Change is considered on 18/01/2020, as the date were ALLCOT started on the field implementing capacity building activities focused on empowerment of the leaders and increasing the awareness of the protection of the forest.

1.9 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	
Large project	X

Year	Estimated GHG emission reductions or removals (tCO_2eq)
2020	123,130
2021	126,470
2022	124,191
2023	121,953
2024	119,756
2025	138,980
2026	136,477
2027	134,019
2028	131,605

Year	Estimated GHG emission reductions or removals (tCO_2eq)
2029	129,235
2030	146,432
2031	143,795
2032	141,206
2033	138,664
2034	136,167
2035	133,716
2036	131,310
2037	128,946
2038	126,626
2039	124,347
2040	122,110
2041	119,913
2042	117,756
2043	115,638
2044	113,558
2045	111,516
2046	109,511
2047	107,542
2048	105,609
2049	103,710
2050	4,757
Total estimated ERs	3,768,645
Total number of crediting years	30
Average annual ERs	121,569

1.10 Description of the Project Activity

The theory of change for this project was designed following the adoption of the Open Standards Methodology presented at the Social and Biodiversity Impact Assessment manual for REDD+ Projects.

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.1.11_ 211104_CO_Teoria del Cambio* 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 systems. Each line of action, that leads to reduce deforestation is described:

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

The project brings together associations and 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.

Considering 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.

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 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.

- 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 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 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 strengthen 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 CO_2 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

This 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 number of areas that will successfully be 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 allow 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.

The project is not located under any jurisdictional program, according to VERRA registry and the other available registries, as shown on 1.15. At the national level, RENARE generates the cross-check with

existing emission reduction activities, analyzing overlaps and giving the go-ahead for their continuation. The project has made this registration and receive no report of overlapping[2].

Regarding jurisdictional baseline, there are not any registration under VERRA. The FREL presented to UNFCCC by Colombia, does not fulfilled the request of the methodology VM0015 regarding covering the complete area, nor the scale or the scope.

1.11 Project Location

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

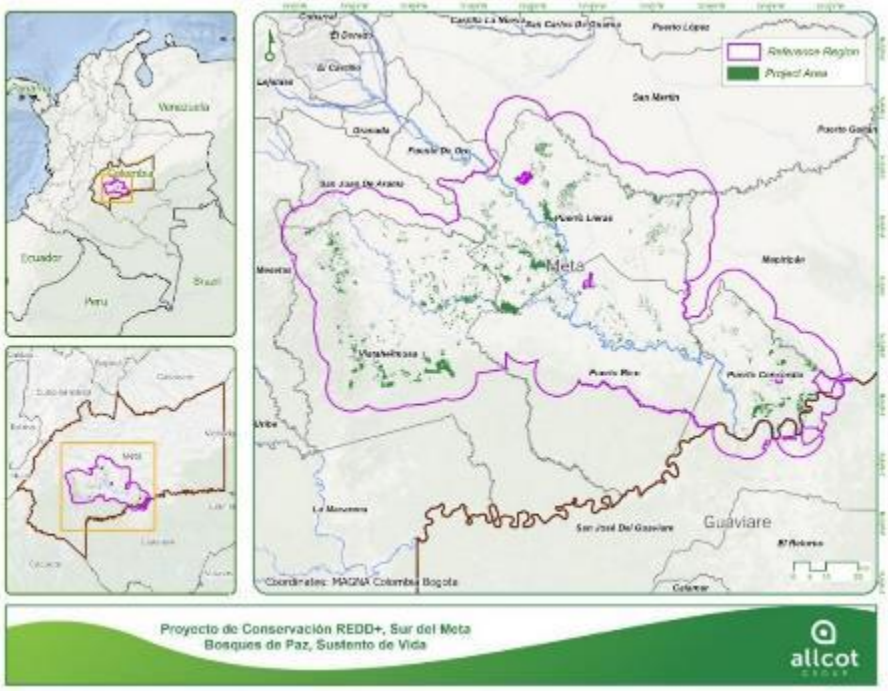


Figure 1. General location of the Project
Source: ALLCOT 2024

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. The specific coordinates are on Table 1.

Table 1. Coordinate's location

East X	North Y	East XD	North YD
1,077,793.677	882,531.021	-73.377371	3.533636
1,149,733.632	770,055.3525	-72.731263	2.516035
1,182,560.157	794,863.3356	-72.435903	2.739954

[2] http://renare.siac.gov.co/GPY-web/#/gpy/datbasreddpre/121/1141

East X	North Y	East XD	North YD
1004500.324	839764.8929	-74.03702	3.147149

Source: ALLCOT 2024

1.12 Conditions Prior to Project Initiation

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 is made, and at the end an evaluation projected into the future.

The definition of the main drivers of deforestation and the historical behaviour of deforestation from 2010 to 2020 (see 3.4 baseline scenario) 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, which as presented on 3.3 Project boundaries, spatial boundaries, corresponds to the requirements of VM0015.

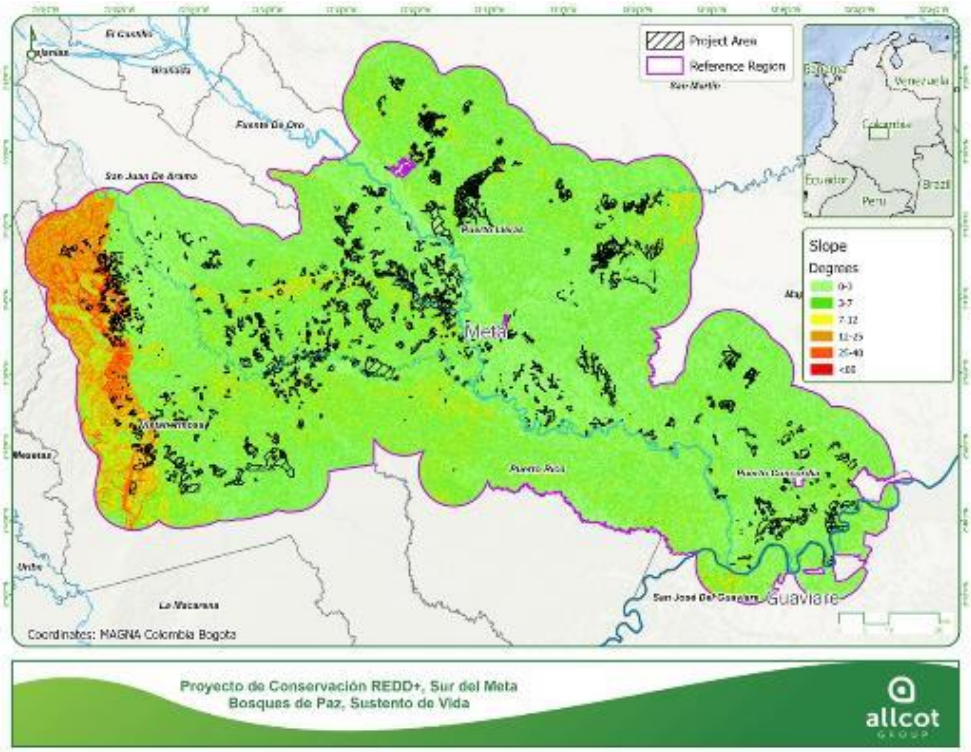


Figure 2. Slopes in the study area

Source: elaborated by ALLCOT, 2024 using ASTER DEM (30 m)[3]

[3] A 30 m Shuttle Radar Topography Mission (STRM).30-Meter SRTM Elevation Data Downloader (dwtkns.com)

Slopes: 48.1% (512,277.2 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-negligible denudation, with favourable passable and workable conditions, traditionally used for agricultural activities and whose use is mainly difficult under dry or low humidity conditions. 38% (404,767.6 ha) of the Reference Region has slopes between 3-7°, being slightly inclined slopes and with minimal effects caused mainly by water erosion. 7.9% of the Reference Region (83,936.6 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 fourth place, slopes in the range of 12-25°, with a predominance of 4.2% of the surface (44,639.2 ha), considered as strongly sloping or moderately undulating, present mainly towards the north towards the centre, characterized by mass movements of all types and erosion, mainly in ruts. The 1.5% (16,433.8 ha) corresponds to slopes in the 25-40° range, located mainly towards the western zone, with the presence of intensive denudation processes and clear evidence of soil erosion. Regarding the remaining slope classes, 0.2% (2,282.1 ha) in the Reference Region has a slope over 89°.

Elevation

Elevation measured in meters above sea level, for the Reference Region presents elevations less than 800 meters for 96.2% of the total area, the remaining percentage presents elevations between 800 and 1700 masl.

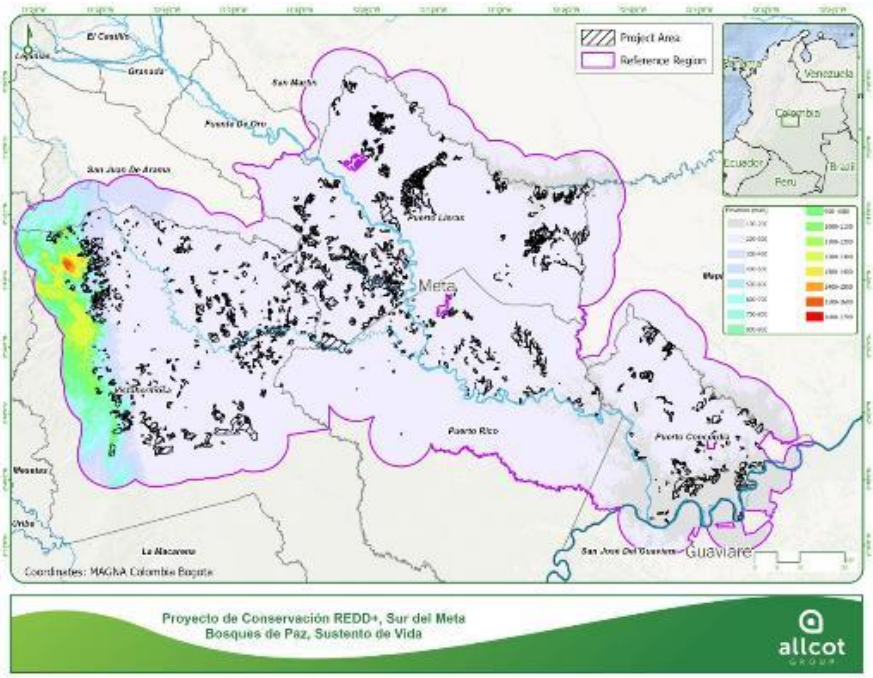


Figure 3. Elevation above sea level of the reference region.
Source: elaborated by ALLCOT, 2024 from Nasa information4

- Precipitation

Based on the average annual precipitation conditions in millimetres, the Reference Region has a predominance of precipitation for 95.8% of its territory in a range of 2500 to 3000 mm per year. Towards the northwestern zone of the Reference Region, and 4.2% of its surface area has a precipitation range of 3000-4000 mm per year.

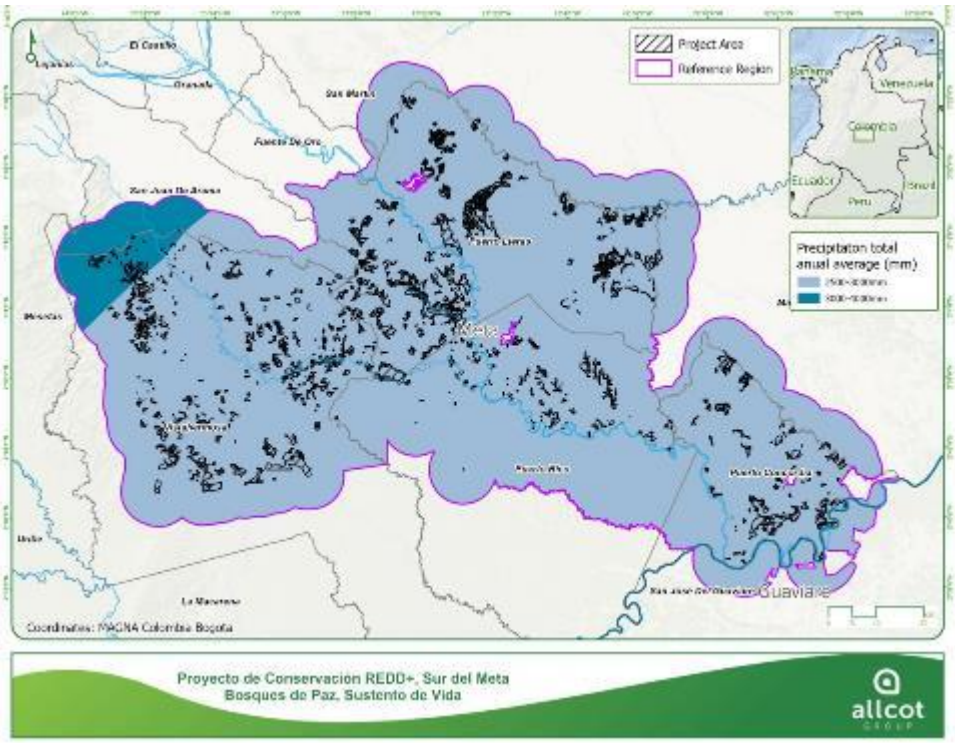


Figure 4. Precipitation on the reference region.
Source: elaborated by ALLCOT, 2024 using IDEAM information5

- Temperature

Based on the average annual temperature conditions in degrees Celsius, the Reference Region has a predominance of temperature in 93.6% of its territory over 24 °C, in the central and northeastern part of the Reference Region. 6.4% of the remaining area has an average temperature range of 18 to 24 °C in the western part of the region.

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

[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

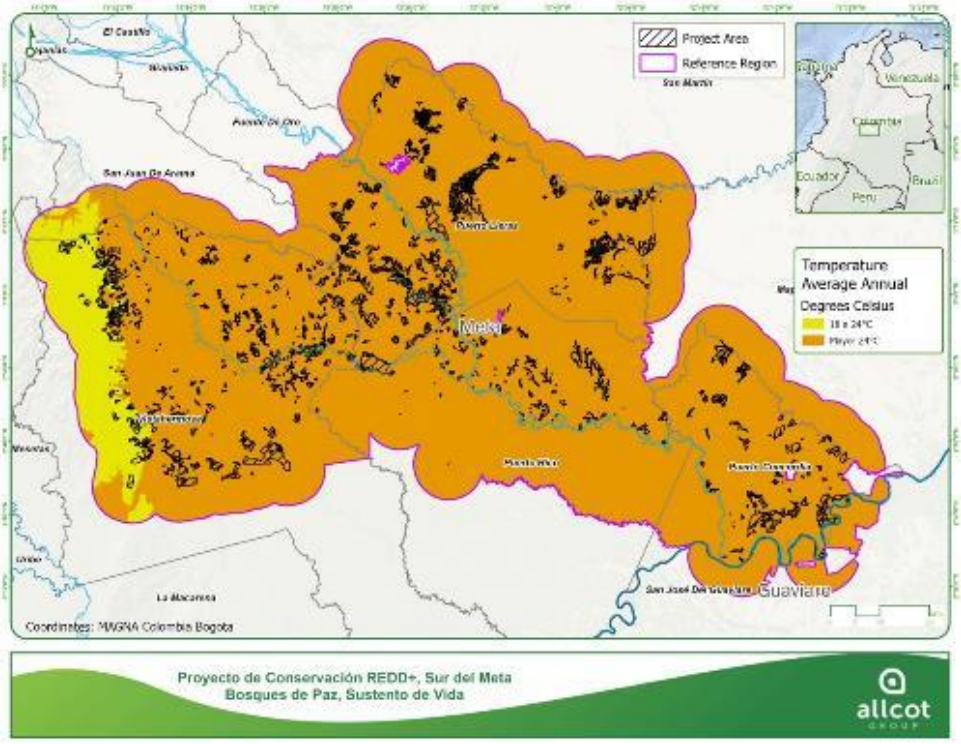


Figure 5. Temperature on the reference region
Source: elaborated by Allcot Colombia using IDEAM information 2024[6]

- Climate

For the Project Area and Reference Region, according to the Caldas Lang Climate Classification, 93.6% of the surface area is predominantly Humid Warm Climate, followed by 6.38% of the surface area in Humid Temperate Climate towards the western part of the Reference Region, and the remaining 0.02%of the Reference Region, with Semi Humid Temperate Climate.

[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

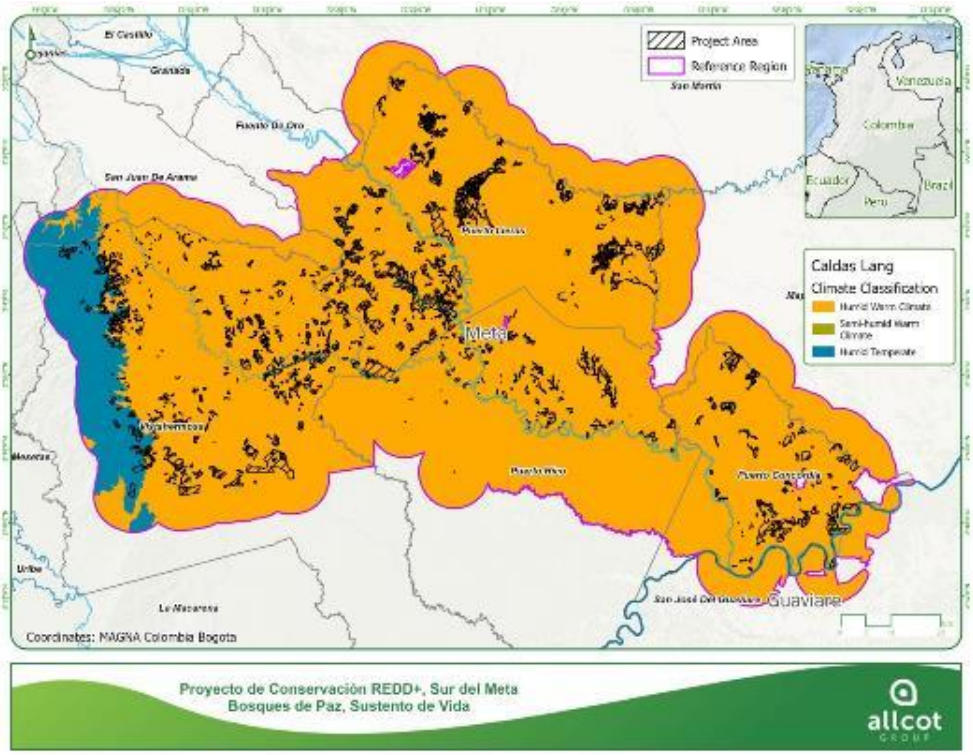


Figure 6. Caldas – Lang Climate Classification on reference region
Source: elaborated by Allcot Colombia 2024 using IDEAM information[7]

- Soils

36.78% 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 26.63% 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. Ultisolss dominate 24.85% of the area of the Reference Region and are 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. Finally, Inceptisols, with a dominance of 10.36% of the area of the Reference Region, correspond to soils that are mostly used for forestry activities. In relation to 1.4% 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.

[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

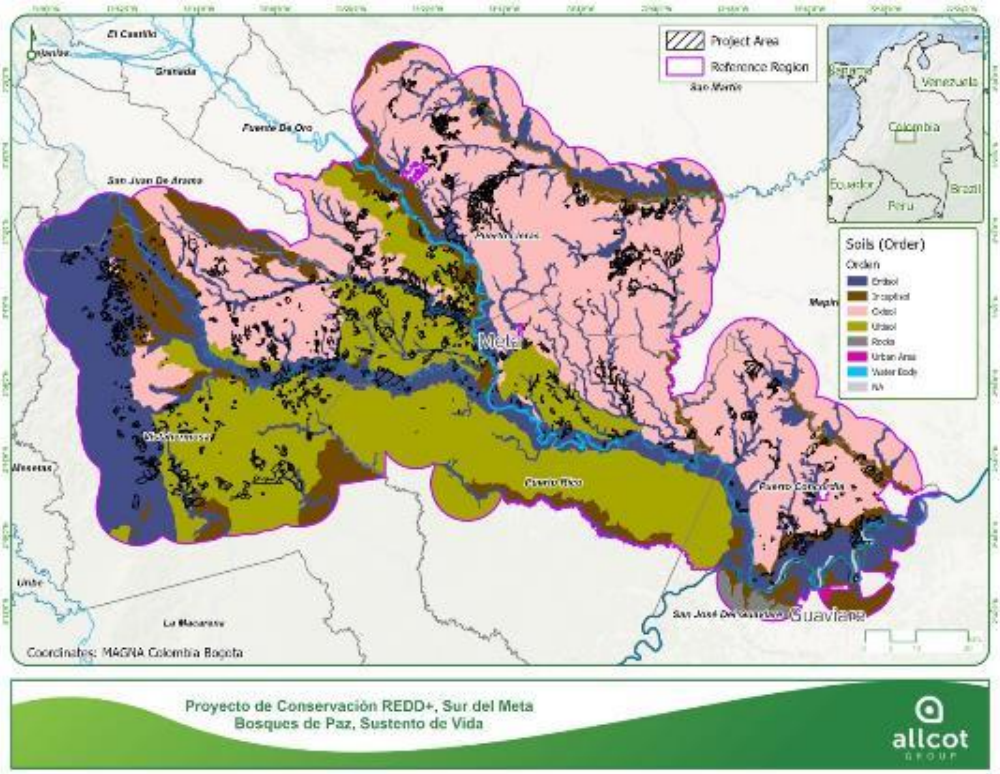


Figure 7. Soils in the reference region.
Source: elaborated by ALLCOT, 2024 using information from IGAC[8]

- Hydrography

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, which then flows into the Guaviare River.

[8] Soil Maps of the Colombian Territory at a scale of 1: 100,000. Department: Meta.
https://metadatos.icde.gov.co/geonetwork/srv/spa/catalog.search#/metadata/58fb4039-556d-41ca-a058-c52704fe67de

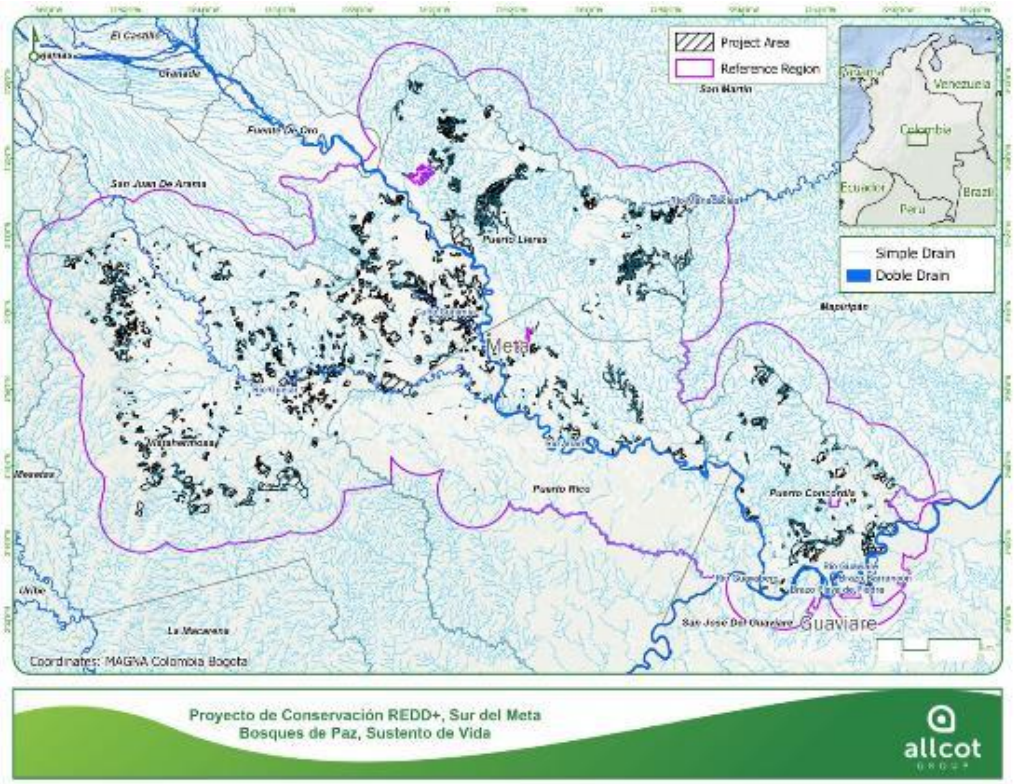


Figure 8. Hydrography on the reference region
Source: IGAC, 2024[9]

- Roads and access

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.

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.

[9] IGAC's base mapping 2019. Escale 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

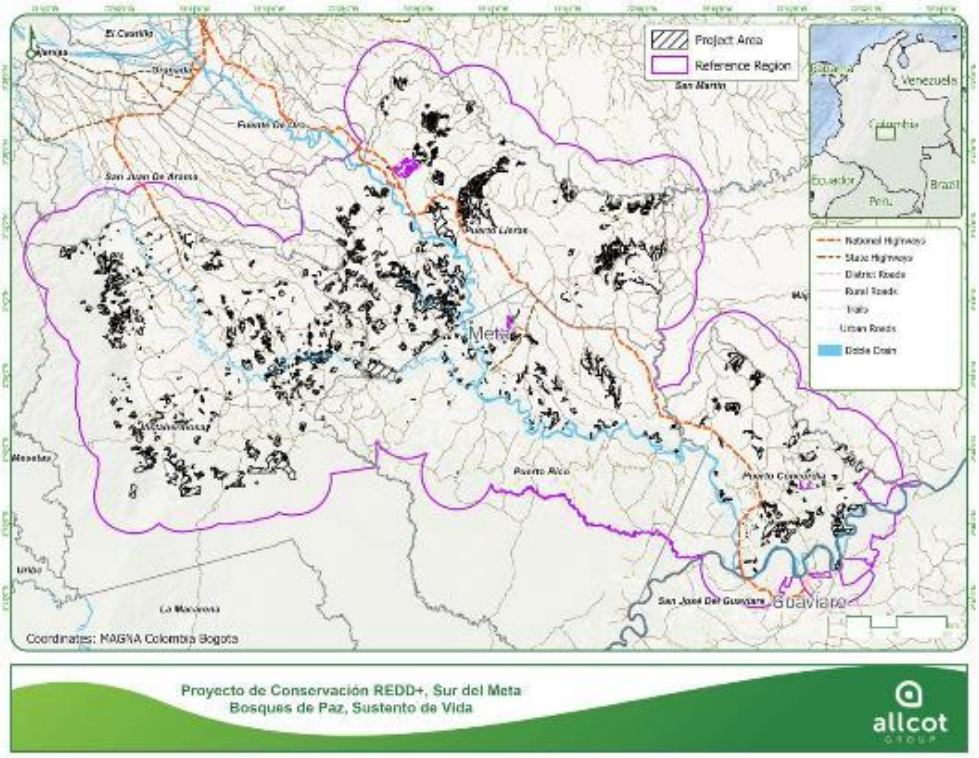


Figure 9. Roads and access in the reference region
Source: IGAC, 2024[10]

- Land Cover:

For the reference region of the Project, 10 types of Corine Land cover Classes are found within the study area. Below are the Corine Land Cover 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 Areas	1,212.7
13	Minig Extraction Areas	6.3
21	Transitory Crops	7,714.4
22	Permanent Crops	31,667.2
23	Pastures	278,680.8
24	Heterogeneous agricultural areas	129,628.4
31	Forest	375,174.9
32	Scrub and/or herbaceous associations	206,521.4
33	Open spaces with little or no vegetation	14,160.0
41	Inland wetlands	7,017.9

[10] IGAC's base mapping 2019. Escale 1:100.000. Tracks, 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

CODE	CORINE Land Cover Classes	AREA hectares
51	Inland Waters	12,416.5

Source: elaborated by Allcot Colombia using information from 2017 IDEAM [11]

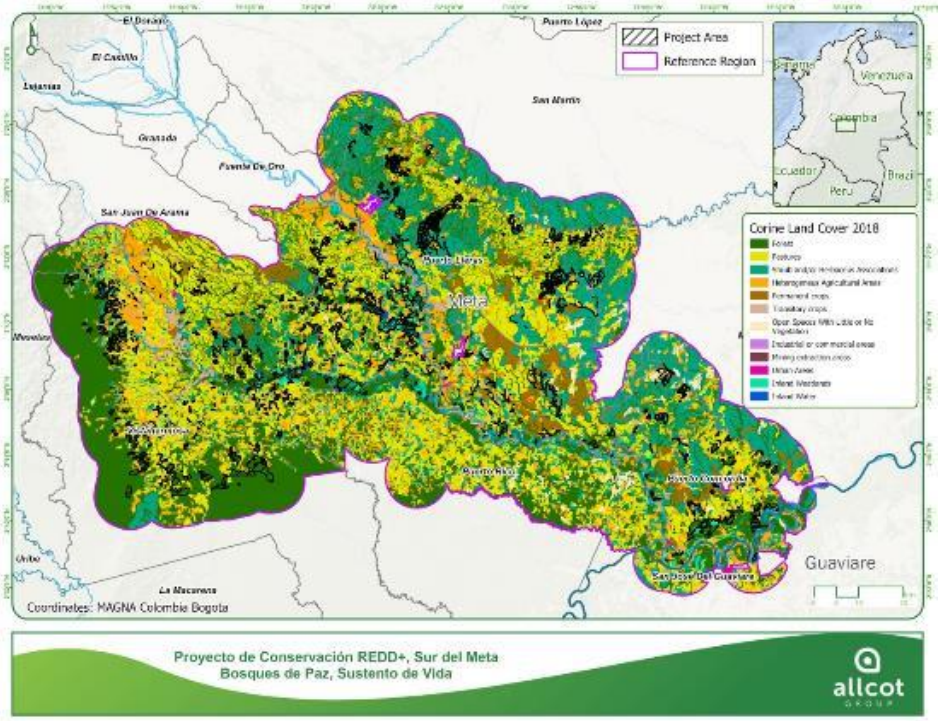


Figure 10 Land covers for the Reference Region. For the year 2018

Source: IDEAM, 2024

- Land uses:

Using land covers, land use was determined, resulting in 8 land use classes within the Reference Region.

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

LAND USE CLASSES	AREA (Hectares)
Forest Management	378,059.1
Restoration/ Recovery /Special uses	10,231.88
Agricultural/ Mixed Agricultural/ Livestock	408,337.8
Commercial, transport infrastructure and/or communication	80.35
Lands at rest/Special Uses	251,859.84
Special uses	3,185.98
Settlements	1,093
Use and/or conservation of water resources	11,488.7

[11] Corine Land Cover by IDEAM 2018. Downloaded from Sistema de Información Ambiental de Colombia-SIAC .http://bart.ideam.gov.co/cneideam/Capasgeo/Clasificacion_Climatica_Caldas_Lang_2012.zip.

Source: ALLCOT, 2024

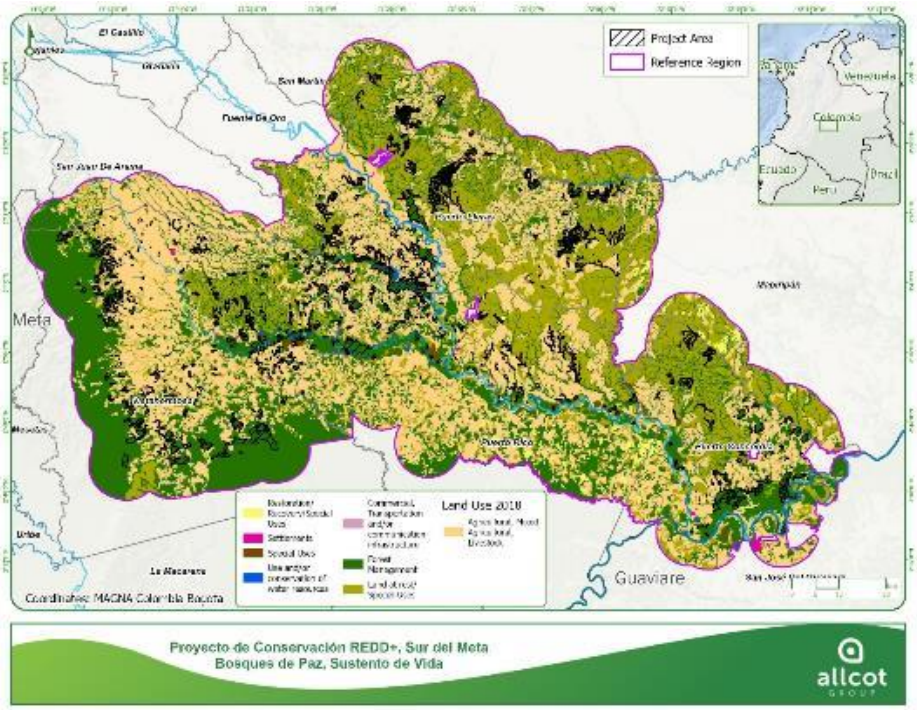


Figure 11 Land Use, 2018
Source: ALLCOT, 2024

1.13 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. See Table 4

Table 4 Laws and decrees

Law/Decree/Conventions	Compliance
Law 164 of 1994: 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	The project complies with this law because its main purpose is to contribute to the reduction of GHG emissions through the conservation of important forest remnants that are highly endangered due to the expansion of grasslands and croplands
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 forest in order to consolidate the forestry sector in the national economy. 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:	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 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
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	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
Convention for the Protection of the World Cultural and Natural Heritage. Paris, 1972	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

Law/Decree/Conventions	Compliance
	other stakeholders in the importance of the conservation of forest,
Convention on International Trade in Endangered Species: wild fauna and flora. Washington, 1973 and law 357 of 1997	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. 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. Only those able to obtain harvesting permits for domestic purposes will be allowed
Convention on Biological Diversity. Rio de Janeiro, 1992. Convention on Wetlands of International Importance especially as Waterfowl Habitat - Ramsar (hosted by Colombia in 1997).	The project area does not include any wetland of International Importance as defined by the RAMSAR convention. On the other hand, the 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,	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

Law/Decree/Conventions	Compliance
Vistahermosa, Mesetas, Puerto Rico and Puerto Colombia	
Resolution 1447 of 2018 that creates the national MRV system for GHG mitigation activities.	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). 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 that would occur in the absence of a mitigation initiative. 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. 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. There have been presented a new reference level, but the UNFCCC has not yet finished the approbatory phase and the time scale does not cover the one for the project. Consequently, the project complies with such the resolution.

Law/Decree/Conventions	Compliance
Decree 926 of 2017 that rules the national carbon tax	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: . The project is a GHG mitigation initiative developed in the national territory: The project is located in the department of Meta . 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
Law 388 of 1997 Decree Law 1989 of 1989 creates the Especial Area of Management of Macarena	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”.

1.14 Participation under Other GHG Programs

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

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 were checked. 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.

1.14.2 Projects Rejected by Other GHG Programs

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

1.15 Other Forms of Credit

1.15.1 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.

1.15.2 Other Forms of Environmental Credit

The project area has not received any environmental credits.

1.16 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 3918[12] 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, to be included on the national results. Nevertheless, the project will continue to look forward spaces to present results on this aspect.

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:

[12] https://colaboracion.dnp.gov.co/CDT/Conpes/Econ%C3%B3micos/3918.pdf

Table 5 SDG of the project

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 and organizational capacities of the project partners.	Through practical theoretical modules of training and training aimed at partners, coordinating committees and overseers 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.	1. Training and education for the improvement of the individual, collective and organizational capacities of the project partners. 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.	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	1. Training and education for the improvement of the individual, collective and organizational capacities of the project partners. 2. Support the formalization of ownership through processes of belonging, titling and judicial processes. 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.	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 project area 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 fulfilment of local and regional objectives and goals.

1.17 Additional Information Relevant to the Project

1.17.1 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. 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, and coffee in smaller proportions for areas where conditions are suitable for their development.

The Project's LMA will subtract the Project area (Forested Project area) from the total area resulting from summarizing the properties of each landowner after its successful legal legitimation. Now, reaching this stage is still an ongoing effort due to the lengthy nature and the complexity of overcoming the Colombian historical trend of legal access to the territory but not legal tenure, reaching 80% of the national territory in this legal limbo, including most of the smallholders and campesino communities associated to the REDD Project. For context, delimitation, and legalization of properties in Colombia can take approximately between 3 and 5 years, according to national authorities and, therefore, Allcot was selected as one of the strategic lines of action within the ToC of the REDD+ project to support the Project associates on their properties' delimitation and legalization.

With this background, to calculate the LMA as ex ante value, a buffer of 400 m was established for each project area. This buffer was delimited based on the mobility analysis, considering those non-forested areas (no stable forest and deforested forest during the historical period) that have greater vulnerability due to mobility variables (farming, settlements, slope, roads, infrastructure, rivers, streams) and that are bordering the project area. The ex-ante LMA is 27.058,59 ha, which is more extensive than the 26,497.5 ha of the Leakage Belt of the PD. . This LMA boundary is included in the monitoring plan (see Section 5.2 Data and Parameters Monitored, of the PD) and will be adjusted and verified during the monitoring activities of the project, once the properties of the project participants are delimited. It is important to mention that to date there are areas bordering the project area that are not included within the transitory LMA, due to the results of the mobility analysis used for its delimitation. However, during the implementation of the lines of action of the Theory of Change, those additional areas to those contemplated in the first instance will be analysed to be included.

On the other hand, sustainable, productive activities are grouped together into one of the lines of action of the REDD+ Project. They are intended to be carried out on the LMA (non-forested areas), including sustainable cattle ranching13 and low-impact citrus, cocoa, and coffee crops. These sustainable, productive activities will enhance the productivity per area and then reduce the risk of activity leakage in proximal forested areas outside the control of the Project. Furthermore, under this context, carbon stocks will remain stable or be enhanced by the project activities throughout the life of the Project, which conservative can be excluded from accounting. In the same way, the Project has not planned to intense regimes in the livestock sector of the area. Then, ex–ante CH4 and N2O emissions estimates due to the increase in the number of grazing animals are not considered, as it is stated in the methodology.

[13] The most important livestock association in Colombia is generating this type of production. See https://www.fedegan.org.co/programas/ganaderia-colombiana-sostenible#:~:text=El%20proyecto%20Ganadería%20Colombiana%20Sostenible,bosques%20nativos%20en%20su%20finca. (The source page is in Spanish language)

Regarding leakage due to displacement of activities, VM0015 states that GHG emissions (as carbon stocks decrease) from the displacement of activities could only be considered leakage if these emissions within the leakage belt (LK) occur above baseline projection.

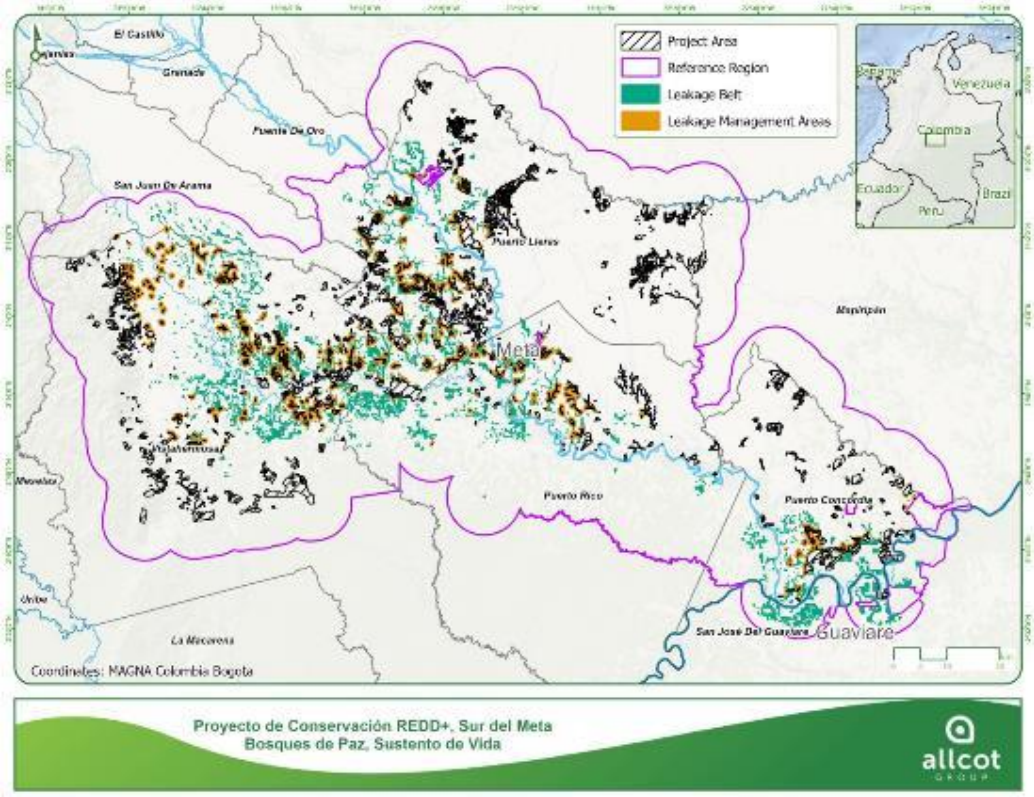


Figure 13. – Leakage Management Area
Source: ALLCOT 2024

- 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 resolution images (Landsat). 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 official, with partial annual temporality, 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, 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. Figure 14. shows that the project areas correspond to forest areas when overlaid with the information from the IDEAM forest/non-forest layer.

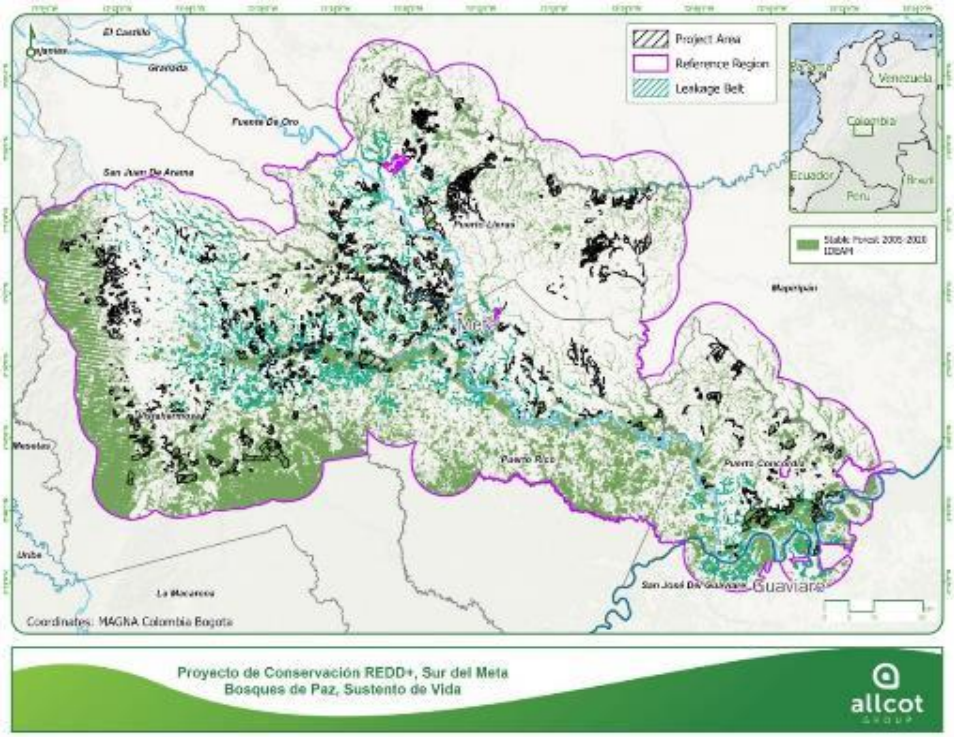


Figure 14. Project Boundary – Forest areas
Source: ALLCOT, 2021

- Temporal boundaries

Considering the VM0015 methodology, the following are the temporal boundaries for the project:

For deforestation projection under the historical approach, the reference period corresponds to the years elapsed between at least three spatial data points. The historical reference period selected was 2010-2014 and 2018 (10 years into the past with respect to the project start date).

Starting date of the project crediting period of the AUD project activity: Start: 18/01/2020.

Starting date and end date of the first fixed baseline period: Start: 18/01/2020 End: 17/01/2030.

- Carbon pools

According to the methodology, the six carbon pools listed in Table 6 are considered in the methodology and some of these have considered for the project.

Table 6 Carbon pools

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 majority 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+	Not 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

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) has been part of ALLCOT´s Know-how.

1.18.3 Further Information

Further information in Annex 4.5.6_CO_Distribuciónde BeneficiosSdM_V2.

2 SAFEGUARDS

2.1 No Net Harm

In addition to the protection of carbon reservoirs represented in the biomass of forest cover in the project area and the ecosystem service of habitat provision offered by these areas, the identification of species

categorized as threatened in the IUCN red lists in the classes of Birds, Mammalia, Reptilia, and Amphibia is highlighted. In addition, some of the potential species identified have been catalogued as endemic or near-endemic.

In turn, because the conservation of forested areas reduces the effect of habitat fragmentation that is evident in the department of Meta. If the patches that serve as habitats for species cover large areas, it is likely to increase the heterogeneity of the landscapes. In the case of amphibians, it has been found that this has improved resilience to climate change, attenuating the risk of local extinctions among patches with extreme climatic events (Piha, Louto, Piha, & J, 2007).

Negative Offsite Impact	Mitigation Measure(s)
There are forest species of high commercial value that are frequently harvested and were identified within the project areas. It is possible that the harvesting of these species will increase outside the project areas. Environmental education activities have been proposed to communities near the project areas to stop or reduce the overexploitation of forest species.	The project areas can be sources of seed and seedlings for the propagation of species of high commercial value and ecosystemic importance.
Wildlife hunting is another activity that may increase outside the project areas.	Since hunting activities will be restricted within the project areas, it is possible that the same communities within the project will carry out this activity in forests outside the project area. It is necessary to carry out environmental education campaigns and coordinate strategies with regional environmental authorities that focus on reducing these types of practices.
Community group	Small landowners or holders (less than 10 hectares)
Impact(s)	Positive cultural, educational, governance, social and economic welfare impact.
Type of benefit/cost/risk	Welfare benefits. land access and use. The project considers involving small landowners regardless of the amount of area contributed in order to ensure that benefits reach all partners.
Change in well-being	-Social appropriation of knowledge about the forest and biodiversity to control deforestation and degradation. Communities achieve long-term goals of their life plans thanks to the articulation of actions and resources. -Partners make decisions on the convenience of implementing productive projects. -Through the implementation of GAPA in productive projects, partners adopt new management practices that improve productivity, which contributes to improving family income, migration and quality of life. - Cultural and intergenerational change in the way of seeing and relating to nature and managing the goods and services it offers in an efficient manner. Installed capacities for community self-management. -More resilient communities in the face of climate change. -Claiming the right to land, peaceful environment.

	- Creation or increase of territorial governance capacity.

Community group	Medium landowners or holders (51 to 100 hectares)
Impact(s)	Positive cultural, educational, governance, social and economic welfare impact.
Type of Benefit/Cost/Risk	Welfare benefits, land access and use. The project considers involving small landowners regardless of the amount of area contributed to ensure that benefits reach all partners.
Change in Well-being	Reduction of rural poverty and unsatisfied basic needs. Creation or increase of territorial governance capacity. This group achieves its goals related to its long-term life plans thanks to the articulation of actions and resources. -Partners make decisions on the convenience of implementing productive projects. -Through the implementation of GAPA in the productive projects, the partners adopt new management practices that improve productivity, which contributes to improving family income, migration and quality of life.

Community group	Large Landowners and holders (more than 101 hectares)
Impact(s)	Identify impact(s): Positive impacts on ecosystems and communities, as well as cultural, educational, governance, social and economic wellbeing.
Type of Benefit/Cost/Risk	Activities will support the design of specific incentives aimed at reducing deforestation and promoting conservation activities on large tracts of land, considering the cost of productivity per hectare that is attractive to the partner.
Change in Well-being	- Partners make decisions on the convenience of implementing productive projects. -Through the implementation of GAPA in productive projects, partners adopt new management practices that improve productivity. - Cultural and intergenerational change in the way of seeing and relating to nature and managing the goods and services it offers in an efficient manner.

Community group	Vulnerable groups: women heads of household, elderly, children and teenagers, day laborers, victims of violence.

Impact(s)	Positive impacts. Vulnerable groups are often marginalized, and their roles limited to certain activities and excluded from participation in activities and decision-making regarding family and community dynamics. It is expected that by joining the project, these groups will be called upon to have a voice and vote in the project
Type of Benefit/Cost/Risk	Vulnerable groups will have active and equal participation in the proposed project activities, thus emphasizing their relevance and contribution to the project, vindicating their rights and strengthening their capacities and skills.
Change in Well-being	Empowerment and strengthening of vulnerable groups within the family and community groups.

2.2 Local Stakeholder Consultation

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

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 Vistahermosa. Also, in two other municipalities that finally were not included in the project.

In Puerto Rico, on May 8th, 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 8th, 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 Vistahermosa on December 16th, 2018 ASOPROGÜEJAR Assembly was held, on April 6th, 2019 Agrocavis members assembly was held, and on May 8th, 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 7th, 2019 a meeting of operating and overseer committees was held to organize the implementation of possible early actions.

In the first quarter of 2020 information activities and participation of the communities was carried out, when the ALLCOT technical team convened the operational committees with the leaders of Puerto Rico and Vistahermosa 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 18th, 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 Vistahermosa. 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 Vistahermosa and 6 in Puerto Rico, but in Vistahermosa 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 these processes of consultation and involvement of leaders and communities, inputs were used to design and implement the project, specifically:

- 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

Positive impacts on biodiversity outside the project areas are expected to be generated mainly due to the conservation of habitats for species with extensive home ranges or home ranches, such as medium and large felines, large terrestrial fauna species (tapir) and aquatic mammals. As mentioned in previous chapters, there is a sustained and often increasing trend of deforestation in the region, affecting the habitat of these species. At the same time, the increase in human activities generates pressure on the populations of these species, especially through sport hunting for meat or skins or, on many occasions, mainly due to competition for resources, unfavorable perceptions, and attitudes.

There is a risk of leakage of illegal activities or prohibited activities by the project to nearby areas, such as deforestation, hunting, selective logging. Other possible negative impact is that due to increase of species, people starts hunting them more, considering they are out of danger.

The main mitigation measure will be training and community communication. Training for project partners, but open for stakeholders, to improve their understanding of the ecosystem, and reduce the pressure over the species and the HCV.

Same condition applies for strategic ecosystem. Campaigns directed or displayed on those areas will mitigate the negative impact, nevertheless, it is important to recognize that not all the impacts will come from this project, as Vision Amazonia is also trying to generate activities on nearby territories. It is expected positive synergetic actions that help to reduce the negative impacts.

The fact of being a grouped project is itself a mitigation action, as it allows new owners to be part of the project, and so improve their incomes by protecting biodiversity.

Because the project avoids habitat loss and will generate actions for the conservation of species of high ecosystem value or categorized as high risk of extinction, the areas outside the project will indirectly benefit from the provision of these ecosystem services associated with forests and semi-natural areas.

The negative impacts must be minor by the mitigation actions, and as other program as Vision Amazonia will be in the department, it is fair to expect a larger leakage control area to be achieved by synergetic process and the general behavior of impact towards biodiversity to be reduced.

2.4 Public Comments

No comments were received during the public comment period on the VERRA Platform. As the project has been public on the country and international spaces, comments have been received, which have been analyzed and used as a constructive source of improvement. Specifically, the one from community have been addressed by the mechanism of grievance.

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, new partners might be added into the project if 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 in 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 in 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 Vistahermosa 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. 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 Vistahermosa 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, the National Association of Peasant Users (ANUC) and 39 Community Action Boards joined to the project. In Vistahermosa the Association of Small and Medium Agricultural Farmers of the Güejar Sector (ASOPROGÜEJAR) and the Agroindustrial Association of Cocoa Growers of Vistahermosa (AGROCAVIS) also joined.

In May 2019, meetings were held with municipal authorities, mayors' offices, and municipal councils, and subsequently, leaders of the social organizations identified in these two municipalities were contracted. 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.

In Puerto Concordia, 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 also joined. In Puerto Lleras, the El Hatico 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 joined.

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 7. Associations that act on behalf of the member families of the project

MUNICIPALITY	ASSOCIATION
Vistahermosa	ASOPROGÜEJAR Association of small and medium agricultural farmers of the sector of the Güejar
	AGROCAVIS Agroindustrial Association of cocoa farmers of Vistahermosa, 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

MUNICIPALITY	ASSOCIATION
	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

Source: ALLCOT 2021

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

Table 8. 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
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		

- Source: ALLCOT 2024

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

Among the key institutional actors the regulatory bodies were also identified: 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 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. Annex2.1.8_ 211103_CO_StakeholderMappingSurdelMeta.

- Community participation risks

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

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

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 are 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, 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, especially 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.

Detailed information is included in the 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 always ensure that 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 Conservation project REDD+ Sur del Meta.

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).

The procedure is detailed 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:

a) VCS approved VT0001 Tool for demonstration and assessment of additionality in VCS AFOLU project activities, V3.0
b) VCS AFOLU non-permanence risk tool: VCS version 4.0.

3.2 Applicability of Methodology

The table shows 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	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. 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.	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”.
VM0015 Methodology	Baseline activities may include planned or unplanned logging for timber, fuel-wood collection, charcoal production, agricultural and grazing activities if the category is unplanned deforestation according to the most recent VCS AFOLU requirements	Reference activities within the baseline include unplanned logging and agricultural and grazing activities. This scenario considers the conversion of forested areas to agriculture and pasture through unplanned deforestation, complying with the most recent VCS AFOLU requirements.
VM0015 Methodology	Project activities may include one or a combination of the eligible categories defined in the description of the scope of the methodology.	Baseline activities include deforestation in humid tropical and very humid premontane forests due to the expansion of the agricultural frontier, while project activities include no-log conservation and agroforestry projects
VM0015 Methodology	The project area can include different types of forest, such as,	The project area corresponds to two types of forests, humid tropical and

Tool or Module	Applicability conditions	Compliance
	but not limited to, old-growth forest, degraded forest, secondary forests, planted forests and agro-forestry systems meeting the definition of "forest".	very humid tropical, according to the life zones of Holdridge in 1981 and contemplated within the definition of forest of IDEAM, 2012
VM0015 Methodology	At project commencement, the project area shall include only land qualifying as "forest" for a minimum of 10 years prior to the project start date	In Colombia, the Institute of Hydrology, Meteorology and Environmental Studies (IDEAM) since 2012 has a Forest and Carbon Monitoring System (SMByC) for which natural forest 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 5 meters". The definition was approved by REDD+ and CDM and applies to the last 10 years prior to the start of this project. Forest area monitoring by SMByC has estimated forest cover at the national level and has historical information since 1990, and for the years 2010, 2012 to 2020 yearly. rBased on IDEAM's forest and non-forest layers plus the use of visual inspection of satellite images, a cartographic cross-referencing was carried out to generate eligibility. Eligible areas were understood as those that remained as stable forests since 201014.
VM0015 Methodology	The project area can include forested wetlands (such as bottomland forests, floodplain forests, mangrove forests) as long as they do not grow on peat. Peat shall be defined as organic soils with at least 65% organic matter and a minimum thickness of 50 cm. If the project area includes a forested wetlands growing on peat (e.g. peat swamp forests), this methodology is not applicable.	The project area does not have peatlands, which in Colombia are concentrated in areas above 3200 meters above sea level in the Andean region. The present project is spatially located between the altitudinal range of 138 to 1816 meters above sea level, therefore, this methodology is applicable within the present project because it does not include peatland cover.

[14] http://smbyc.ideam.gov.co/MonitoreoBC-WEB/reg/indexLogOn.jsp

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 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. 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_2O	Excluded	Potential emissions are insignificant from burning woody biomass for cooking.
		Other	N/A	N/A
	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_2O	Excluded	Potential emissions are not taken into account for the project.
		Other	N/A	N/A
	Biomass	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_2O	Excluded	Potential emissions are not taken into account for the project.
		Other	N/A	N/A
	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

Source		Gas	Included?	Justification/Explanation
				activity" CO2 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_2O	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	N/A	N/A
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 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.
		N_2O	Excluded	Potential emissions are insignificant from burning woody biomass for cooking
		Other	N/A	N/A
	Dead 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_2O	Excluded	Potential emissions are not taken into account for the project
		Other	N/A	N/A
	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_2O	Excluded	Potential emissions are not taken into account for the project
		Other	N/A	N/A
	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

Source		Gas	Included?	Justification/Explanation
				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_2O	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	N/A	N/A

According to the VM0015 Methodology, **PART 2 - METHODOLOGY STEPS FOR EX-ANTE ESTIMATION OF GHG EMISSION REDUCTIONS**, there are nine (9) steps for the calculation of ex ante net anthropogenic GHG emission reductions. Considering 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 gases.
- 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 VCS 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, Colombia.

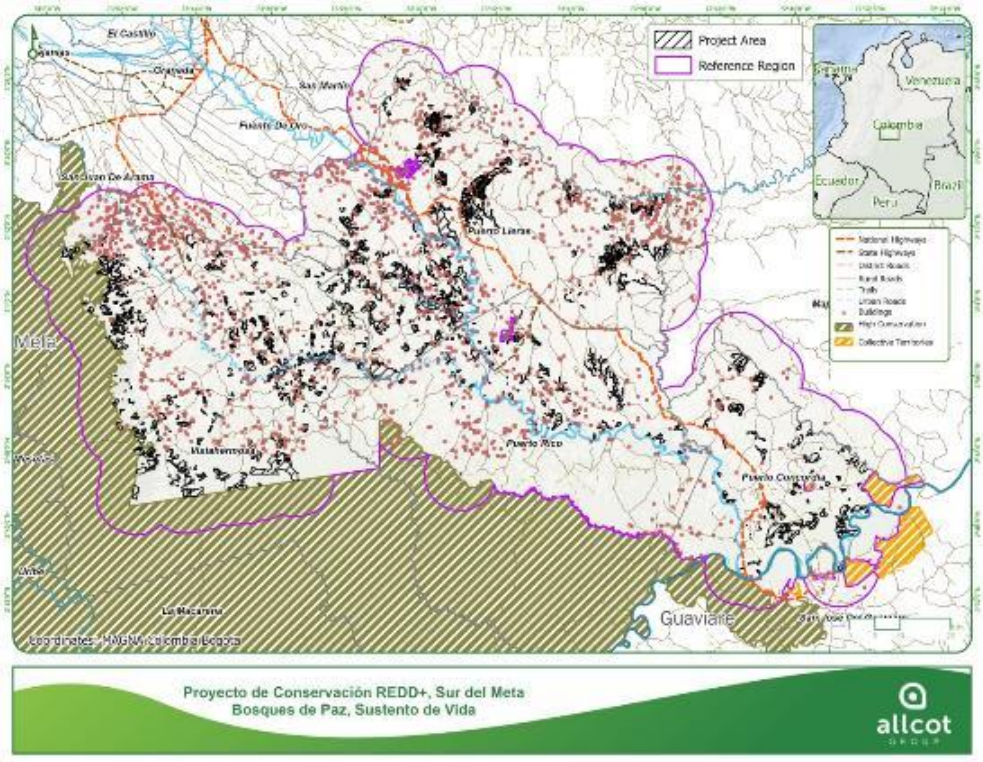


Figure 15. Constructions, roads, reservation areas, indigenous reservations and project area
Source: ALLCOT 2024

For the definition of the boundaries, categories presented in step 1 of the VM0015 methodology, definitions presented as well as its recommendation are used 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 deforestation are also considered.

- Reference Region:

As indicated in aspect 1.13 Conditions prior to project initiation, spatial variables were mainly considered 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 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 and Vistahermosa were selected. Using the boundaries of the DANE political division, a polygon containing the selected municipalities was generated. The National Natural Park "Sierra de la Macarena" was subtracted, given that currently the National Natural Parks of Colombia and the Ministry of Environment are the entities responsible for administering and providing guidelines for the management of these protected areas. And there are no guidelines related to the participation of National Natural Parks in REDD+ projects.

Taking into account that there are agents in the limits of the selected municipalities that could move their activities beyond these limits, it was performed an analysis of the historical mobility of deforestation agents from the project boundaries to the deforested areas identified for the municipalities involved within the Reference Region boundary (Vista Hermosa, Puerto Rico, Puerto Concordia, Puerto Lleras, San Juan de Arama, and Fuente De Oro).

The Table below shows that a buffer of 7 km is the average distance of movements of deforestation and degradation agents of the project.

Table 9. Average distance from PM to historical deforestation areas

Municipality	Average distance from the PA to historically deforested areas (Km)
Fuente de Oro	17.5
Puerto Concordia	2.3
Puerto Lleras	1.1
Puerto Rico	8.0
San Juan de Arama	9.1
Vista hermosa	2.5
Mean Distance (Km)	**6.8**

Source: ALLCOT 2024

For this analysis, the municipality of Mapiripan was not considered because deforestation is present within a range of 102 to 173 km distance, which could not be attributed to the deforestation agents belonging to the Project Area. 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" and “Naexil Put” reserves were subtracted from the polygon generated, for the municipalities of Puerto Lleras and Puerto Rico, two Regional Natural Parks were also subtracted, "Laguna de Lomalinda" and "Laguna San Vicente", respectively. In addition, the areas of the "La Fuga", "El Refugio", "El Barrancón", "Panure" and "Guayavero de la Maria" reserves that fall within the buffer of 7 km southeast of the reference region were also extracted.

The area of the reference region corresponds to 1.064.336,42 hectares. Consistent with the methodology, the reference region compared to the project area is 26.2 times the project area, this accordingly with the Methodology according with the rule of Brown et al. (2007), “For projects below 100.000 ha, the reference region should be 20-40 times the size of the project area”.



Figure 16. Reference Region
Source: ALLCOT 2021

The reference region was defined considering that the biotic, physical, and social aspects were similar to the project area, according to the following criteria of the VM0015 methodology: landscape configuration, elevation, rainfall, strata, drivers of deforestation, infrastructures, among others.

Regards to **Landscape configuration and ecological conditions** Allcot embraced a numerical approach to test possible changes in deforestation rates in the Project Area and the similarity of landscape and ecological conditions between different versions of the Reference Region and the Project Area using GIS.

The following tables show that the reference region meets the characteristics of landscape similarity (forest/vegetation classes, elevation, slope, and rainfall) to the project area. See details of deforestation rates also in the tables below. The methodology indicates at least 90% of the project area must be within the elevation range of at least 90% of the rest of the reference region." Therefore, the information related to this topic is as follows:

Table 10 - Elevation Ranges - Project Area and Reference Region

Elevation Range (hmals)	Project Area		Reference Region	
Elevation Range (hmals	Project Area Surface (ha)	Project Area % of Surface	Reference Region Surface (ha)	Reference Region % of Surface
100-200	4,166.4	10.3%	105,111.2	9.88%
200-300	31,704.1	78.0%	848,569.5	79.73%
300-400	656.0	1.6%	28,065.2	2.64%
400-500	675.7	1.7%	8,652.9	0.81%
500-600	699.7	1.7%	9,943.8	0.93%
600-700	811.3	2.0%	10,761.4	1.01%

700-800	881.2	2.2%	12,350.8	1.16%
800-900	635.0	1.6%	11,719.8	1.10%
900-1000	376.1	0.9%	9,126.6	0.86%
1000-1100	31.8	0.1%	6,298.6	0.59%
1100-1200	0.0	0.0%	5,529.5	0.52%
1200-1300	0.0	0.0%	5,861.7	0.55%
1300-1400	0.0	0.0%	1,564.2	0.15%
1400-1500	0.0	0.0%	493.1	0.05%
1500-1600	0.0	0.0%	286.0	0.03%
1600-1700	0.0	0.0%	2.1	0.00%
TOTAL	40,637	100.0%	1,064,336	100%

Source: Reclass from DEM SRTM

The sum of the elevation classes from the range 100-500 hmals, for the RR is 990.399 hectares corresponding to 93% of the Reference Region. And, for the project area this value corresponds to 37.202 hectares, equating to 92%. This is evidence that at least 90% of the surface of the Project Area is within the elevation range of at least 90% of the rest of the reference region.

The next condition evaluated was Slope. The comparation between the Project Area and Reference Region related to the Slope Classes is the following:

Table 11. Slopes Ranges - Project Area and Reference Region

Slope Range (Degrees)	Project Area		Reference Region	
Slope Range (Degrees)	Project Area Surface (ha)	Project Area % of Surface	Reference Region Surface (ha)	Reference Region Surface (ha)
0 -3	19,489.4	48.0%	512,277.2	48.1%
3 - 7	14,418.1	35.5%	404,767.6	38.0%
7 - 12	3,004.2	7.4%	83,936.6	7.9%
12 -25	2,195.3	5.4%	44,639.2	4.2%
25 - 40	1,259.2	3.1%	16,433.8	1.5%
<89	271.0	0.7%	2,282.1	0.2%
TOTAL	**40,637**	100%	**1,064,336**	100%

Source: generated from SRTM DEM with the Slope tool of ArcGIS

The sum of the slope classes from 0-12% for the Reference Region is equal to 1.000.981 hectares and represents 94% of all Reference Region surface, the same sum for the Project Area is equal to 36.912 hectares and represents 90,8% of all its surface. Consequently, the average slope of at least 90% of the project area is within ±10% of the average slope of at least 90% of the rest of the reference region.

The next condition is in relation to the "*The **average annual rainfall** in at least 90% of the project area shall be within ± 10% of the average annual rainfall of at least 90% of the rest of the reference region*". The following information shows the rainfall classes and the area values for the RR and the PA.

Table 12- Project Area and Reference Region

Rainfall Ranges (mm)	Project Area		Reference Region	
	Project Area Surface (ha)	Project Area % of Surface	Reference Region Surface (ha)	Reference Region Surface (%)
2500 - 3000	39,562.0	97.4%	1,019,797.5	95.8%
3000 - 4000	1,075.2	2.6%	44,538.9	4.2%
TOTAL	**40,637**	100.0%	**1,064,336**	100%

Source: IDEAM 2012

The rainfall classes from 2.500 to 3000 mm for the Reference Region is equal to 1,019,795.5 hectares and represents 95.8% of all Reference Region surface, the same range for the Project Area is equal to 39,562 hectares and represents 97.4% of all its surface. Consequently, at least 90% of the project area is within ±10% of the rainfall ranges of at least 90% of the rest of the reference region.

For the Reference Region exist two **types or strata**, the Tropical humid forest - bh-T and the very humid Pre-Montane forest - bmh-PM, the surface and relation with the project area is the following:

Table 13 - Stable Forest by forest class Project Area and Reference Region ()

Forest Types (Zonas de Vida Class)	Project Area		Reference Region	
Forest Types (Zonas de Vida Class)	Project Area Surface (ha)	Project Area % of Surface	Reference Region Surface (ha)	Reference Region % of Surface
bh-T	39,598.5	97.4%	1,024,461.1	96.25%
bmh-PM	1,038.7	2.6%	39,875.4	3.75%
TOTAL	**40,637**	100%	**1,064,336**	100%

Source: IDEAM

The forest information shows that 100% of the project area have forest classes or vegetation types that exist in the 100% of the delimited reference region, in a similar proportion in both areas.

In the case of **agents and drivers of deforestation** local experts' knowledge gathered in multiple participatory workshops with the communities was used to determine that historically talking the Meta department has an agricultural vocation where extensive livestock farming plays a leading role in the expansion of the agricultural frontier and, therefore, in the worsening of deforestation and forest degradation. These phenomena are unfortunately also driven by the construction of illegal roads, illicit crops and land grabbing by settlers who come from other departments and the dissent of the former FARC guerrilla. Both extensive livestock farming, which is usually related to the country's large economic elites, and illegal phenomena, leave ordinary farmers out of the bulk of the production chains and access to land. This peasantry congregates and acquires legal scope in terms of the use and planning of the territories under the figure of the Community Action Boards (JAC, for their acronym in Spanish). These are precisely the legal figures who signed the accession agreements and contracts for the sale of carbon credits of the REDD+ project.

One of the main issues in Colombia is the irregular land tenure, where people have legal rights, as legal tenures, but the legal documentation has not been fulfilled. The "*Plan Integral De Desarrollo Agropecuario Y Rural Con Enfoque Territorial de Meta*" from the National Land Agency, declares that more than 75 % of the department has informal land tenure. The project area presents 82,53 % of this informal tenure.

More specific studies such as "*Lineamientos De Un Programa De Ordenamiento De La Propiedad Rural En La Zona De La Macarena"* (Reyes, 2010) shows for the rural area of Puerto Rico and Vista Hermosa 77% and 97% of illegal tenure for each one, similar to 85% and 97.5% in the project area. Puerto Lleras, according to its "*Plan de Ordenamiento Social de la Propiedad Rural*" has 63.46 % of land under this figure and the Project Area for this municipality has 51.7%.

On the other hand, VistaHermosa is the municipality that is completely embedded in the Amazon Biome according to the polygon recognized by the Colombian government, while Puerto Rico, Puerto Concordia and Puerto Lleras are located exactly in the zone of influence of the Ariari River and the transition from the Amazon Biome to the Orinoco biome. This implies a change in the natural conditions of the territory and, therefore, in its productive abilities.

In terms of vegetable crops due to climatic and altitude conditions, cocoa and coffee grow better in Vista Hermosa, while citrus fruits benefit more from the transition to the Orinoco biome and, therefore, have greater preponderance in the municipalities of Puerto Lleras, Puerto Rico and Puerto Concordia. However, half of the project partners or more refer to livestock farming as part of their productive activities, regardless of the municipality in question, which is partly because extensive livestock farming does not imply the establishment of infrastructure or specialized establishments (see tables below). It is then clear that the expansion of the agricultural frontier, mostly due to livestock activity, is a phenomenon that involves the entire Project area and the Reference Region.

Table 14 - Semiqualitative importance for REDD+ Project prioritized productive lines per municipality[15].

Municipalities	Cacao	Coffee	Citrus	Extensive livestock
Puerto Lleras	+		++	+++ to ++++
Puerto Rico	+		++	+++ to ++++
Puerto Concordia	+		++	+++ to ++++
Vista Hermosa	+++	+	+	+++ to ++++

Source: ALLCCOT 2024

The establishment of illegal roads, illicit crops and land grabbing by the dissidents of the former FARC guerrilla are phenomena whose direct management is beyond the reach of most public entities and even more so of private ones. However, and in parallel, the management of the governance and operation of the JAC supported by the REDD+ Project vindicates and allows the permanence of the peasantry in the department of Meta. This must also be understood to manage the phenomena of deforestation and forest degradation.

Regarding the **Área de Manejo Especial de La Macarena (AMEM)**, the zoning was issued by the government but has no operation in the territory since the entire department of Meta presents strong processes of colonization, high conflict due to disorderly use and occupation of the territory, informality of land ownership, armed conflict, and the permanence of crops for illicit use. Nevertheless, the analysis

[15] The maximum number of + signs are four (4); one + corresponds to 25%, two to 50%, three to 75% and 4 to 100%. In the case of livestock, the value could vary from 3+ to 4+.

has done in accordance with the official information from National Parks ("*Visor de informacion Ambiental para el Departamento del Meta*"), and a numerical representation percentage of the zones called "*Recuperación para la Preservación Norte*" and *Recuperación para la Producción Norte*" are shown in the following table, where, the percentage of AMEM zones included in RR and PA are offered.

Table 15 - AMEN Categories - Project Area and Reference Region

AMEN Categories		Project Area	Reference Region
DMI	Zone	Percentage	Percentage
Ariari Guayabero	Producción	52%	35%
Ariari Guayabero	Preservación Serranía de La Lindosa	0%	2%
Ariari Guayabero	Recuperación Para La Producción Sur	0%	1%
Macarena Norte	Recuperación para la Producción Norte	7%	20%
Macarena Norte	Recuperación para la Preservación Norte	22%	8%
Parque Nacional	Sierra de la Macarena	0%	8%
NA	NA	19%	26%
TOTAL		100%	100%

Source: PNN Colombia 2018

Furthermore, referencing the **legal status of the land**, the project partners are owners, holders, or users legally recognized through the figure of Community Action Boards (JAC, for its acronym in Spanish). These figures or communal systems are repetitive in the Meta department; even the official data supports it. The Agricultural Rural Planning Unit (UPRA) indicates that 75% of the properties are legal but present legal informality (In other words, the locals have the legal right of use but no legal information or evidence that supports it). See https://www.adr.gov.co/wp-content/uploads/2021/07/META-TOMO-1.pdf for more details.

Another familiar figure related to the project's partners is the small producers coming together to form legally recognized peasant associations with specific productive and social purposes. In this case, the informality of tenure is also evident.

- Project Area

The project area was defined by two factors: the presence or absence of forest, and secondly project partners who provide areas of their land for project development. The name of each discrete 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 40,637.

When each landowner signed the contact adhering to the general one, general information and coordinates were taken. With the information obtained from the reference points in the field, 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.

After desk review on the areas complying to technical and legal requests, 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. To do this, local personal was trained by ALLCOT, the information migrated to GIS and verified in Bogota. Corrections were made accordingly.

These are finally considered as project area. 20231221_co_sdm_annex_1.7_project_database_v2.0_ADD.xlsx contain the information regarding each discrete area, and Project_Area.kmz resents these areas.

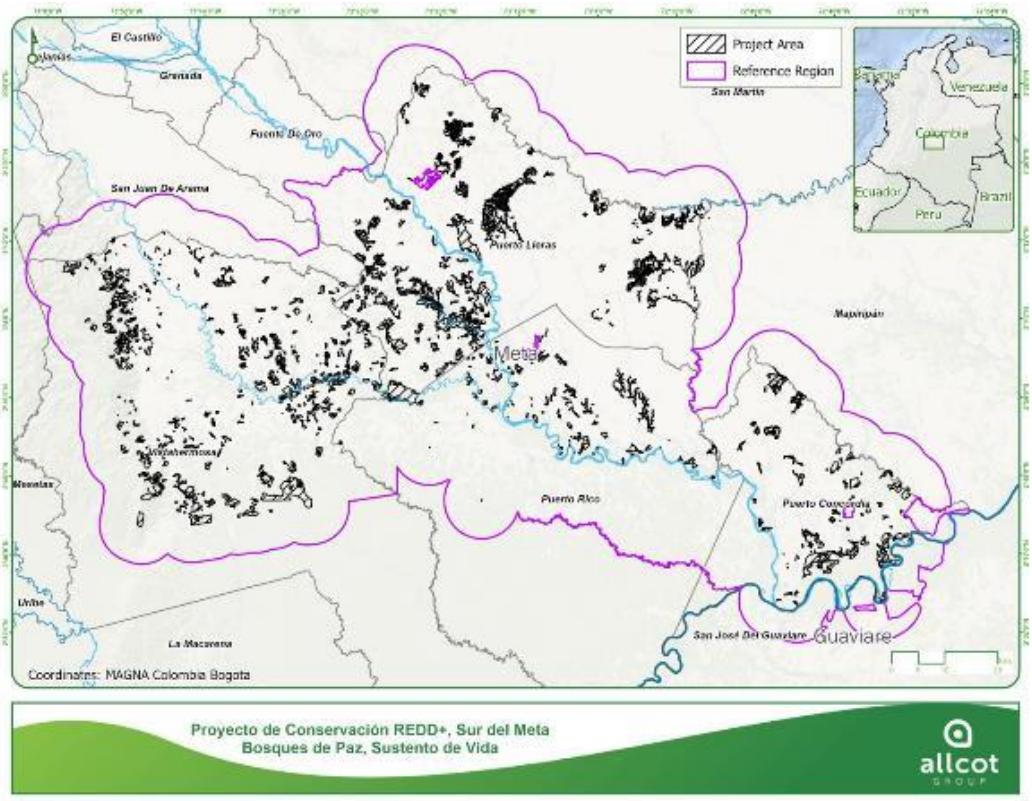


Figure 17. Project boundary – Project area
Source: ALLCOT, 2024

- 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.

As indicated in VM0015 methodology in section 1.13 Leakage Belt, the methodological option referred to as "Mobility analysis (Option II)" was used. With this option, the mobility potential of deforestation agents was evaluated using a multi-criteria analysis. For the analysis, the historical information of Forest/Non Forest from IDEAM was taken into account to characterize the historical behavior of forest loss between 2005 and 2020, additionality the variables used to perform the mobility analysis and the delimitation of the Leakage Belt are described below.

Table 16. Variables considered in the Mobility Analysis

Variable	Source
Farming Areas	IDEAM (2018)[16]
Infrastructure	Geofabrik (2022)[17]
Project Area	ALLCOT (2024)
Rivers	IDEAM (2015)[18]
Roads	Geofabrik[19]
Settlements	DANE (2021)[20]
Slope	ASTER DEM (30 m)[21]
Streams	IDEAM (2015)[22]

Source: ALLCOT 2024

Finally, the forest-non-forest map available in the Forest and Carbon Monitoring System (SMBYC)[23] and developed by the Institute of Hydrology, Meteorology and Environmental Studies (IDEAM) (Cabrera et al., 2011) (Galindo et al., 2014), was the most important variable for delimiting areas susceptible to leakage.

The steps for identifying the mobility analysis are described below:

1. Transformation of variables. From the information obtained for each of the variables, the Euclidean distance toolbox available in the ArcGIS Pro software, was run to calculate the straight-line distance between the polygons of each variable. The distance obtained in the resulting raster is the shortest distance between two points in a two-dimensional space. This process was executed for all variables except slope, which is a categorical variable that was classified from the POMCA of the Middle and Lower Ariari River, which is presented below.

Table 17 Slope classification

Class	Value (%)	Slope Type
1	1 -3	Slightly flat
2	3 – 7	Slightly inclined
3	7 – 12	Moderately inclined
4	12 -25	Steeply inclined
5	25 – 50	Slightly steep
6	50 – 75	Moderately steep

[16] http://bart.ideam.gov.co/cneideam/Capasgeo/Cobertura_de_la_Tierra_100K_Periodo_2018.zip

[17] https://download.geofabrik.de/south-america/colombia-latest-free.shp.zip

[18] https://www.colombiaenmapas.gov.co/?e=-82.43784778320864,-0.17644239911865092,-71.23179309571162,9.90326984502256,4686&b=igac&u=0&t=23&servicio=206

[19] https://download.geofabrik.de/south-america/colombia-latest-free.shp.zip

[20] https://geoportal.dane.gov.co/descargas/mgn_2021/MGN2021_URB_AREA_CENSAL.rar

[21] https://dwtkns.com/srtm30m/

[22] https://www.colombiaenmapas.gov.co/?e=-82.88828723633223,0.17511954935192,-70.78135364258544,9.556765109030875,4686&b=igac&u=0&t=2306&servicio=205

[23] http://smbyc.ideam.gov.co/MonitoreoBC-WEB/reg/indexLogOn.jsp

Class	Value (%)	Slope Type
7	> 75	Steeply steep

Source: CORMACARENA , 2016[24]

The resulting rasters for each of the variables are presented below.

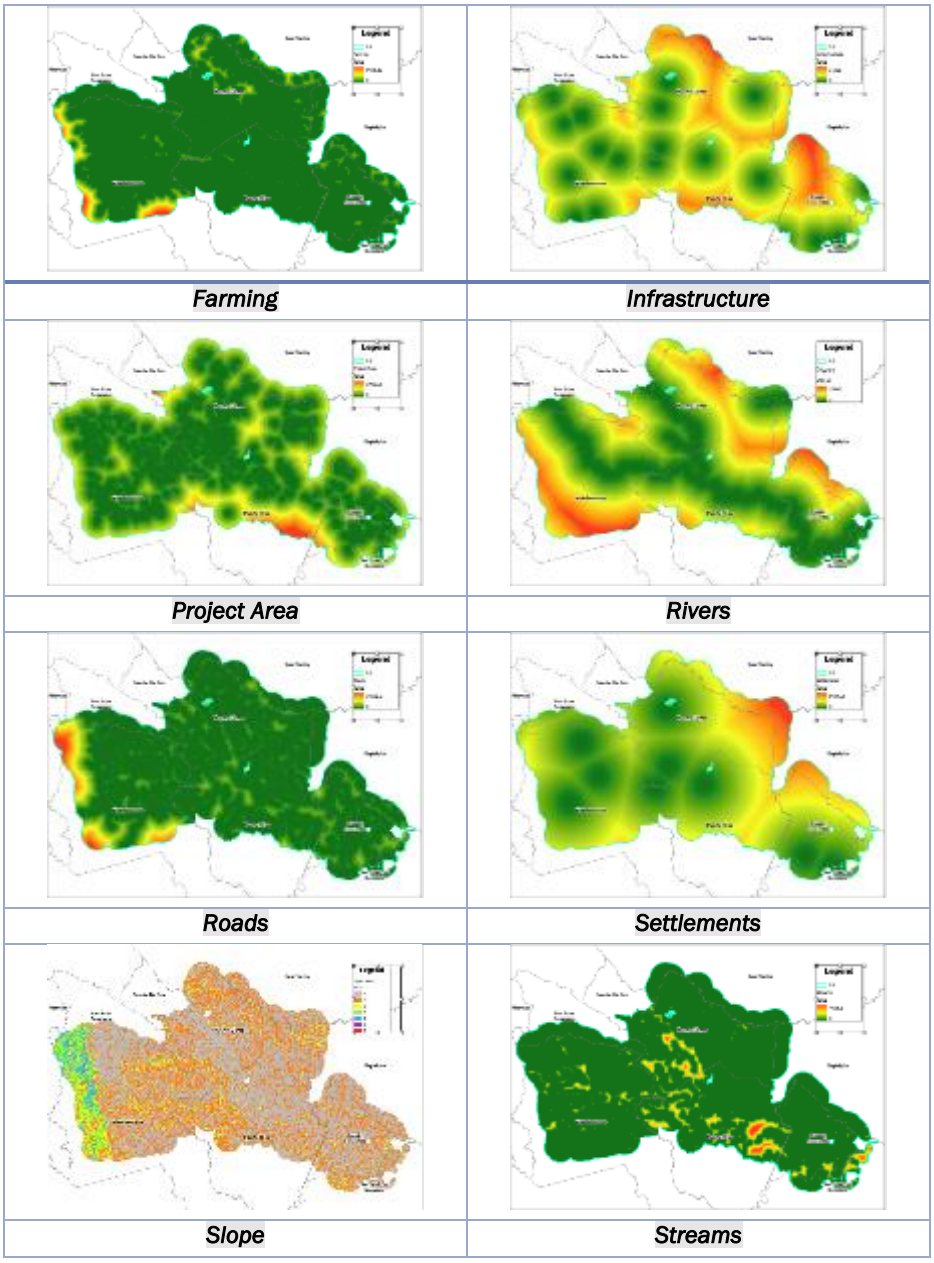


Figure 18. Euclidean Distance of the Variables and Slope Classes

[24] CORMACARENA (2016). Plan de Ordenación y Manejo de las Cuenca Hidrográfica (POMCA) del Río Medio y Bajo Ariari (Available at https://drive.google.com/drive/folders/1AC8vKupqkzxtMLR0yrdedOVPioW1OBsk?usp=sharing).

2. Identification of deforestation patterns by variable. Based on the shape of deforested areas resulting from the execution of the multiannual land cover analysis, a distribution analysis of deforested areas was performed for each of the variables. This allows us to obtain the mean distance of each variable to the deforested areas and the distance at the 90% percentile. The 90% percentile distance was chosen because it is assumed that 90% of the deforested areas are attributed to the deforestation agents while only 10% are attributable to other agents. On the other hand, the Slope variable identified the average slope on which 50% of deforestation is found and the average slope on which 90% of deforestation is found (Percentile 90%). The values obtained from the distance analysis of each variable concerning deforestation identified in the historical period (2005-2020) are presented below.

Table 18. Mean and Percentile 90% Distance Variables

Variable	Mean Distance (m)	Percentile 90 Distance (m)
Farming	133.18	854.23
Infrastructure	11,404.27	17,897.94
Project Area	6,766.64	21,930.38
Rivers	7,391.41	16,121.41
Streams	266.35	995.12
Roads	932.24	3,250.92
Settlements	14,956.02	24,237.32
Variable	**Mean Slope**	**Percentile 90 Slope**
Slope	2	3

Source: ALLCOT 2024

3. Variable weighting and multicriteria analysis. After identifying the deforestation patterns for each of the variables of the analysis, the ranges and their respective qualification were identified as follows:

   - Class 1: These are those values that present a distance greater than the 90% percentile. It represents those zones with less susceptibility to deforestation, due to the wide distance that the historical deforestation presents to each of the variables and because it covers only 10% of the historical deforestation.
   - Class 2: Values between the mean and the 90% percentile. Represents those areas that are moderately susceptible to deforestation by comprising between 50 and 90% of historical deforestation.
   - Class 3: Those values that are below the mean. Represents those areas that are highly susceptible to deforestation, due to the proximity between historical deforestation and each of the variables, and because they comprise 50% of historical deforestation within the evaluated RR.

The following is a description of the ranges obtained for each of the variables with their respective classification.

Table 19 Range and categories by variable

Variable	Classes (Range Distance m)		
	3	2	1
Farming	< 133.18	133.18 – 854.23	> 854.23
Infrastructure	< 11,404.27	11,404.27 – 17,897.94	> 17,897.94
Project Area	< 6,766.64	6,766.64 – 21,930.38	> 21,930.38
Rivers	< 7,391.41	7,391.41 – 16,121.41	> 16,121.41
Streams	< 266.35	266.35 – 995.12	> 995.12
Roads	< 932.24	932.24 – 16,121.41	> 16,121.41
Settlements	< 14,956.02	14,956.02 – 24,237.32	> 24,237.32
Variable	Classes (Range Classes Slope)		
	3	2	1
Slope	1 – 2	2 – 3	> 3

Source: ALLCOT 2024

.

Before calculating the total score resulting from the sum of all the variables, equal weights were defined for all the variables considered, since the mobility analysis used is a causal analysis that takes into account the deforestation agents already identified on Section 3.3 (see figure below).The causal analysis was delimited by grouping the variables into four categories that are related to each other and are presented below.

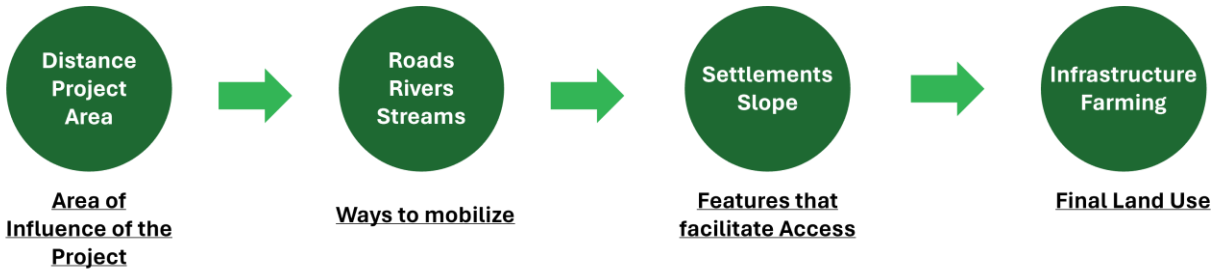


Figure 19 - Structure and variables of the causal analysis.

- Area of Influence of the Project: Identifies the areas near or bordering the project area, over which deforestation may be generated by the deforestation agents identified.

- Paths of mobilization: Variables that delimit the possible paths of mobilization of the agents of deforestation in the areas that are susceptible to deforestation.

- Features that facilitate Access: Physiographic, social and territorial conditions that increase or decrease the risk of deforestation to forested areas.

- Final Land Use: Corresponds to post-deforestation land uses identified for the project area[25] . The Farming category encompasses the possible dynamics due to praderization and/or generation of agricultural land uses after deforestation, previously reported (see Section 3.3 Project Boundary).

It is important to mention that correlations were made between the variables that determine mobility with respect to the historical deforestation of the project, but no significant differences (p-value > 0.05) were found that would show the "preference" of one type of road over the others. The case is similar to features that facilitate Access and distance to anthropized landscapes, where none of them were singularity determining the mobility and behavior of deforestation agents (p-value > 0.05). The case is similar for the other groups of variables (Area of Influence of the Project, Features that facilitate the access), where none of them show significant differences between variables on the influence of historical deforestation evaluated (p-value > 0.05). Still the multicriteria analysis carried out using the Suitability Modeler module of ArcGIS Pro, in which all variables were weighted equally, was able to rescue the historically known deforestation dynamics in the area. This means that the south of the Ariari River is at higher risk of deforestation. According to experts, this has to do with the higher terrestrial connectivity and stronger economic supply chains between municipalities in the south and between them and the rest of the country. The main land routes in the south include the Via Puerto Rico - Puerto Concordia - Puerto Lleras urban zone; the Via Vistahermosa - Mesetas - Uribe - San Juan de Arama; the Via Nacional Villavicencio - Guaviare; and the illegal route to the municipality of La Macarena. Although in Puerto Lleras, in particular, the presence of a bridge that crosses the Ariari River is beginning to make this difference less visible, it is an example of infrastructure development that affects deforestation patterns, since there are no proper plans for the use of forest areas.

Still other variables affecting the deforestation phenomenon other that agriculture and livestock ranching in the Meta department include range land establishment for land grabbing and logging without any lucrative purpose. This process is associated with armed groups outside the law. It is not associated with ordinary farmers, who are the central target of the REDD+ Sur del Meta project. It is important to emphasize that there is no reliable or public data on the number, location, or conduct of the former. Neither the communities are open to talk about it or map it due to security reasons. Therefore, armed groups cannot be included in a mobility analysis or any other statistical treatment. The REDD+ Sur del Meta project dignifies and promotes the belonging of ordinary farmers to the municipalities of Villahermosa, Puerto Rico, Puerto Concordia, and Puerto Lleras, as a way of contributing to the sustainable development of the territory, without ignoring that there are dynamics that surpass the REDD+ Squeme and continue to be part of the political evolution of the country.

Finally, the multicriteria analysis resulted in the totalized calculation of the weights of each variable is obtained.

[25] http://www.ideam.gov.co/documents/11769/126429586/Bolet%C3%ADn+6+-+II+Semestre+2015/0b6951c2-f8eb-46b9-96c6-734d9632e707?version=1.0. REPORTE REGIONAL IV TRIMESTRE 2023_PDF (ideam.gov.co)

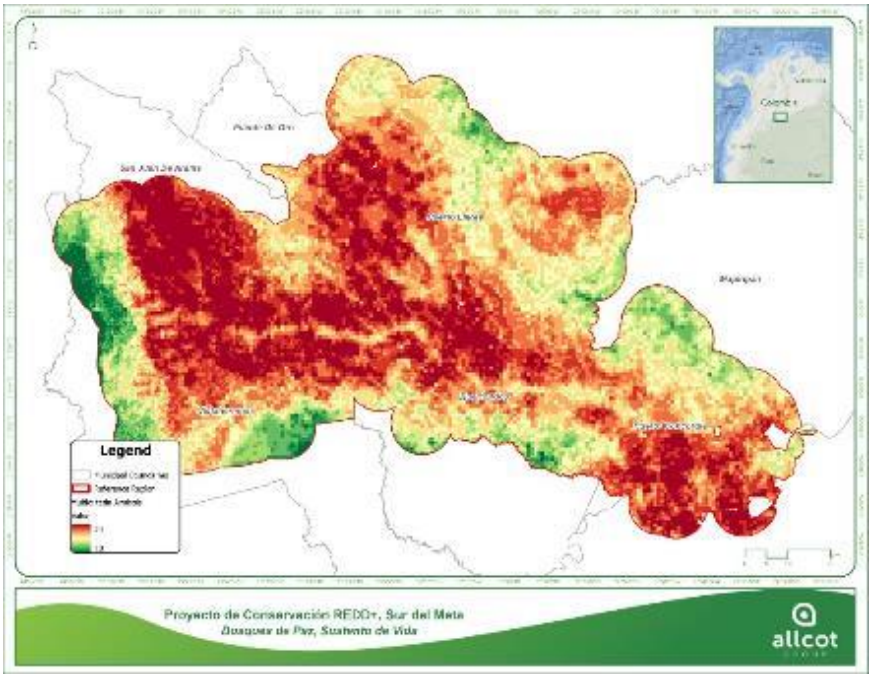


Figure 20 - Result - Multicriteria Analysis
Source: ALLCOT 2024

4. The **final identification of the Leakage Belt** was obtained by selecting those forested areas with a weighted score higher than 22. This is because they are those forests that have a greater influence on the mobility variables due to their proximity and understanding of the historical deforestation dynamics that have occurred in the territory. It is important to mention that the resulting values were initially divided into quartiles (8-12, 12-16, 16-20, 20-24), where the values in the range of 20 to 24 are those with the highest probability of deforestation risk according to the mobility analysis. However, when values between 20 and 22 are included, a leakage belt area greater than the project area is obtained (4 to 1.4 times the project area), which would attribute a greater amount of leakage to the project than would actually be generated by its implementation. Considering the above, the criterion of values greater than 22 meets the criterion where the leakage belt is equal to or less than the project area.
5.

Finally, all forested areas with an area greater than 1 ha were selected, according to the definition of forest established by the SMByC, and that did not overlap with the project area.

Following figure shows the Leakage Belt delimited from the mobility analysis, which covers 26.499,09 ha.

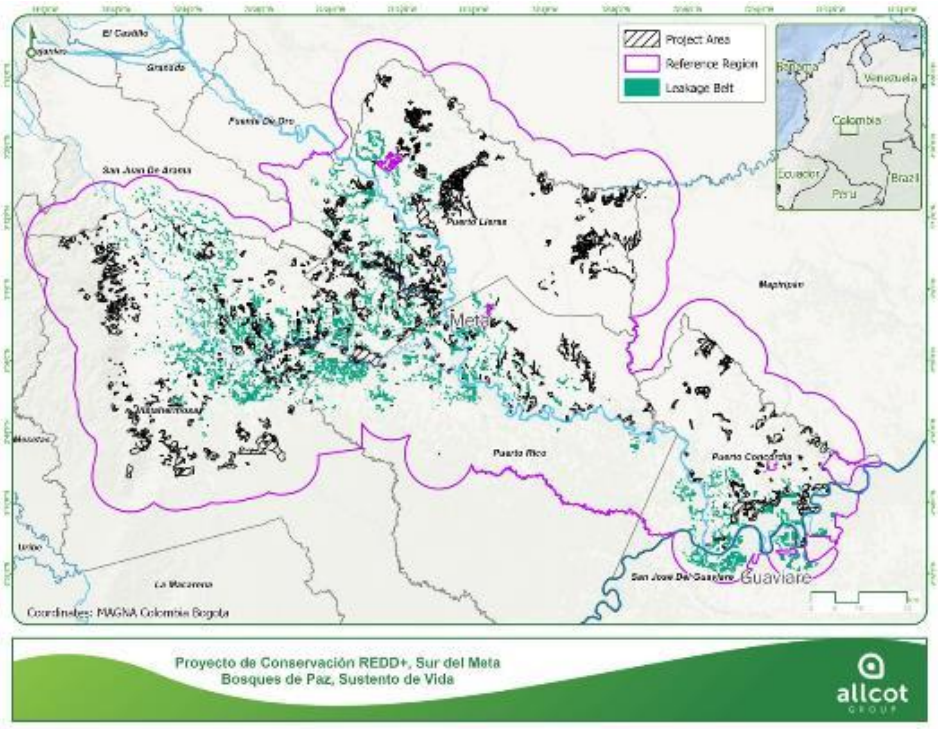


Figure 21 – Leakage belt
Source: ALLCOT, 2024

- Leakage management area

Leakage management area was delimited also based on the mobility analysis. This involved considering those non-forested areas (No stable forest and deforested forest during the historical period) that have greater vulnerability due to mobility variables (Farming, Settlements, Slope, Roads, Infrastructure, Rivers, Streams) and that are bordering the project area.

To determine the areas bordering the project area, a buffer of 400 m was established for each of the project areas. This distance is obtained from the calculation of the average area described in Annex 1.7 Distance_LMA.xlsx for each of the project partners, which was subsequently transformed into length (radius), based on the formula described below (Equation 1).

$$A = \pi r^2 = \sqrt{\frac{\pi}{A}}$$

Equation 1. Area of a circle

Considering the above, the leakage management area corresponds to the non-forested areas that are within a range of 400 m around each of the project areas and that are most affected by the different mobility variables.

The figure below shows the spatial limits delimited from the mobility analysis, including the Leakage Management Areas covering 27,058.59 ha. 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.

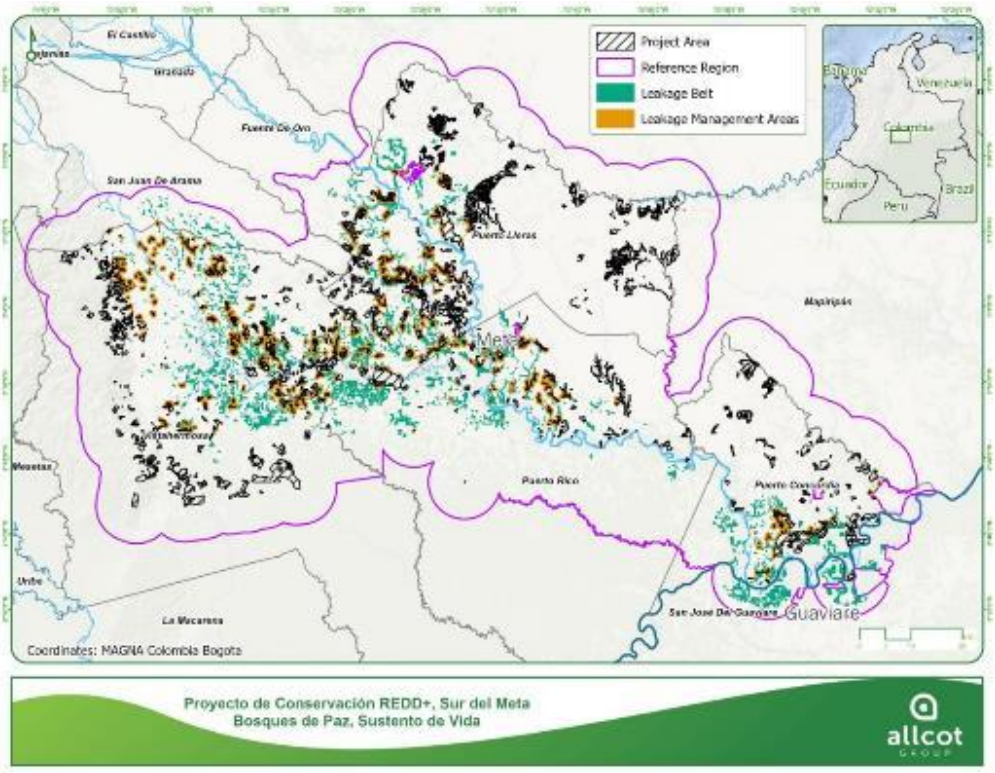


Figure 22 Project boundary - Reference Region, Project Area and Leakage Belt
Source: ALLCOT 2024

3.4 Baseline Scenario

The baseline scenario identification is done on accordance with the steps stablished in the applied methodology:

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

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[26] 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

Landsat 7 (ETM+ Sensor) and Landsat 8 (OLI and TIRS Sensors) were searched and downloaded through Earth Explorer. The downloaded images have a spatial resolution of 30 meters and a temporal resolution

[26] The historical reference period according to the methodology for the analysis of deforestation corresponds to at least 10 years prior to the project start date, 2010 to 2020 (11 years),. Likewise, to complement this analysis of land cover dynamics, an analysis of land use change for the years 2010, 2014 and 2018 was carried out.

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 20 - Images used to generate land cover (5)

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	23/01/2010	7	58
Landsat 7	ETM	30	11	3,576.61	08/02/2010	7	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	279,650.98	23/12/2018	8	58
Landsat 8	OLI	30	11	486,262.24	30/12/2018	8	58

Source: ALLCOT 2024

Additionally, a mosaic of medians was elaborated with Landsat 7 and 8 images according to availability, for each of the years under analysis (2010-2014-2018). This input allows obtaining more information to determine the project's RR coverages. The median mosaics cover the following temporalities.

Table 21. Dates of median Landsat mosaics

Year	Satellite	Start Date	End Date
2010	Landsat 7	01/01/2010	31/01/2010
2014	Landsat 8	01/03/2014	31/03/2014
2018	Landsat 8	01/12/2018	31/12/2018

Source: ALLCOT 2024

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 22. List of all land use and land cover classes existing at the project start date within the reference region (6)

Class Identifier		Trend in Carbon stock[27]	Presence in[28]	Baseline activity[29]			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	Industrial and Comercial Zones	Constant	RR	N	N	N	Territories covered by infrastructure for exclusively commercial, industrial, service and communications use. Covers facilities such as communications networks.
3	Agriculture Territories	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. 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, 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.
4	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.
5	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.

[27] Note if “decreasing”, “constant”, “increasing”

[28] RR = Reference region, LK = Leakage belt, LM = Leakage management Areas, PA = Project area

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

Class Identifier		Trend in Carbon stock[27]	Presence in[28]	Baseline activity[29]			Description (including criteria for unambiguous boundary definition)
ID_{cl}	Name			LG	FW	CP	
6	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.
7	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.
8	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 2024

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 23. Potential land use and land cover change matrix (7)

ID_{cl}			Initial LU/LC class							
			Urban fabric	Industrial and Comercial Zones	Agriculture Territories	Forest	Scrub and/or herbaceous associations	Open spaces with little or no vegetation	Inland wetlands	Inland Waters
Final LU/LC class	F1	Urban fabric	I1/F1	I2/F1	I3/F1	I4/F1	I5/F1	I6/F1	I7/F1	I8/F1
	F2	Industrial and Comercial Zones	I1/F2	I2/F2	I3/F2	I4/F2	I5/F2	I6/F2	I7/F2	I8/F2
	F3	Agriculture Territories	I1/F3	I2/F3	I3/F3	I4/F3	I5/F3	I6/F3	I7/F3	I8/F3
	F4	Forest	I1/F4	I2/F4	I3/F4	I4/F4	I5/F4	I6/F4	I7/F4	I8/F4
	F5	Scrub and/or herbaceous associations	I1/F5	I2/F5	I3/F5	I4/F5	I5/F5	I6/F5	I7/F5	I8/F5
	F6	Open spaces with little or no vegetation	I1/F6	I2/F6	I3/F6	I4/F6	I5/F6	I6/F6	I7/F6	I8/F6
	F7	Inland wetlands	I1/F7	I2/F7	I3/F7	I4/F7	I5/F7	I6/F7	I7/F7	I8/F7
	F8	Inland Waters	I1/F8	I2/F8	I3/F8	I4/F8	I5/F8	I6/F8	I7/F8	I8/F8

Source: ALLCOT 2024

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 agriculture territories.

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 24. List of land use and land cover change categories (8)

ID_{ct}	Name	Trend in Carbon stock	Presence in	Activity in the baseline case			Trend in Carbon stock	Presence in	Activity in the project case		
				LG	FW	CP			LG	FW	CP
I4/F1	Forest /Urban fabric	Decreasing	RR	Y	Y	N	Decreasing	RR	Y	Y	N
I4/F2	Forest /Industrial and Comercial Zones	Decreasing	RR	Y	Y	N	Decreasing	RR	Y	Y	N
I4/F3	Forest /Agriculture Territories	Decreasing	RR	Y	Y	N	Decreasing	RR	Y	Y	N
I4/F4	Forest /Forest	Constant	RR	Y	Y	N	Constant	RR	Y	Y	N
I4/F5	Forest /Scrub and/or herbaceous associations	Decreasing	RR	Y	Y	N	Decreasing	RR	Y	Y	N
I4/F6	Forest /Open spaces with little or no vegetation	Decreasing	RR	Y	Y	N	Decreasing	RR	Y	Y	N
I4/F7	Forest /Inland wetlands	Decreasing	RR	N	N	N	Decreasing	RR	N	N	N
I4/F8	Forest /Inland Waters	Decreasing	RR	N	N	N	Decreasing	RR	N	N	N

Source: ALLCOT, 2024

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. Based on the land covers obtained from the years 2010, 2014, and 2018, forest and non-forest classes were reclassified according to the country's definition of forest.

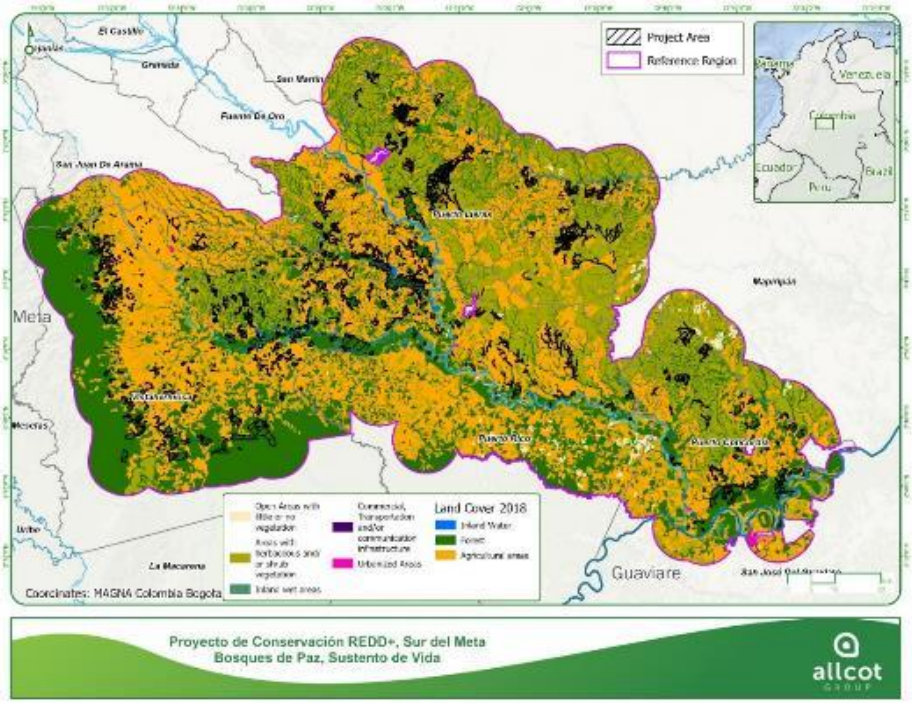


Figure 23- Land cover map 2018

Source: ALLCOT, 2024

Table 25. Historic land cover classes for the Reference Region

Code	Corine Land Cover Class	Area (ha)		
		Year 2010	Year 2014	Year 2018
11	Urbanized areas	946.23	1,092.96	1,092.96
12	Industrial and Commercial Zones	80.35	80.35	80.35
2	Agricultural territories	355,439.23	404,302.24	408,337.81
31	Forests	-*	-*	-*
32	Areas with herbaceous and/or shrub vegetation	247,921.84	247,451.45	251,859.81
33	Open areas with little or no vegetation	4,017.95	10,231.76	10,231.76
41	Inland wet areas	3,160.75	3,185.93	3,185.93
51	Inland waters	13,471.31	11,272.08	11,488.66

Source: ALLCOT, 2024

Although an extension for the forest class (31) was obtained from the land cover classification, the information used to determine the forest within each of the project boundaries is that determined by the IDEAM.

From the forest cover maps, the deforestation process between the three periods analyzed is clear. Between the years 2010 to 2014, 30,039.17 hectares were lost while for the period 2014 to 2018, 16.837,51 hectares were lost. In total, since 2010 to 2018, 46,876.68 hectares net was lost in the Reference Region.

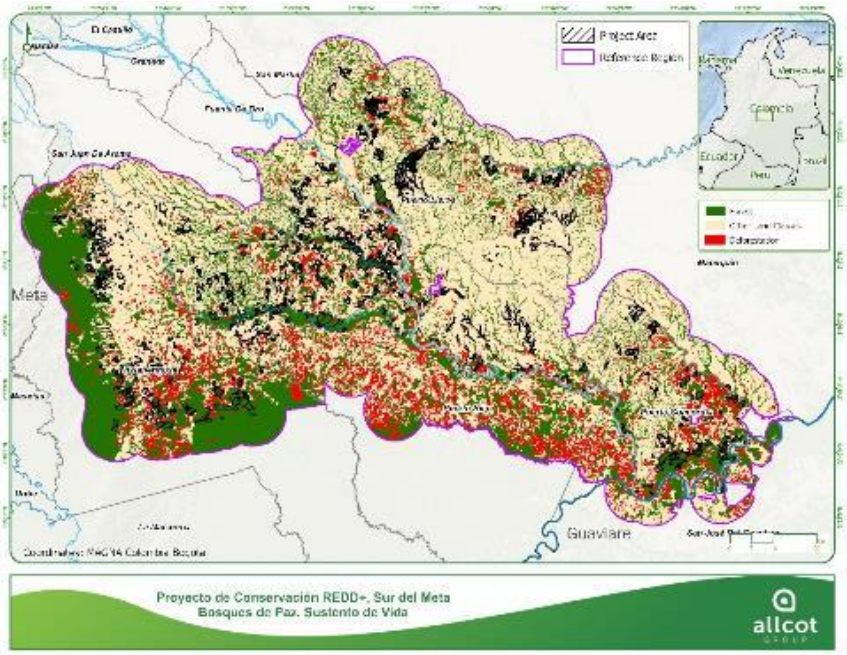


Figure 24 - Deforestation map 2010-2018
Source: ALLCOT, 2024

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 369,999.60 ha, and for 2018 it is 323,292.70 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 26. Change forest to other cover matrix 2010 - 2018 reference region.

CLC Classes	Area (ha)
Agricultural territories	38,191.67
Urbanized areas	8.35
Areas with herbaceous and/or shrub vegetation	7,916.06
Open areas with little or no vegetation	760.61
TOTAL	**46,876.68**

Source: ALLCOT, 2021

According to 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 a spatial scale of 1:100,000 (Cabrera et al., 2011) (Galindo et al., 2014).

With the forest non-forest data from the SMBYC, a cartographic clip was made in raster format, maintaining the extent of the Reference region. Then, a reclassification of pixels was made to obtain the following categories: forest (1), non-Forest (2), No Information (3) for each year.

Next, a cartographic overlap was made between the years to obtain a pixel-by-pixel record of the dynamics of the forest and non-forest in the analyzed period (2010 - 2020), obtaining the following categories between a couple of years: forest, non-forest, gain, deforestation, and no information.

Table 27. Dynamics of the forest and non-forest

Land cover year 1	Land cover year 2	Dynamics of the forest and non-forest
Forest	Forest	Forest
Forest	Non-Forest	Deforestation
Forest	No Information	No Information
Non-Forest	Forest	No Forest
Non-Forest	Non-Forest	Non-Forest
Non-Forest	No Information	No Forest
No Information	Forest	No Information
No Information	Non-Forest	No Forest
No Information	No Information	No Information

Next, the map overlaps information, in raster format, was converted into a vector format and then the areas of stable forest during the period 2010-2020 that did not meet the minimum area of 1 ha were converted to non-forest (no meet the minimum forest area). This will allow the project to construct a broad analysis of forest changes for the years 2010, and from 2012 to 2020 (annually) within the historical baseline for the Reference Region.

Table 28. Forest/Non Forest baseline for the Reference Region. 2010-2020

Year	Area in Non Forest (ha)	Area in Forest (ha)
2010	24,752.67	374,750.42
2012	44,009.12	355,493.97
2013	49,646.79	349,856.30
2014	51,889.42	347,613.66
2015	51,889.89	347,613.19
2016	55,642.79	343,860.30
2017	63,487.30	336,015.78
2018	73,427.25	326,075.84
2019	79,171.89	320,331.20
2020	85,672.90	313,830.19

Source: Allcot 2024

To take into consideration, from this moment and onwards, considering 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-montane. It should be noted that the estimation of carbon content in Colombia considers 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.

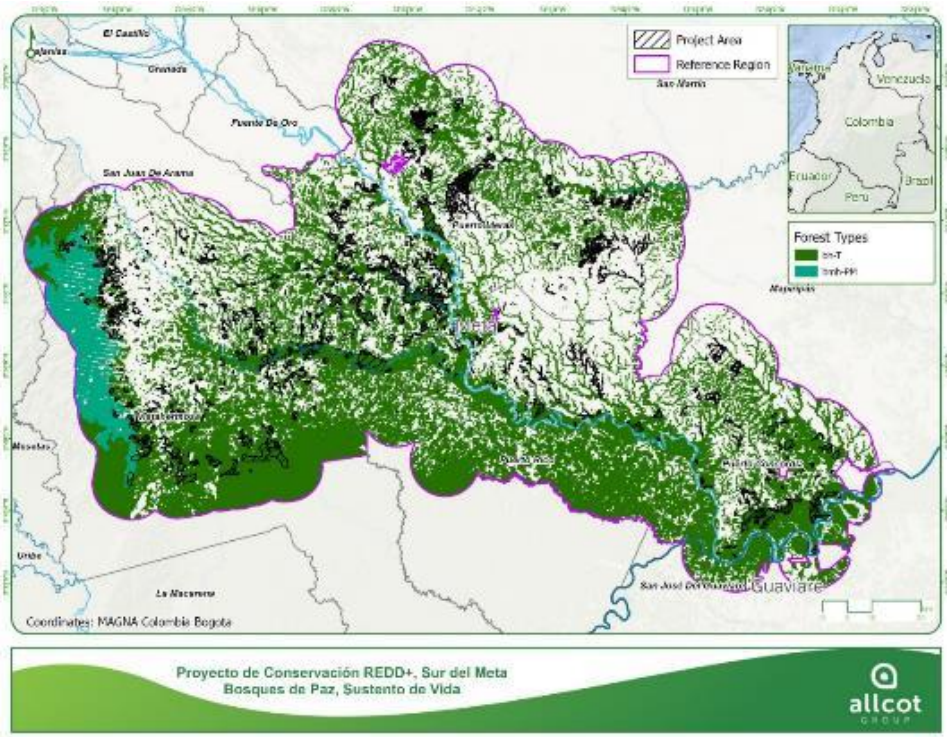


Figure 25. Map of forest by Holdridge Life Zonas 2018
Source: ALLCOT, 2024

Table 29 - Forest/Non Forest baseline for the Reference Region by Forest type. 2010-2020

Year	Forest for year	Area in Forest (ha)	Area in Non Forest (ha)
2010	bh_T	344,687.91	24,430.91
	bmh_PM	30,062.50	321.76
2012	bh_T	325,727.33	43,391.50
	bmh_PM	29,766.65	617.62
2013	bh_T	320,201.85	48,916.98
	bmh_PM	29,654.45	729.81
2014	bh_T	318,010.61	51,108.22
	bmh_PM	29,603.06	781.21
2015	bh_T	318,010.14	51,108.69
	bmh_PM	29,603.06	781.21
2016	bh_T	314,297.08	54,821.74
	bmh_PM	29,563.22	821.05
2017	bh_T	306,539.55	62,579.27
	bmh_PM	29,476.23	908.03
2018	bh_T	296,706.80	72,412.02
	bmh_PM	29,369.04	1,015.23
2019	bh_T	291,054.83	78,063.99
	bmh_PM	29,276.36	1,107.90
2020	bh_T	284,691.37	84,427.45
	bmh_PM	29,138.82	1,245.45

Source: Allcot 2024

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 classification accuracy for 2018 was validated through a confusion matrix with errors of commission (pixels classified as a land cover to which it does not belong) and omission (pixels that correspond to a land cover class but were not classified as such), which results in a percentage of the overall accuracy, comparing randomly distributed control points within the study area. The total number of points for the evaluation was calculated from the total number of polygons in the 2018 cover layer, considering the finite population methodology proposed by Morillas (2007). The GIS and RS expert evaluated this information points, assigning the forest cover class to each point, by observing imagery from different

sources than the sensors used for the classification, such as Google Earth image repository, Microsoft Bing, and the ESRI map, and Landsat images for the year previously mentioned.

Table 30. Result of the confusion matrix for the Project, changes from forest to other land cover

Class Value	C_11	C_12	C_2	C_31	C_32	C_33	C_41	C_51	Total	U Accuracy	Kappa
C_11	21	0	0	0	0	0	0	0	21	1	
C_12	0	2	0	0	0	0	0	0	2	1	
C_2	0	0	693	16	4	0	0	3	716	0.968	
C_31	0	0	20	296	7	0	11	1	335	0.884	
C_32	1	1	22	5	333	3	8	1	374	0.890	
C_33	0	0	5	2	2	61	0	0	70	0.871	
C_41	0	0	0	0	0	0	11	0	11	1	
C_51	0	0	0	0	1	0	1	27	29	0.931	
Total	22	3	740	319	347	64	31	32	1,558		
P Accuracy	0.955	0.667	0.936	0.928	0.960	0.953	0.355	0.844			
Kappa	0	0	0	0	0	0	0	0	0	0.00	0.893

Source: ALLCOT 2021

The results of the confusion matrix for the 2018 classification, in project area, where an overall accuracy of 92% was obtained. In the forest class, there is an accuracy of over 91%

- **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:

a) Identification of agents of deforestation.

b) Identification of deforestation drivers.

c) Identification of underlying causes.

d) Analysis of chain of events leading to deforestation; and

e) Conclusion.

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

The Project analysis is based on the document "Characterization of the Main Causes and Agents of Deforestation at the National Level. 2005 -2015" that reaches the level of the department of Meta. Likewise, the analysis of agents and drivers of deforestation in the reference region of the project "Reduction of Emissions from Deforestation and Degradation of Natural Forests in the Municipalities of Puerto Rico, Vistahermosa, La Macarena, Puerto Concordia, San Vicente Del Caguán and San José Del Guaviare - Colombia" is presented, which includes the rural areas of these municipalities located in the

department of Meta and San José del Guaviare in the Department of Guaviare. Finally, the data were supported at the project level, through workshops with partners, carried out for this purpose.

The analysis was developed following the guidelines of the VCS methodology for avoided unplanned deforestation (VM0015 v1.1) and the conceptual and methodological guidelines for the characterization of causes and agents of deforestation in Colombia of the Institute of Hydrology, Meteorology and Environmental Studies - IDEAM (2018).

The information to develop the analysis was obtained from the National Administrative Department of Statistics (DANE), the Colombian Federation of Cattle Ranchers (FEDEGAN), the Ministry of Agriculture and Rural Development (AGRONET), the Colombian Agricultural Institute and the Institute of Hydrology, Meteorology and Environment.

a) Identification of agents of deforestation

The project's reference region is located within the Amazon biome, catalogued as the largest region in the country with 46 million hectares and 87% of natural forests in 2015, with a high water supply, shallow soils for forestry and home to 10% of the world's species. A region in which the logging and burning of forests and their transformation into pastures for cattle ranching has been enhanced, in addition to agricultural activity linked to bonanzas (quina, rubber, cocoa, meat, tobacco) and illegal activities such as marijuana and coca cultivation (Corpoamazonia, 2012, as cited in González et al., 2018) see illustration.

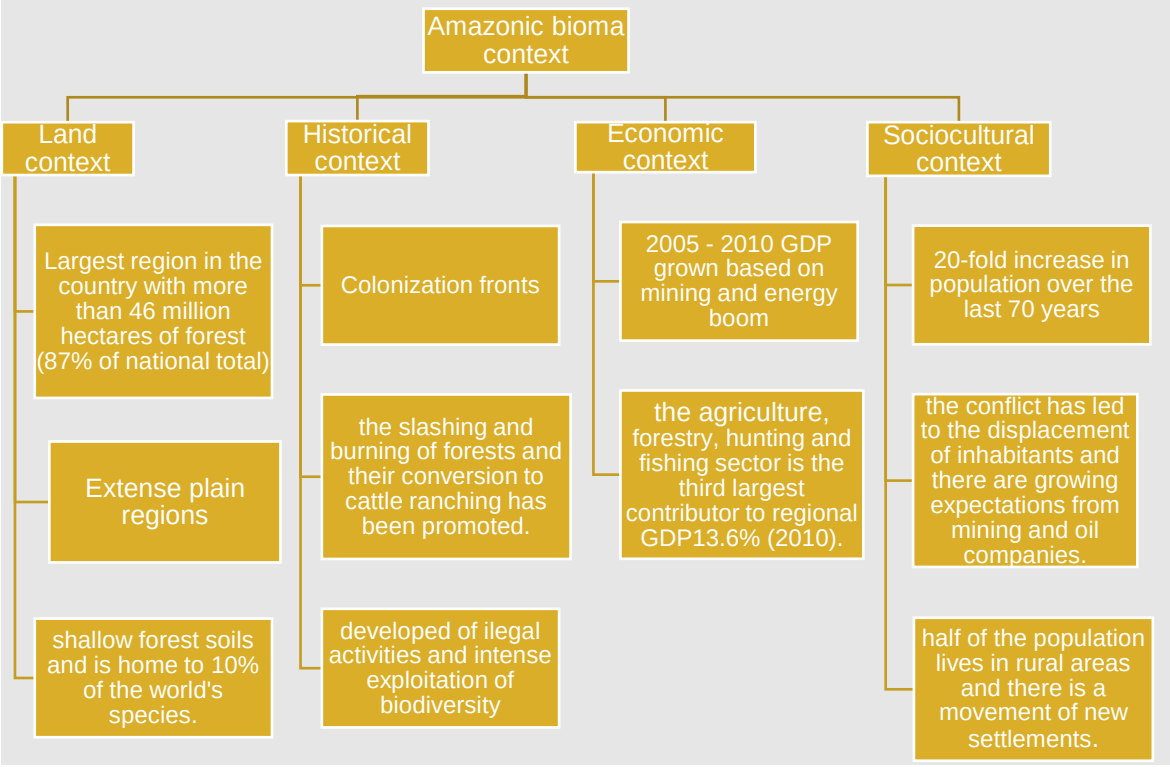


Figure 26. Amazonic bioma contextt

Source: González, J., Cubillos, A., Chadid, M., Arias, M., Zúñiga, E., Cubillos, M., Pérez, I. B. (2018)

According to IDEAM (2018), SINCHI (2016) and CORMACARENA (2015) highlight mainly cattle ranchers, agricultural producers and coca growers as the agents involved in the dynamics of deforestation at the national and departmental levels, which contrasts with information obtained from research works for the reference region Carmenza (2016) and Hurtado (2012) where they highlight the environmental conflicts generated by agro-industrial activity, extensive cattle ranching and illicit crops, so it can be concluded that the agents directly involved in the destruction of forests in the reference region are associated with the expansion of the agricultural frontier, timber extraction, mineral extraction and illicit crops.

This statement is reaffirmed by the ONUREDD study, which identifies the expansion of the agricultural frontier in the department of Meta, with special emphasis on livestock production and logging.

Agricultural frontier expansion (Cattle ranching):

These are rural ranchers whose primary vocation is dual-purpose livestock (milk and meat). This group of agents includes those who keep cattle for productive purposes, such as those who seek to secure land tenure by introducing cattle and who cut natural forests to plant new pastures for grazing their animals. The typical chain of activities for smallholders is to cut, burn, plant crops and plant pastures.

Agent characterization by deforestation driver:

Cattle ranching is one of the main activities causing deforestation in the project's reference region. A large part of this activity is dedicated to dual purpose (meat and milk). Most of the production is geared towards the market and opportunities generated in the cities of Villavicencio and Bogotá. According to the EOT of the municipalities in the region in question, most of the cattle ranching is extensive. Semi-intensive grazing systems on improved pastures are developed near the urban center. If we analyze the number of farms dedicated to cattle raising according to FEDEGAN, the municipality of Vistahermosa has the largest number of farms dedicated to this activity with 8,795 farms (36.87% of the total), Puerto Lleras with 5,292 farms (22.19%), Puerto Rico with 5,167 farms (21.66%) and finally Puerto Concordia with 4,594 farms dedicated to cattle raising (19.26%) (see following Table).

Table 31 Livestock farms in the municipalities of greatest influence in the reference region 2005 - 2019

Municipality	Farms with 1 to 50 cattle	Farms with 51 to 100 cattle	Farms with 101 to 500 cattle	Farms with 501 or more cattle	Total, farms
Vistahermosa	3,746	2,358	2,477	214	8,795
Puerto Lleras	2,064	1,432	1,698	98	5,292
Puerto Rico	1,998	1,348	1,600	221	5,167
Puerto Concordia	2,357	1,054	1,043	139	4,594
Total	**10,165**	**6,192**	**6,818**	**672**	**23,848**

Source: Own elaboration based on Fedegan statistics 2005 - 2019.

Next, social, economic, and cultural variables that characterize cattle ranchers in the project's reference region are identified, which help to understand why this agent is deforesting.

Table 32 cattle producer's socio-economic information on reference region

Municipality	Variable	Description
Puerto Rico	Age	Of the total of 90 resident producers according to age range, sex and municipality are distributed as follows: 62 men and 28 women, in "economically active or productive" age (15-64 years) there are 77 individuals (24 women and 53 men). The "dependent" age group (0-14 years old and over 65 years old) includes 13 individuals who work outside the productive age.
	Education	55.6% of the resident farmers have basic primary education, only 22.2% have a high school degree, which indicates that more than 50% of the graduates of basic education dropped out of school at the last level. Illiteracy among these producers is 14.4% (13 individuals have no schooling). Only 1 producer in this municipality has complementary studies.
	Income	The multidimensional poverty index for the municipality is 77.85%
Puerto Concordia	Age	Of the total of 678 resident producers according to age range, sex and municipality, 463 men and 215 women are distributed, in "economically active or productive" age (15-64 years) is 578 individuals (199 women and 379 men). The "dependent" age group (0-14 years old and over 65 years old) is 100 individuals (16 women and 84 men), of which 3 are under 15 years old and work outside the productive age.
	Education	Of the resident producers, 60.8% have a primary school education, only 12.2% have a high school degree, and only 0.7% (corresponding to 5 people) have a technical education. There is a high student dropout rate in the last cycle of education among young people, since a high proportion of those who come from elementary school do not continue on to secondary school. The 112 producers without any type of academic degree occupy 16.5% of this producer population.
	Income	The multidimensional poverty index for the municipality is 87.8%
Vistahermosa	Age	Of the total of 328 resident producers according to age range, sex and municipality, 239 men and 89 women are of "economically active or productive" age (15-64 years old), 141 individuals (72 women and 170 men). The "dependent" age group (0-14 years old and over 65 years old) is 69 men and 17 women for a total of 86 individuals working outside the productive age.
	Education	58.2% (191 of the total of 328) of the resident producers have primary school education, only 6.1% have a high school degree. In this municipality, 20.1% (66 of the producers) have no academic degree of the total number of producers.
	Income	The multidimensional poverty index for the municipality is 77,0%
Puerto Lleras	Age	Of the total of 130 resident producers according to age range, sex and municipality, those in "economically active or productive" age (15-64 years old) are 124 individuals (80 men and 44 women) corresponding to 95.4% of the resident producer population of this municipality. The "dependent" age group (0-14 years old and over 65 years old) is 4.6%.

Municipality	Variable	Description
	Education	50.0% of the resident producers have basic primary education, only 8.5% have basic secondary education. In this municipality, 35.4% (46 of the 130 producers) do not have any type of academic degree.
	Income	The multidimensional poverty index for the municipality is 85.64%

Source: Geoportal Dane, 2019 and Goberment of Meta, 2018.

Cattle ranchers develop their economic activity in a context where the expansion of the agricultural frontier is encouraged; therefore, they are reluctant to adapt to conservation policies. The low level of schooling makes it difficult for ranchers to access new techniques and tools, which limits their ability to implement sustainable activities on their farms. In addition, the lack of access to education creates a vacuum regarding the proper use of natural resources and leads to excessive exploitation of forest resources, causing deforestation or deterioration of ecosystems[30].

There is a high dropout rate in the last cycle of education among young people, since a high proportion of those who come from primary school do not continue to secondary school.

If a rancher needs to increase his income, he will most likely decide to increase his livestock production, thus increasing the pasture area to support the additional head of cattle[31] (extensive cattle raising).

Size of cattle producer's population:

Considering that there is no information available on the size of the population dedicated to cattle ranching in the reference region, we used the information on the number of heads of cattle for the historical period of deforestation in the municipalities of: Puerto Rico, Vistahermosa, Puerto Lleras, Puerto Concordia, San Vicente Del Caguán And San José Del Guaviare (available information) as an approximation of the size of the population dedicated to cattle ranching (2005-2019).

The behavior of the cattle inventory of the municipalities that make up the reference region of the project in the last fourteen years shows an increasing behavior, where the municipality of Vistahermosa stands out with 129,432 head of cattle in 2019 and a growth of 147% compared to 2005 where it had 52,346 head of cattle. In second place is the municipality of Puerto Rico with 82,831 head of cattle in 2019 and a growth of 189% compared to 2005 where it registered 28,649 head of cattle. In third place is the municipality of Puerto Lleras with 163,397 head of cattle for 2019 with a growth of 809% compared to 2005 where it registered 17,971 head of cattle. Finally, the municipality of Puerto Concordia is in seventh

[30] Germán I. Andrade. 2009. Selvas sin Ley. Conflicto, drogas y globalización de la deforestación de Colombia. Disponible en: http://library.fes.de/pdf-files/bueros/kolumbien/01993/05.pdf

[31] Organización de las Naciones Unidas para la Agricultura y la Alimentación FAO, 2006. La larga sombra del ganado. Disponible en: http://www.fao.org/3/a-a0701s.pdf

place in cattle inventory with 54,213 head of cattle for 2019, which represents an increase of 117% compared to 2005, when it registered 25,000 head of cattle [32].

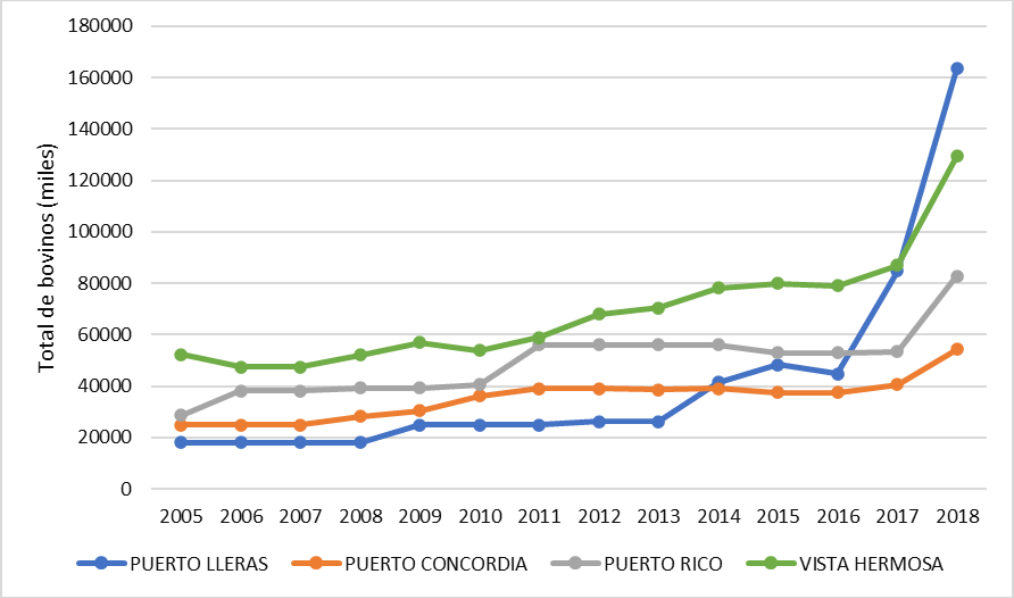


Figure 27 - Cattle inventory on the reference region.

Correlation between deforestation and cattle:

The following is a correlation analysis for the period (2010-2020) as a technique for analyzing statistically based information that allows us to study the relationship between the variables: forest area (hectares) and cattle production (number of head of cattle) and with this, establish whether livestock activity is a cause of deforestation in the area.

Following figure shows that while the cattle inventory increased in the period 2010 to 2018 from 155,727 to 429,873 head of cattle respectively, the remaining forest area in the period 2010 to 2018 decreased by 14.9% from 329,805 ha to 280,650 ha respectively.

[32] Información sobre el comportamiento del inventario bovino en los últimos 14 años. Recopilada en las bases de datos de FEDEGAN. Fuente: Federación Colombiana de ganaderos, FEDEGAN, 2005-2015. Estadísticas, Inventario Bovino. Disponible en: https://www.fedegan.org.co/estadisticas/inventario-ganadero y el Instituto Colombiano Agropecuario, censo pecuario 2016 – 2019, disponible en: https://www.ica.gov.co/areas/pecuaria/servicios/epidemiologia-veterinaria/censos-2016/censo-2018

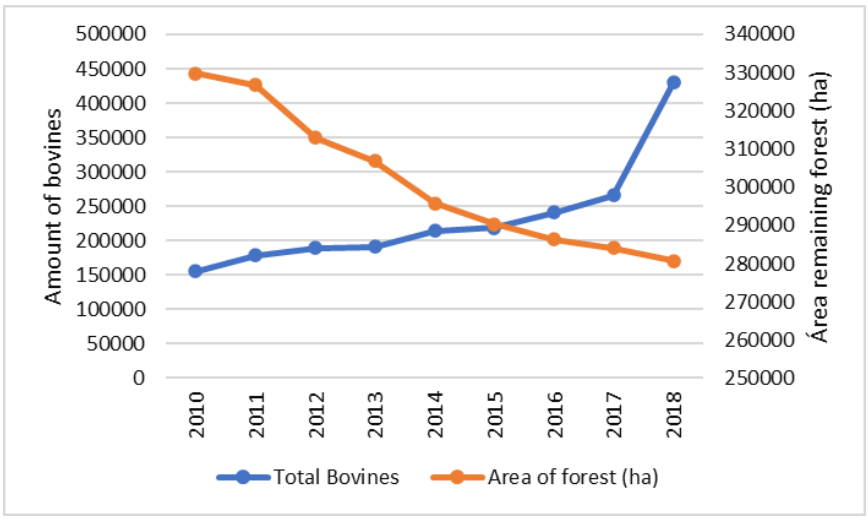


Figure 28 Comparison cattle and remaining forest ha 2010 – 2018.

To evaluate the relationship between cattle ranching and deforestation in the reference region, the hectares of remaining forest during the period 2010-2018 and the cattle inventory in the reference region for the same period of time were used as variables of analysis, for which information was collected from the databases of FEDEGAN and ICA, on the behavior of the cattle inventory and then a correlation and simple regression analysis was carried out using the R Project software.

The correlation coefficients indicate the relative relationship, or degree of relationship between variables, their dispersion, as well as outlier observations. The scatter diagram in following figure shows outliers (presence of atypical data) that may affect the correlation analysis, but it is not possible to show a linear or concave trend between the variables, which indicates a minimal relationship between the area of remaining forest (ha) and the number of heads of cattle.

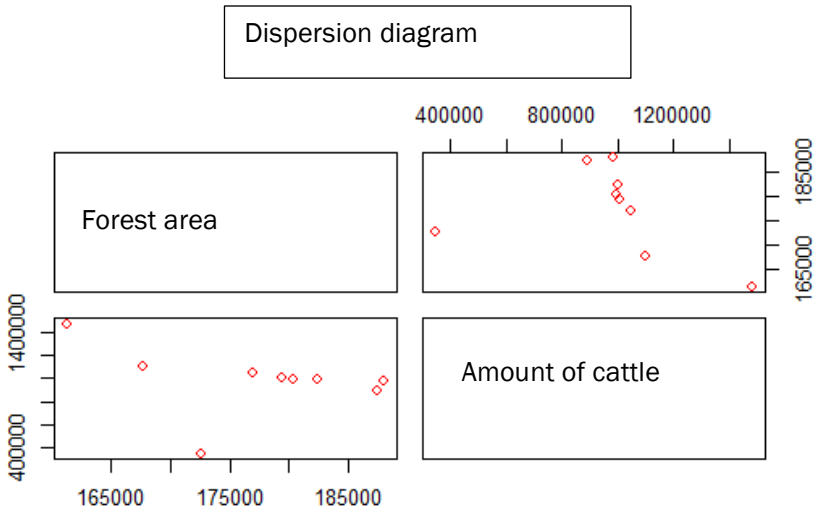


Figure 29 Dispersion diagram remaining forest area - number of cattle.

Source: Allcot 2024

By means of the correlation coefficient it is possible to identify whether there is a correlation between the variables, although this does not indicate that it is systematically significant, since it may be affected by the small sample size. Taking into account the above, some assumptions were reviewed to determine signs of significance and strengthen the hypothesis.

We propose the following Shapiro-Wilk hypothesis test used for samples of a maximum size of 50, to test the hypothesis that a sample comes from a normal distribution and thus the correlation assumptions are met.

$$\begin{cases} H_0: X \sim Normal \\ \quad vs \\ H_a: X \nsim Normal \end{cases}$$

Note: the decision criterion is to reject H_0 if the ¬p-value<0,05.

```
        Shapiro-Wilk normality test

data:  AREA
W = 0.94808, p-value = 0.6689
```

```
        Shapiro-Wilk normality test

data:  BOVINOS
W = 0.82453, p-value = 0.03876
```

From the results obtained, sufficient evidence was found to reject the null hypothesis that the data "number of heads of cattle" behave normally. On the other hand, no evidence was found to reject the null hypothesis that the data "area of remaining forest (ha)" does not behave normally. Therefore, it is concluded that both variables do not behave as a normal distribution. However, by Pearson's correlation coefficient for sample sizes less than 22 observations we can approximate this relationship.

Pearson's correlation coefficient is an index that measures the degree of covariation between linearly related variables, its values range from -1 to 1, where values close to 1 indicate a higher magnitude versus those values closer to 0. In addition, negative values indicate an inverse relationship and positive values a direct relationship between the variables:

```
        Pearson's product-moment correlation

data:  AREA and BOVINOS
t = -0.93418, df = 7, p-value = 0.3813
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 -0.8165199  0.4251962
sample estimates:
       cor
-0.3329425
```

Once the value of the correlation coefficient has been calculated, it is of interest to determine whether the value influences whether the compared variables are actually related or whether they are only related by chance. Therefore, testing the significance of the correlation coefficient means that one starts from the hypothesis that the correlation is equal to zero and wishes to find evidence, with a certain probability, that it is different from zero. For such work, the objective is to show that the sampling distribution of correlation from a population follows a t-student distribution (t-statistic) with N-2 degrees of freedom (df). Again, as in the previous estimation of normality, the calculation of the p-value as an approximation (statistical approximation between 0 and 1 that is interpreted as the maximum area of the region of rejection of H0) is less than 5% probability; in general, the smaller the p-value, the stronger the evidence from the sample to reject H0.

$$\begin{cases} H_0: \rho = 0 \ (correlacion\ de\ la\ población\ igual\ a\ 0) \\ vs \\ H_a: \rho \neq 0 \ (correlacion\ de\ la\ población\ diferente\ a\ 0) \end{cases}$$

Note: the decision criterion is to reject H0 if the p-value<0,05.

We do not reject the null hypothesis that the population correlation is equal to 0. Therefore, the Pearson correlation coefficient of -0.3329 between the amount of remaining forest (ha) and the number of head of cattle does not have a statistical interpretation, i.e., we can indicate that there is no or null correlation between variables.

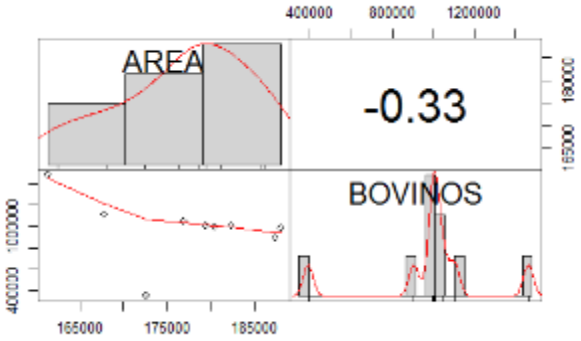


Figure 30- Histogram Forest area - total cattle.
Source: Allcot 2024

Agricultural producer:

This group includes small agricultural producers that generally correspond to peasant communities, ethnic communities and settlers who plant transitory or permanent crops for their own or community consumption and with some integration to local and regional markets (González et al., 2018) [33].

b) Characterization of agents according to deforestation driver:

The agricultural production area is characterized by being traditional, family and semi-mechanized with rotation with pastures, the incentive that the rural sector has for this type of crops comes from the opportunities and food demands generated by a market such as the City of Bogota (Cormacarena 2015).

In general, the total area planted in the municipalities of the reference region as of 2018 amounted to 444,422 ha, of which 330,079 ha were harvested with a production of 963 tons per year and an average yield of 8 ton/ha, with the municipality of Vistahermosa having the best yield with 13 ton/ha, followed by Puerto Rico with 9 ton/ha, Puerto Concordia 8 ton/ha, Puerto Lleras 6 ton/ha.

Table 33 Total areas for agricultural in the reference region

Municipality	Total planted area (ha)	Total harvested area (ha)	Total production(t)	Average yeild (t/ha)
Vistahermosa	91,294	60,775	174	13
Puerto Rico	90,379	59,196	231	9
Puerto Concordia	46,214	29,591	111	8

[33] González, J., Cubillos, A., Chadid, M., Arias, M., Zúñiga, E., Cubillos, M., . . . Pérez, I. B. (2018). Caracterización de las principales causas y agentes de la deforestación a nivel nacional periodo 2005-2015. Recuperado el 12 de junio de 2019, de Instituto de Hidrología, Meteorología y Estudios Ambientales – IDEAM-. Ministerio de Ambiente y Desarrollo Sostenible. Programa ONU-REDD Colombia: http://documentacion.ideam.gov.co/openbiblio/bvirtual/023780/Caracterizacion.pdf

Municipality	Total planted area (ha)	Total harvested area (ha)	Total production(t)	Average yeild (t/ha)
Puerto Lleras	18,069	16,133	68	6
Total	**245,956**	**165,695**	**484**	**42**

Source: Municipal Agricultural Assessments. Oficina Asesora de Planeación y Prospectiva - Grupo de Información y Estadísticas Sectoriales. Ministry of Agriculture and Rural Development, 2006 - 2018.

Of the total crops, 68% are permanent crops, mainly cassava, banana, rubber, sugarcane and cocoa, with an average yield of 10 tons/ha and a planted area of 167,250 ha; 32% are transitory crops, mainly corn, with an average yield of 8 tons/ha and a planted area of 78,705 ha.

Socieconomic characterization:

Next, socioeconomic variables that characterize farmers in the project's reference region are identified, which help to understand why this agent is deforesting.

Table 34 socio economic information on agriculture producer on Meta department

Department	Variable	Description
Meta	Legal status	According to the National Agricultural Survey EVA (2017) obtained from DANE, the legal status at the national level of agricultural producers is 90% natural person alone who develop productive activities, 1.2% are associated natural persons and only 0.9% are legal persons, which in comparison with the results obtained in the departments of the reference region are very similar, 84% of the productive activities are carried out by single individuals, 2% by associated individuals and 0.9% by legal entities , which reflects the low level of associativity for the establishment of productive activities, most of which are carried out in a traditional and familiar manner.
	Age and gender	On the other hand, when analyzing the participation of agricultural producers at the national level according to age and sex, 74% are men and 26% are women, of which 38% are female heads of household. When comparing the results at the national level with those obtained in the departments involved in the reference region, the structure is almost identical, with 76% of men engaged in agricultural production and 24% of women. The ages of men and women engaged in agricultural activities are 38.16% between 45 and 59 years old.
	Education	In terms of the level of schooling attained by farmers, 65% have completed primary school, 7.6% have completed junior high

Department	Variable	Description
		school, 9.9% have completed high school, 1.8% have a technical or technological degree, 5.2% have a university degree, and 0.9% have a postgraduate degree.

Source: EVA 2017

In order to take the information to the RR, the social development figures for the four municipalities where the project will be implemented are presented here.

Puerto Concordia: There are 21,442 inhabitants. The population increase has been constant in both rural and urban areas (DANE, 2020). The population concentration in rural areas is 50.58% and 49.42% in urban areas. The multidimensional poverty indexes for the municipalities 87.8%[34] Annex 2.1.6 Social Parameters. Informal employment in the municipality is 99.37%. Until approximately 15 years ago, the main source of income for the municipality was the production, processing and commercialization of coca, and given the income generated by this activity, there was little interest in developing licit agricultural activities, except for cattle ranching under the extensive production system.

The municipality of Puerto Concordia has low health coverage indexes for the existing systems, with 4.1% coverage of the subsidized system and 1.3% of the special system, 4.14% for the contributory system, and 13.8% for the uninsured population.

As part of the population, there is an indigenous reservation with a population of 266 people, equivalent to 1.2% of the total population of the municipality. This reservation is located outside of the project area and reference area.

Puerto Concordia has not published its municipal development plan, but it was one of the municipalities favored by Program Visión Amazonía[35] for the review and adjustment of the Land Use Planning Scheme (EOT).

Puerto Lleras: According to DANE (National Department of Statistics), Puerto Lleras had 10,354 inhabitants by 2020. The multidimensional poverty index for the municipality is 85.64% As indicated in the municipality's Development Plan, some rural areas have been experiencing land use conflicts associated with agricultural production, the expansion of the agricultural frontier, which has led to the clearing of native forests, the invasion of river banks and canals, as well as the construction of housing and the formation of population centers in areas of river flooding, which has led to the loss of native flora and fauna species.

Among the problems of the economic sector in the municipality are:

[34] According to National Department of Statistics DANE, In Colombia, a person is considered to be in a condition of multidimensional poverty if he or she has 33.3% of the deprivations as index.

[35] Vision Amazonia is a program oriented to avoid deforestation, which proposes a model of sustainable development for the Amazon. This initiative empowers local populations and articulates economic and social sectors to improve the quality of life. It promotes biodiversity conservation and productivity that recognizes the limitations and opportunities of the region, recovers the indigenous practices of indigenous peoples for conservation, the sustainability of the territory and the strengthening of local institutions. https://visionamazonia.minambiente.gov.co/en/what-is-amazon-vision/

- Low profitability and economic losses for rural producers because there is no compensatory balance between the sale of products and fair payment by intermediaries.
- Low income for rural families, no generation of new jobs, low economic dynamics in agriculture among small and medium-scale producers.
- Low installed capacity for administration and management among farmer associations and producers.
- Lack of infrastructure for agricultural production, provision of services and tourism products in the territory.

The National Planning Department reports low coverage in the provision of water and sewer services in the municipality of Puerto Lleras, indicating that 1/3 of the population has access to these services.

Solid waste collection is only provided in the urban center and in the Loma Linda sector, benefiting 22 households.

In the other population centers, the communities have opted to generate open dumps, which do not meet the requirements of the environmental authorities. Broadband coverage and access to ICTs is only 1.9%.

Puerto Rico: According to the 2018 DANE census, the municipality has 11,433 people, 55.22% equivalent to 6,313 are located in the urban area and 44.78 % equivalent to 44.78 % are located in the rural part of the municipality, i.e. 5,120 people. Of this population, 6,222 people are male (54.8%) and 5,171 are female (45.2%). The age ranges from 0 to 19 years old represents 36% of the population, followed by the 14 to 28 years old population (24%) and the elderly (10%). The multidimensional poverty index for the municipality is 77.85%

Public electricity service coverage is 96.49% in urban areas and 14.09% in rural areas. Gas coverage is 65.64% in urban areas and 0.26% in rural areas.

According to the Agency for Reincorporation and Normalization - ARN for 2019, 15 people were in the process of reintegration and 69 reincorporation for a total of 74 ex-combatants.

- Main problems at the territorial level
- Lack of ample and targeted urban housing.
- Problems of land formalization and legalization.
- Rural housing deficit.
- Deteriorated rural housing.
- Public services.

The municipality of Puerto Rico has 42 educational centers. The urban area has one educational institution: IE Alicio Amador Alvira with three educational centers and 56 teachers. The rural sector has one educational institution with 39 schools and a total of 53 rural teachers. However, there have been school dropouts due to factors such as poor road conditions, lack of school transportation and long distances, lack of school meals, school dropouts due to child labor, and overflowing and flooding of pipes. There is also a lack of internet connectivity, and some schools have damaged infrastructure.

Public water, sewer, and sanitation services are provided by Empresa de Servicios Públicos Departamental EDESASA ESP only in urban areas, with 663 water and sewer users and 740 sanitation

users. The municipality does not have a water purification system. There is no public sewer service in rural areas. Septic tanks are used. There is inadequate solid waste disposal in the territory and low energy coverage.

According to the 2005 DANE census, the municipality of Puerto Rico has 251 ethnically recognized inhabitants. There are no reservations or community councils.

The main problems identified in the area of competitiveness, productive transformation and tourism are:

- Little added value to the raw material produced by farmers.
- Lack of technical assistance to rural producers.
- Lack of productive projects that involve rural women.
- High agricultural production costs and insecure marketing.

Vistahermosa: According to the DANE census (2005), the municipality of Vistahermosa has 27,671 inhabitants, of which 10,407 inhabitants are located in the urban center (37.6%) and 17,264 in rural areas (62.4%), with 13,698 women (49.5%) and 13,973 men (49.5%).

Within the pyramidal structure, 49% of the population is under 24 years of age, which corresponds to 6,885 men and 6,677 women, 43% of the population corresponds to the 25-59 age range identifying 5,880 men and 5,892 women, finally, there is the population range between 60 to 80 and over with a proportion of men of 1,208 and women of 1,129 women which is equivalent to 8%. The multidimensional poverty index for the municipality is 77,0%

In relation to ethnic minorities, 45 indigenous people and 388 Afro-descendants were recognized according to the 2005 Census. However, none of the project partners belong to these ethnic groups.

The municipality has an educational staff of 195 teachers, of which 67 are from urban areas and 128 from rural areas. 25.8% of the municipality's enrolled students are victims of the armed conflict, 99% of whom are displaced; as of 2016, 50 children have disabilities. The educational centers have poor infrastructure, poor access to public services, and do not have legalized land.

The employment rate indicates that 85% of the population is engaged in some formal economic activity. The unemployment rate is 30% of the population.

The municipality has public water, sewer, and sanitation services in the Piñalito, Campo Alegre, and Puerto Lucas population centers. The towns of Piñalito, Campo Alegre, Maracaibo and Santo Domingo have collective infrastructure for collecting, transporting and disposing of wastewater. The company in charge of solid waste collection services is provided by the Public Services Unit, using a 12-ton compactor collection vehicle.

Size of the agricultural producer´s population:

Agriculture is one of the most important productive activities in the reference region in terms of income generation, along with cattle ranching, and in terms of area it represents the second most important driver of deforestation after cattle ranching. To represent the size of the farmer population, the number of hectares planted was used as an indirect measure, since there is no information on the number of families dedicated to this activity and in most cases, there are agents that are dedicated to both agriculture and cattle ranching on the same property.

When analyzing the behavior of the total area planted in the municipalities that make up the reference region in the period 2010- 2014 -2018, there is evidence of a 15% growth from 2010 to 2014, going from 128,093 ha to 147,184 ha planted in 2014, period from which it begins to grow more slowly, where it went from 147,184 ha to 154,032 ha planted in 2018.

Correlation between agriculture and deforestation:

To determine the relationship between agricultural activity and the pressure on land use associated with deforestation, the same correlation analysis as in the previous paragraph is performed for the period (2008-2018) to establish whether there is a relationship between the two variables. For this purpose, the relationship and interaction between the area of remaining forest (ha) and the area planted (ha) of the main permanent and transitory crops in the reference region is analyzed.

To test the relationship between these two variables, information was collected from Agronet[36] databases on the behavior of cultivated areas in the last 10 years and then a correlation and simple regression analysis was carried out using R Project software.

The following figure shows the increase in planted area from 2008 to 2018. On the other hand, the remaining forest area decreases continuously for the period 2010 to 2018.

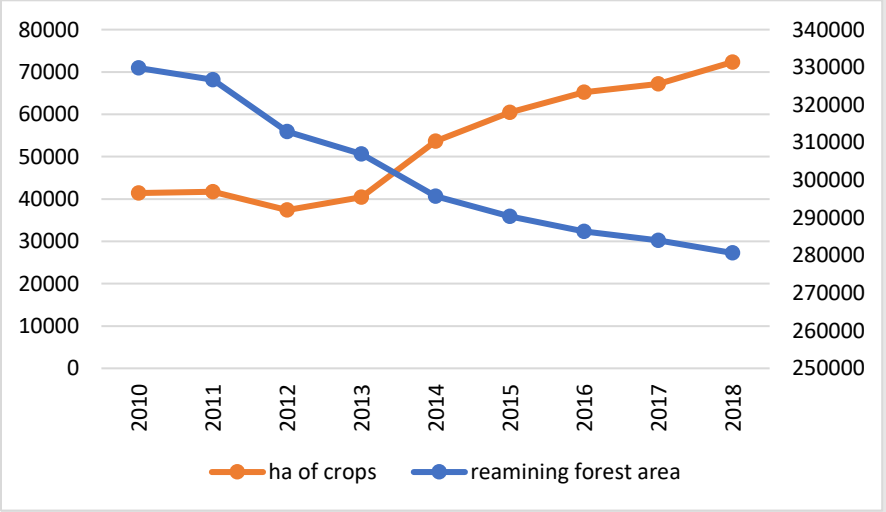


Figure 31.-Comparison agriculture area - remaining forest area on the RR.

The correlation coefficients indicate the relative relationship or degree of covariation between the area of remaining forest (ha) compared to the area planted in the reference region for the period 2010-2018. When plotting the respective points, placing on the x-axis "area planted" and on the y-axis "area of remaining forest (ha)" the type of association between both variables is not observed in the scatter plot, so it is not convenient to suggest a behavior. However, in the same graph in the lower left part (by

36 Agronet. Es la Red de Información y Comunicación del Sector Agropecuario de Colombia, liderada por el Ministerio de Agricultura y Desarrollo Rural y con el apoyo de la Organización de las Naciones Unidas para la Agricultura y la Alimentación FAO. Centraliza y difunde información del sector, para apoyar la toma de decisiones. Disponible en: https://www.agronet.gov.co/estadistica/Paginas/home.aspx?cod=59

interchanging the axes) we can suggest a positive exponential association, associated to a strong and directly proportional correlation.

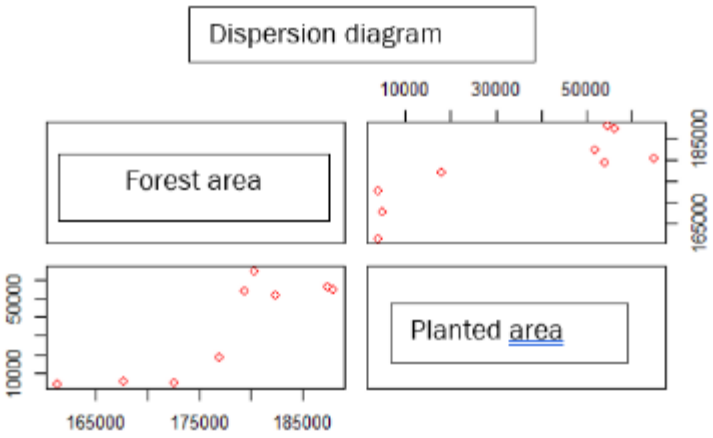


Figure 32 Dispersion diagram forest area - planted area.

Source: Allcot 2024

By means of the correlation coefficient it is possible to identify whether there is a correlation between the variables, although this does not indicate that it is systematically significant, since it may be affected by the small sample size. Taking into account the above, some assumptions were reviewed to determine signs of significance and strengthen the hypothesis.

We proposed the following Shapiro-Wilk hypothesis test for samples with a maximum sample size of 50 observations, to test the hypothesis that the sample comes from a normal distribution and thus the correlation assumptions are met.

$$\begin{cases} H_0: X \sim Normal \\ \quad vs \\ H_a: X \nsim Normal \end{cases}$$ Note: the decision criterion is to reject H_0 if the ¬p-value<0.05.

The null hypothesis of normality will be rejected if the W statistic is less than the critical value provided by statistical theory or if the p-value (statistical approximation between 0 and 1 that is interpreted as the maximum area of the region of rejection of H0) is less than 5% probability, in general, the smaller the p-value, the stronger the evidence from the sample to reject H0.

```
        Shapiro-Wilk normality test

data:  AREA
W = 0.94808, p-value = 0.6689
```

```
        Shapiro-Wilk normality test

data:  Sembrado$SEMBRADA
W = 0.79521, p-value = 0.018
```

From the results obtained, we found sufficient evidence to reject the null hypothesis that the "area planted (ha)" data behave normally. On the other hand, we did not find evidence to reject the null hypothesis that the data "area of remaining forest (ha)" does not behave normally. Therefore, we conclude

that both variables do not behave as a normal distribution. However, by Pearson's correlation coefficient for sample sizes less than 22 observations we can approximate this relationship.

Pearson's correlation coefficient is an index that measures the degree of covariation between linearly related variables, its values range between -1 and 1, where values close to 1 indicate a higher magnitude against those values closer to 0. In addition, negative values indicate an inverse relationship and positive values a direct relationship between the variables:

```
        Pearson's product-moment correlation

data:  AREA and Sembrado$SEMBRADA
t = 4.3017, df = 7, p-value = 0.003559
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 0.4320961 0.9682044
sample estimates:
      cor
0.8517856
```

Once the value of the correlation coefficient has been calculated, it is of interest to determine whether the value influences whether the variables compared are in fact related or whether they are only related by chance. Therefore, testing the significance of the correlation coefficient means that one starts from the hypothesis that the correlation is equal to zero and wishes to find evidence, with a certain probability, that it is different from zero. For such work, the objective is to show that the sampling distribution of correlation from a population follows a t-student distribution (t-statistic) with N-2 degrees of freedom (df). Again, as in the previous estimation of normality, the calculation of the p-value as an approximation (statistical approximation between 0 and 1 that is interpreted as the maximum area of the region of rejection of H0) is less than 5% probability; in general, the smaller the p-value, the stronger the evidence from the sample to reject H0.

Test of the statistical significance of the correlation coefficient:

$$\begin{cases} H_0: \rho = 0 \ (correlacion\ de\ la\ población\ igual\ a\ 0) \\ vs \\ H_a: \rho \neq 0 \ (correlacion\ de\ la\ población\ diferente\ a\ 0) \end{cases}$$

Note: the decision criterion is to reject H_0 if the p-value<0.05.

We reject the null hypothesis that the population correlation is equal to 0, because the p-value=0.003559 is less than 5%. Therefore, Pearson's correlation coefficient of 0.8517 between the area of remaining forest (ha) and the amount of area planted have a strong positive correlation.

The coefficient of determination, as a measure of the proportion of variability is:

```
> 0.8517^2
[1] 0.7253929
```

A percentage of 72.53% of the variability of the remaining forest area (ha) of the population is being explained by the variation in the area of planted forest (ha). In other words, it can also be stated that 27.47% (the variability that is not explained) of the variability of remaining forest (ha) is not related to the area of planted forest.

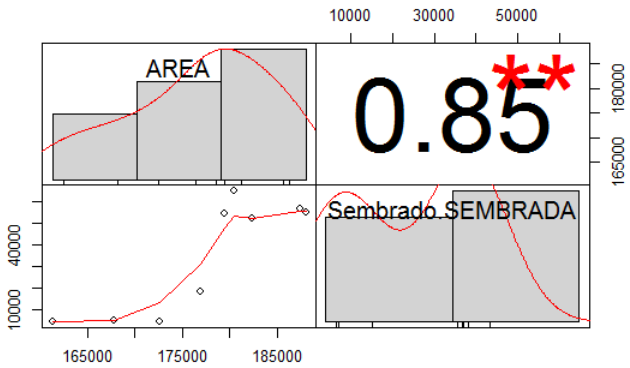


Figure 33 - Histogram Forest area. planted area.

The hypothesis test with p-value < 5% indicates that the relationship between the variables is strong positive (directly proportional) and that the variable planted area (ha) explains 85.17% of the other remaining forest area (ha). Therefore, it can be deduced that agriculture is a factor causing deforestation.

Identification of forest drivers

The key variables to explain deforestation are:

Population density in the reference region: From 2008 to 2018, according to figures provided by the National Department of Statistics DANE, the population of the municipalities of Vistahermosa, Puerto Rico, Puerto Lleras, Puerto Concordia, shows a growing trend, This indicates that there has been an increase in both the municipal capital and the rural area, and that this trend will continue, which means that there will continue to be more population in both the municipal capital and the rural area, which in one way or another will generate pressure on the forests because more land will be required for agricultural activities.

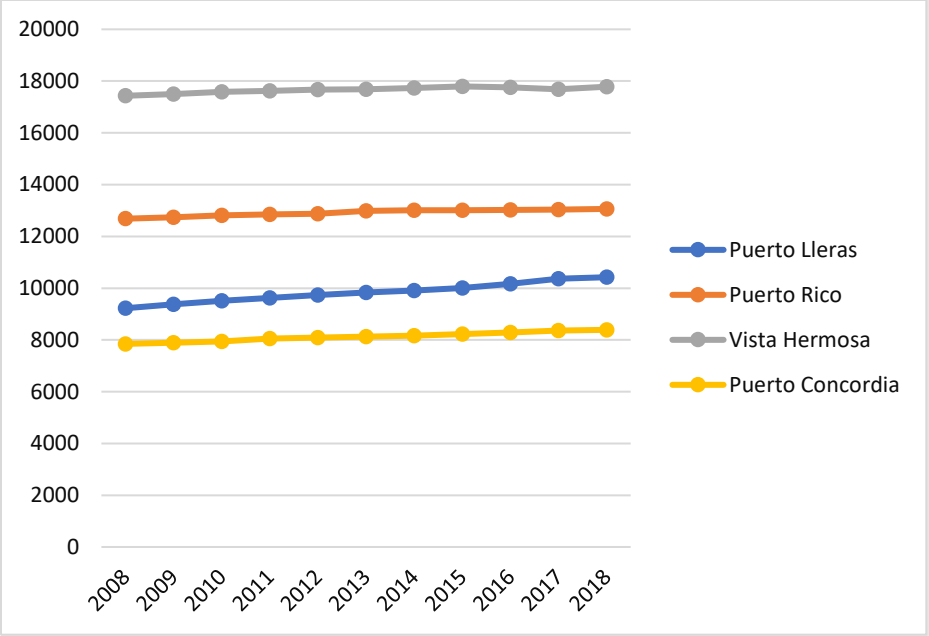


Figure 34 - Population growth in the Reference Region

Source: Prepared by the authors based on information provided by the National Administrative Department of Statistics (Dane, 2019).

Price of agricultural inputs and demand for commodities and raw materials: Within the economic and technological factors identified by González et al., 2018, as the main underlying causes of deforestation, it is that Colombia's incursion into the global economy has influenced the dynamics of deforestation throughout the national territory to the extent that conditions have been propitiated for the increase in national and international demand for commodities and illicit raw materials, and the variation of international prices, since in the face of the increase in demand and price of these raw materials, the expansion of crops and pastures is promoted. An example of this is the case of minerals such as gold and agricultural products such as coca and palm oil, whose extraction and production are recognized as direct causes of deforestation in several parts of the national territory, being the specific case of the project's reference region, where there is evidence of a development and increase in the coca market and a tendency to increase its price, leading to a greater production of these goods.

In the case of palm oil, according to FEDEPALMA and the study performed by IDEAM in 2017, there are no legal palm oil plantations generating deforestation on the RR[37]. The illegal palm oil plantations[38], even though are not representative according to the land use interpretation, it is included on the post deforestation land change as permanent crops.

When analyzing the prices of agricultural inputs in the reference region, an increase in prices can be identified. This fact generates pressures on the forest, since given the low income of the agents responsible for deforestation (cattle ranchers and farmers), they will be forced to clear more land in order

[37] https://elpalmicultor.fedepalma.org/el-sector-palmero-colombiano-no-es-un-motor-de-deforestacion/

[38] https://fedepalma.org/noticias/fedepalma-alerta-sobre-posible-deforestacion-en-zonas-de-exclusion-legal-y-de-importancia-ambiental-y-social-en-la-amazonia-colombiana/

to be able to buy the inputs that will allow them to produce the goods they need[39]. Farmers are generally encouraged to deforest if low land productivity does not allow them to realize their profit expectations[40].

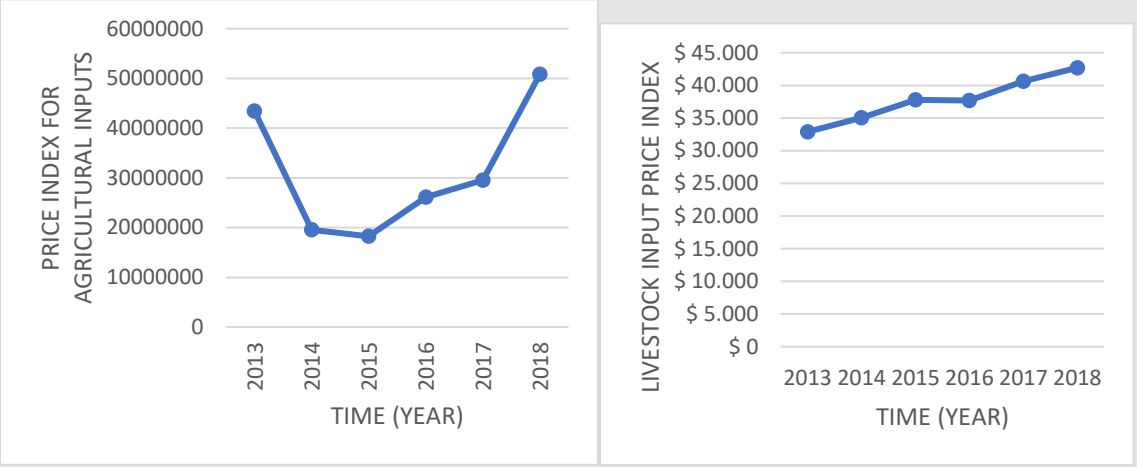


Figure 35 – Average price for agricultural and livestock inputs.

Possible development of the drivers:

Population density

The population density in the reference region is increasing. The population growth projections made by DANE show that the population growth of the municipalities in the reference region had a 7% growth in 10 years. On the other hand, the trend of the amount of forests in this period shows a decreasing behavior (see following figure).

[39] Organización de las Naciones Unidas para la Agricultura y la Alimentación FAO, 2002 Los factores de la deforestación y de la degradación de los bosques. Disponible en: http://www.fao.org/docrep/ARTICLE/WFC/XII/MS12A-S.HTM

[40] Ministerio de ambiente, vivienda y desarrollo territoria-Instituto de Hidrología, Meteorología y Estudios Ambientales-IDEAM. 2011. Análisis de tendencias y patrones espaciales de deforestación en Colombia. Disponible en: http://www.ideam.gov.co/documents/13257/13817/Proyecciones.pdf/6cad956b-6b92-4320-a090-2000408a5765

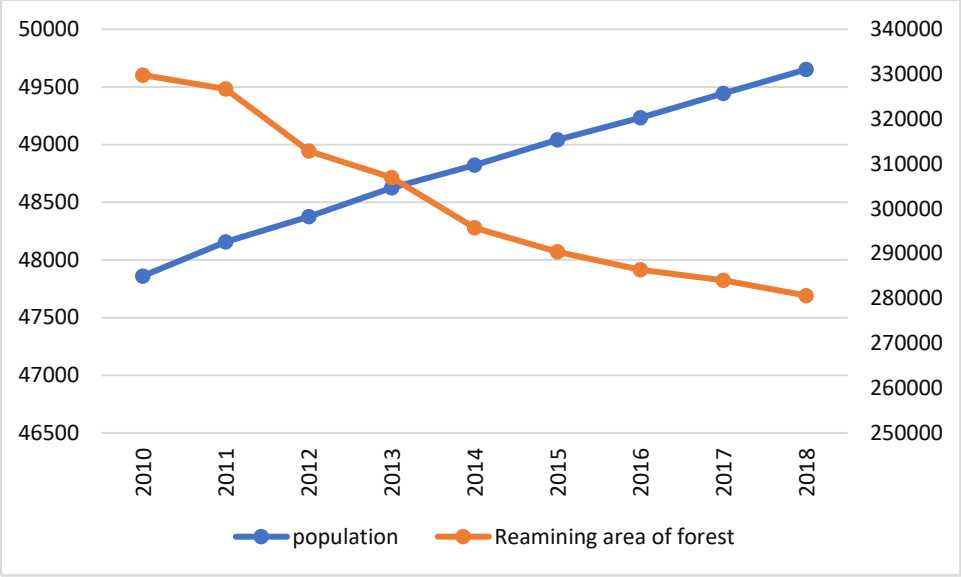


Figure 36 - Correlation population and deforested area.

This graph shows the close relationship between population growth and the amount of forest hectares deforested. However, deforestation rates in the reference region during the period of analysis are high and this is due to the low productivity of soils that lead to lower agricultural production per hectare, and greater deforestation of the area per inhabitant.

According to DANE projections, the population density in the reference region tends to increase where social, political and rural development conditions in the post-conflict framework may reverse the exodus of the rural population and generate a return of farmers to the countryside, generating the pressures on the forest that this growth brings with it.

Agricultural input costs

Considering the Colombian and world macroeconomic context, where strong devaluation pressures have been generated, the prices of imported products will continue to rise, which directly affects the price of agricultural production costs, since a large part of production in Colombia requires inputs that are not produced in the country. Their importance is such that their importation is mandatory, forcing the country to pay the prices imposed by international markets, regardless of the fact that for the vast majority of those who make up the rural sector in Colombia the costs are very high.

Low productivity

Unless measures are taken to address this problem, subsistence farmers and ranchers will continue to have low productivity indices due to the loss of soil quality as a result of the traditional activities carried out there and the lack of technical assistance. As explained above, this will continue to generate pressure on the natural forests, as more land will have to be cleared for agricultural and livestock activities, since the previous lands are not sufficient to generate the expected income. For the analysis of the variables that have a significant impact on the location of deforestation, a preliminary review of the specific conditions of the reference region was carried out and it was established that the elements to be considered are access to forests and distance to population centers.

Distance to roads (forest access)

The effects of roads have been positively correlated with deforestation in most cases. Studies have revealed that access to road infrastructure and growth near forested land increase the pressure on forest resources and consequently also the probability of deforestation. Distance to roads is an important factor in the project area because agents need to transport their products to population centers for marketing. The greater the distance to roads, the higher the transportation costs and the lower the profits.

Distance to population centers (markets)

As cities grow, the surrounding territory - composed of green areas, natural woodlands, rural areas and farmland - is absorbed to build houses, roads and meet the needs of the inhabitant population.

c) Identification of underlying causes of deforestation

Underlying causes are factors that reinforce the direct causes of deforestation and group together complex social, political, economic, technological, and cultural variables, which constitute the initial conditions in the structural relationships between human and natural systems. These factors influence the decisions made by agents and help explain why deforestation occurs.

At the level of underlying causes identified in the reference region, the following are analyzed:

- Poverty: The rural population in the reference region has a direct link to the forest. On average 76% of this population has unsatisfied basic needs (UBN). People living in and around the forests depend on them for survival. Farmers collect fruits and wood, receive payments to extract resources from the forest to cover their economic needs, which is why poverty influences the agents' decisions to deforest.
- Land tenure: Land concentration impacts negatively on the region's environment and leads to an excessive increase in deforestation throughout the territory, this implies that -those who have a monopoly on land are the ones who make the decisions regarding how to work to produce monetary wealth. According to the (UNODC, 2019) in the departments of Meta, Guaviare and Caquetá land tenure has been affected by diverse economic dynamics and by facts and processes related to the armed conflict, which has generated a greater concentration of property, accelerated displacement and impoverishment of peasants and a greater underutilization of land. The situation of lack of property rights is a factor of weakness and high vulnerability for the rural population due to the prevailing conflict conditions in the areas, which has repercussions on productive investment. For some owners, land is not seen as a production factor for productive purposes, but rather as a capital asset for speculative purposes, a situation that does not contribute to rural development based on a better distribution of land.
- Political factors: Although the National Development Plan (NDP) proposed for the period 2014-2018. The government plans to encourage the efficient use of land and natural resources through incentives for the productive use of agricultural and livestock lands, and the land use plans of the municipalities involved in the project promote among their objectives the increase of agroindustrial production in their territories, the fact is that the incentives to increase these productive systems imply the conversion of land use, the transformation of ecosystems and deforestation of native forests if done in areas that are ecologically unsuitable for this purpose.
- Cultural factors: According to González et al., 2018 there is a false perception that the route to obtaining a property title depends on the percentage of forest cleared within a vacant lot, so the forest as an obstacle to production or tenure continues to guide decision-making in deforestation processes. In addition, rooting, education and ancestral practices such as the so-called "forest fallow system" or "slash and burn", which consists of slashing and burning a plot of forest in order

to plant crops on it, taking advantage of the nutrients contained in the ashes, continues to be one of the most deeply rooted practices at the national level.

d) Analysis of chain of events leading to deforestation

Based on the evidence gathered, forest loss has translated into an increase in the area of other land covers with different associated uses. Indirect causes are generally related to social relations such as economic, political, technological and cultural factors. To analyze these causes, political externalities such as social conflicts, population pressure, sectoral, land use and agrarian policies are identified (REDD+META, Cormacarena, Biorinoquia, Minambiente, 2015, pp. 21-22).

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 additionality analysis shows the opportunity cost calculated for the main activities developed in the reference region.

In addition to the social conditions described above, a high percentage of the rural population in the reference region has unsatisfied basic needs, i.e. they are in a situation of poverty. The only source of income for these people is derived from the activities carried out on their small farms, whether livestock or agriculture. Given this reality, if an agent wishes to increase his income to cover his basic needs and those of his family, he must expand the land available to develop his activity. In the case of the cattle rancher, given the type of exploitation (extensive), expanding livestock production implies increasing the pasture area to support the extra head of cattle; for agriculture, the activity is carried out in a traditional manner without sophisticated tools and without technical advice, which puts pressure on the soil and the continuity of traditional practices.

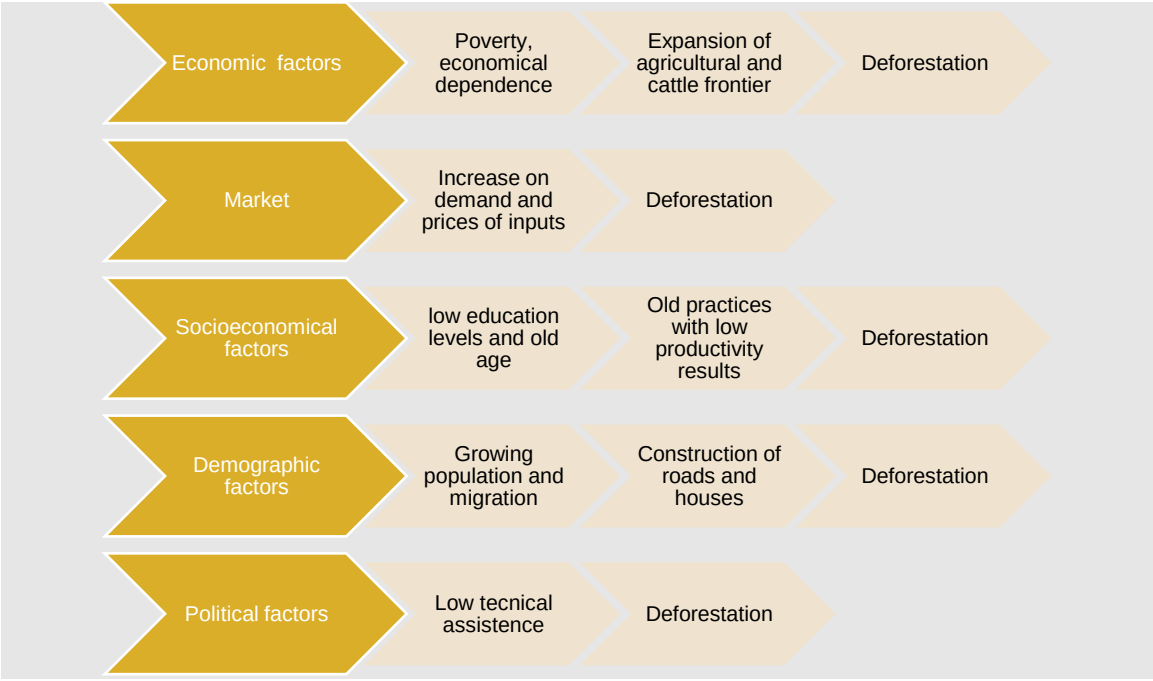


Figure 37 Chain of events leading to deforestation.

e) Conclusion

The project analyzes the main causes of deforestation in the project's reference region, which are 3mainly due to the expansion of the agricultural frontier for the establishment of livestock[41] and agricultural crops, without neglecting other factors that cause pressure on forests such as the expansion of infrastructure associated with population growth. These causes are driven by the same peasants who have had practices rooted in their territory and who are moved by a series of social, economic, political, technological and cultural conditions such as the consolidation of illegal economies, the expectation of land titling or land valuation, migratory processes, the delay in the implementation of the agreements with the FARC, land policy, education, among others, which ultimately show a positive degree of correlation with deforestation. With the identification of the main causes that are leading to deforestation in the reference region, efforts to mitigate the impact of these activities on the environment can be better directed.

It is conclusive that drivers and causes of deforestation, expansion of Agricole frontier and population density, present in the RR are also the ones that could affect the PA and therefore the present deforestation pattern and chain of events on the RR are very likely to reproduce on the PA in absence of the project. This causes were evaluated by agricultural input costs, low productivity, distance to roads (forest access), and distance to population centers (markets). Underlying causes, such as poverty, land tenure, political and cultural factors, increase the risk of deforestation on the PA.

- STEP 4 - Projection of future deforestation

Considering 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 having in consideration the aspects of the Methodology in the section 4.1.1 were decided to use the Historical average approach.

The reason of the selection is focus on the conditions given by the methodology. “Under this approach, the rate of baseline deforestation is assumed to be a continuation of the average annual rate measured during the historical reference period within the reference region or, where appropriate, within different strata of the reference region”. This decision considers that the

[41] In the case of livestock (cattle) the analysis, supported also by the workshops with the landowners, proves that the number of animals is not the cause, but the need of new areas to maintain productivity. Usually, the land required for one cow is high, due to lack of technical support and knowledge.

deforestation rates measured in different historical sub-periods in the reference region for each type of forest (used like strata) reveal a clear trend to increase. This affirmation is in syntony with the STEP 3: Analysis of agents, drivers and underlying causes of deforestation and its probable future development, where gives conclusive evidence emerges from the analysis of agents and drivers explaining the increased trend but this evidence also suggests that the future trend will change.

The above considering the peace agreement signed by the government in 2016 and it uncertainly impact over the forest.

Returning to the subject of deforestation rate, for Colombia, officially the IDEAM has a methodological sheet for the calculation of the deforestation rate. This methological approximation is related to the Pyvaraud formula from his study tittle "Standarizing the calculation of the annual rate deforestation[42]" of the year 2001. This formula is given by the following mathematical expression:

$$TD_{jt1-2} = \left(\left(\frac{1}{t2 - t1}\right) * \ln\left(\frac{SCBE_{jt2}}{SCB_{jt1}}\right)\right) * 100$$

Where:

TD_{jt1-2} = Deforestation rate of reference spatial unit j, between time points t1 and t2.
SCB_{jt1} = Area covered with natural forest in reference spatial unit j at time point t1.
$SCBE_{jt2}$ = Area of reference spatial unit j that having been covered by natural forest at time point t1 remains covered by natural forest at time point t2.
T_1 y T_2 = Time moments t1 and t2.

With this formula, and the existing information of Forest/Non Forest by IDEAM of the years 2010, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019 and 2020. And using the forest types like strata. Was calculated the annual deforestation rate for each possible period. The information generated is the following:

Table 35. Stable Forest Historic Period

Year 1 (t1)	Year 2 (t2)	Forest Surface t1 (SCBt1)	Stable Forest Surface t2 (SCBEt2)	TD (%)	TD bh-T (%)	TD bmh-PM (%)
2010	2012	374,750.41	355,493.98	-2.64%	-2.83%	-0.49%
2012	2013	355,493.98	349,856.30	-1.60%	-1.71%	-0.35%
2013	2014	349,856.30	347,613.67	-0.64%	-0.69%	-0.17%
2014	2015	347,613.67	347,613.20	0.00%	0.00%	0.00%
2015	2016	347,613.20	343,860.30	-1.09%	-1.17%	-0.14%
2016	2017	343,860.30	336,015.78	-2.31%	-2.50%	-0.30%
2017	2018	336,015.78	326,075.84	-3.00%	-3.26%	-0.36%
2018	2019	326,075.84	320,331.19	-1.78%	-1.92%	-0.31%
2019	2020	320,331.19	313,830.19	-2.05%	-2.21%	-0.46%

[42] http://www.ideam.gov.co/documents/11769/72065174/Ficha+metodol%C3%B3gica_26062019.pdf/29796a57-458f-42d4-ac4e-2054c8701d9b

For the generation of the quantitative projection of future deforestation taking into account the selected approach through the historical average using the base deforestation of the reference region, the areas of future forest loss were calculated for each boundary of the Project.

As established in the methodology for step 4.1, the results information for future deforestation is presented following the structure in the following table for the reference region (9a), project area (9b) and leakage belt (9c). The information is presented in following tables.

Table 36. Projected deforestation for the Reference Region. Years 2019-2048 (9a)

Project year t	Stratum *i* in the reference region		Total	
	bh-T	bmh-PM	annual	cumulative
	ABSLRR Forest (ha)		$ABSLRR_t$ (ha)	ABSLRR (ha)
2020	4,927.75	79.89	5,007.64	5,007.64
2021	5,061.00	83.33	5,144.32	10,151.97
2022	4,969.37	83.09	5,052.45	15,204.42
2023	4,879.40	82.85	4,962.25	20,166.67
2024	4,791.06	82.61	4,873.67	25,040.34
2025	4,704.32	82.37	4,786.69	29,827.02
2026	4,619.14	82.14	4,701.28	34,528.31
2027	4,535.52	81.90	4,617.42	39,145.72
2028	4,453.40	81.67	4,535.07	43,680.79
2029	4,372.77	81.43	4,454.20	48,134.99
2030	4,293.60	81.20	4,374.80	52,509.80
2031	4,215.87	80.97	4,296.83	56,806.63
2032	4,139.54	80.73	4,220.27	61,026.90
2033	4,064.59	80.50	4,145.10	65,172.00
2034	3,991.00	80.27	4,071.28	69,243.27
2035	3,918.75	80.04	3,998.79	73,242.06
2036	3,847.80	79.81	3,927.61	77,169.67
2037	3,778.13	79.58	3,857.72	81,027.39
2038	3,709.73	79.35	3,789.09	84,816.48
2039	3,642.57	79.13	3,721.69	88,538.17
2040	3,576.62	78.90	3,655.52	92,193.69
2041	3,511.86	78.67	3,590.54	95,784.23
2042	3,448.28	78.45	3,526.73	99,310.96
2043	3,385.85	78.22	3,464.07	102,775.03
2044	3,324.55	78.00	3,402.55	106,177.58
2045	3,264.36	77.78	3,342.14	109,519.72
2046	3,205.26	77.55	3,282.81	112,802.53
2047	3,147.23	77.33	3,224.56	116,027.09
2048	3,090.25	77.11	3,167.36	119,194.45
2049	3,034.30	76.89	3,111.19	122,305.63
2050	139.15	3.58	142.73	122,448.36

Source: Allcot 2024

Table 37. Projected deforestation for the Project Area. Years 2020-2050 (9b)

Project year t	Stratum *i* in the project area		Total	
	bh-T	bmh-PM	annual	cumulative
	ABSLPA Forest (ha)		$ABSLPA_t$ (ha)	ABSLPA (ha)
2020	685.41	2.85	688.26	688.26
2021	703.95	2.97	706.92	1,395.18
2022	691.20	2.96	694.16	2,089.35
2023	678.69	2.95	681.64	2,770.99
2024	666.40	2.94	669.35	3,440.33
2025	654.34	2.94	657.27	4,097.61
2026	642.49	2.93	645.42	4,743.02
2027	630.86	2.92	633.78	5,376.80
2028	619.44	2.91	622.35	5,999.15
2029	608.22	2.90	611.12	6,610.27
2030	597.21	2.89	600.10	7,210.37
2031	586.40	2.89	589.28	7,799.66
2032	575.78	2.88	578.66	8,378.31
2033	565.36	2.87	568.23	8,946.54
2034	555.12	2.86	557.98	9,504.52
2035	545.07	2.85	547.92	10,052.44
2036	535.20	2.85	538.05	10,590.49
2037	525.51	2.84	528.35	11,118.84
2038	516.00	2.83	518.83	11,637.66
2039	506.65	2.82	509.48	12,147.14
2040	497.48	2.81	500.29	12,647.43
2041	488.47	2.80	491.28	13,138.71
2042	479.63	2.80	482.43	13,621.14
2043	470.95	2.79	473.74	14,094.87
2044	462.42	2.78	465.20	14,560.07
2045	454.05	2.77	456.82	15,016.90
2046	445.83	2.76	448.59	15,465.49
2047	437.76	2.76	440.51	15,906.00
2048	429.83	2.75	432.58	16,338.58
2049	422.05	2.74	424.79	16,763.37
2050	19.35	0.13	19.48	16,782.85

Source: ALLCOT, 2024

Table 38, Projected deforestation for the Leakage Belt, Years 2020-2050 (9c)

Project year t	Stratum *i* in the leakage belt		Total	
	bh-T	bmh-PM	annual	cumulative
	ABSLLK Forest (ha)		$ABSLLK_t$ (ha)	ABSLLK (ha)
2020	458.65	0.00	458.65	458.65
2021	471.05	0.00	471.05	929.70
2022	462.52	0.00	462.52	1,392.22
2023	454.15	0.00	454.15	1,846.37
2024	445.93	0.00	445.93	2,292.29
2025	437.85	0.00	437.85	2,730.14
2026	429.92	0.00	429.92	3,160.07
2027	422.14	0.00	422.14	3,582.21
2028	414.50	0.00	414.50	3,996.71
2029	406.99	0.00	406.99	4,403.70
2030	399.62	0.00	399.62	4,803.32
2031	392.39	0.00	392.39	5,195.71
2032	385.29	0.00	385.29	5,581.00
2033	378.31	0.00	378.31	5,959.31
2034	371.46	0.00	371.46	6,330.77
2035	364.74	0.00	364.74	6,695.51
2036	358.13	0.00	358.13	7,053.64
2037	351.65	0.00	351.65	7,405.29
2038	345.28	0.00	345.28	7,750.57
2039	339.03	0.00	339.03	8,089.60
2040	332.89	0.00	332.89	8,422.49
2041	326.86	0.00	326.86	8,749.35
2042	320.95	0.00	320.95	9,070.30
2043	315.14	0.00	315.14	9,385.44
2044	309.43	0.00	309.43	9,694.87
2045	303.83	0.00	303.83	9,998.70
2046	298.33	0.00	298.33	10,297.02
2047	292.93	0.00	292.93	10,589.95
2048	287.62	0.00	287.62	10,877.57
2049	282.42	0.00	282.42	11,159.99
2050	12.95	0.00	12.95	11,172.94

Source: ALLCOT, 2024

For the projection of the future deforestation location according to the steps suggested by the methodology in the section 4.2 was used the software Terrset's Land Change Modeler, which is the most recent version of IDRISI.

The methodology indicates four tasks to perform the analysis described above: 1) Preparation of factor maps; 2) Preparation of risk maps for deforestation; 3) Selection of the most accurate deforestation risk map; and 4) Mapping of the locations of future deforestation.

Preparation of factor maps

Based on the analysis of step 3 and step 4.1 the spatial variables that most likely explain the patterns in the reference region were identified, spatial data for each variable were derived from these results. Digital maps representing the specific characteristics of each variable were created, reflecting their significance in the deforestation analysis.

Below there is a list of the key variables identified for the analysis of future deforestation. The table includes a description of the importance of each variable. The data used for creating these maps were sourced from reliable institutions, such as geoportals like IGAC, IDEAM, PNNC, and DANE, which provide free access to files in both vector and raster formats.

- *Distance of pastures*: the distance to pasture areas is likely to be related to higher deforestation for the expansion of grasslands or livestock activities. The corresponding Pasture map, supplied by IDEAM with an update date of April 6, 2021, was used. This layer was obtained from the website www.colombiaenmapas.com. In the analysis process, a filter was initially applied to identify land covers associated with pastures. Subsequently, the file was rasterized, and the Euclidean distance algorithm was applied to create a raster with a resolution of 30x30 meters.

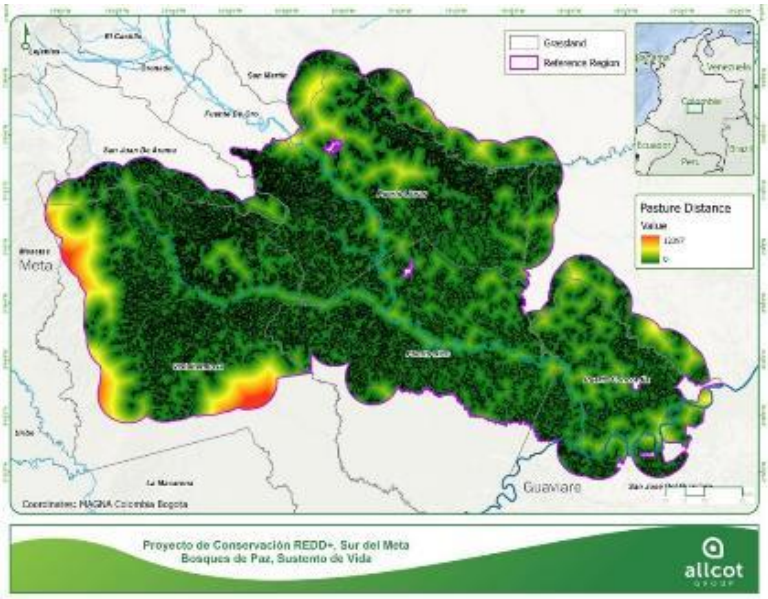


Figure 38 – Distance of pastures
ALLCOT, 2024

- *Distance of the road network*: Roads allows representing the accessibility to any place within the reference region related to the displacement of the ranchers (Agricultural frontier expansion) and farmers (Agricultural production) like agents of deforestation through terrestrial communication routes.

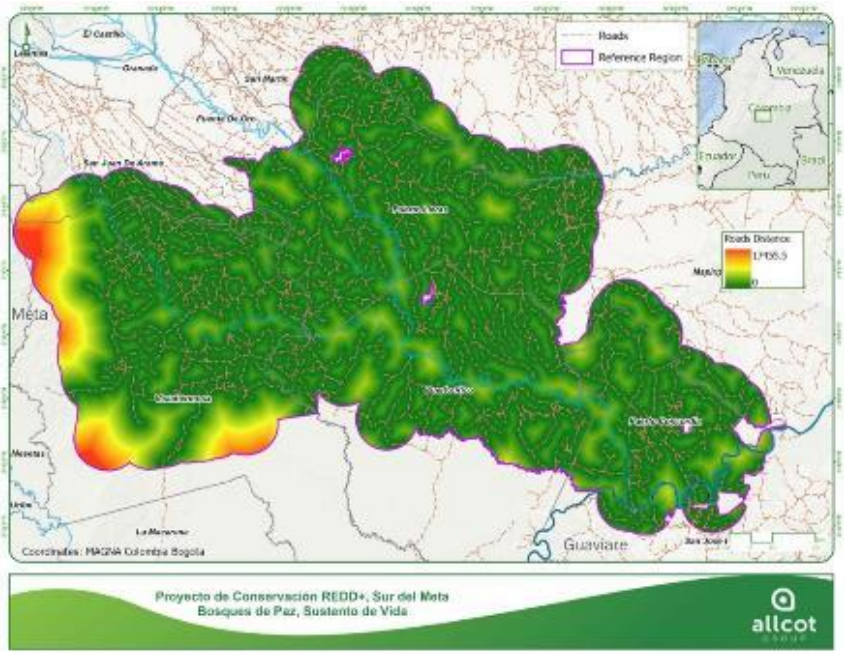


Figure 39 – Distance of the road network.

ALLCOT, 2024

- *Distance to the most representative settlements*: The proximity to populated centers is an indicator of deforestation risk, as areas close to urban zones tend to be more exposed to urban expansion. The map, provided by DANE with a report date of December 31, 2020, was used and downloaded from the website www.colombiaenmapas.com. Subsequently, the file was rasterized and the Euclidean distance algorithm was applied to obtain a raster file with a resolution of 30x30 meters,

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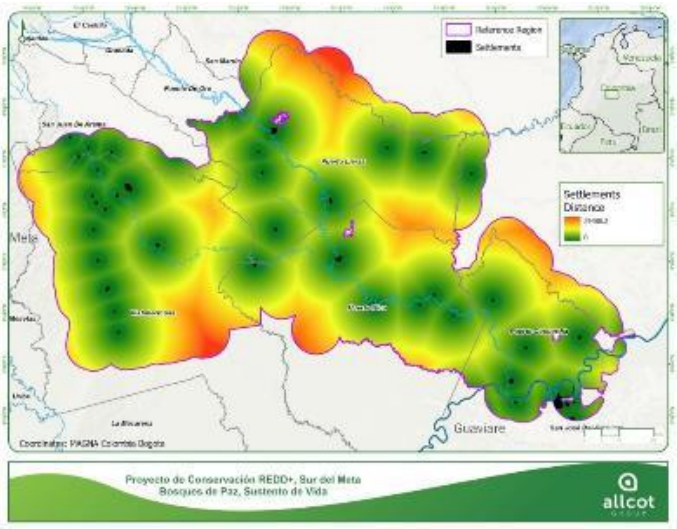


Figure 40 - Distance to the most representative settlements.

ALLCOT, 2024

- *Distance to the areas occupied by agricultural territories*: The polygons occupied by agricultural activities, discriminated in transient crops, permanent crops and heterogeneous agricultural areas.

These activities are associated with the agricultural production. The layer supplied by IDEAM with an update date of April 6, 2021, was used. This layer was obtained from the website www.colombiaenmapas.com. In the analysis process, a filter was initially applied to identify land covers associated with crops. Subsequently, the file was rasterized, and the Euclidean distance algorithm was applied to create a raster with a resolution of 30x30 meters.

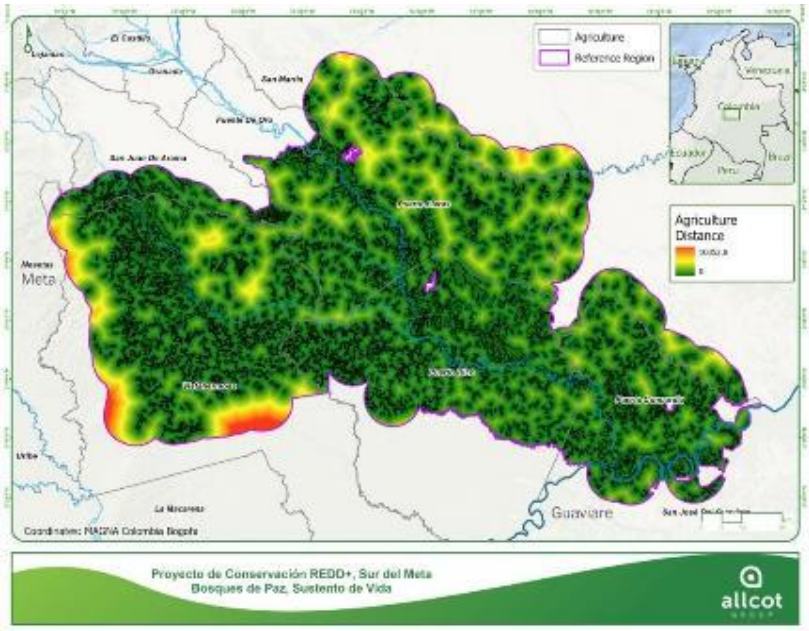


Figure 41 - Distance to the areas occupied by agricultural territories.
ALLCOT, 2024

- *Distance to the Buildings*: The layer represents the minor settlements, home of ranchers and farmers within the reference region and allow estimate the pressure over the forest areas in the historical reference period and the future in the credit period. The layer contained within the Basic Vector Database at a scale of 1:100,000, provided by IGAC with a report date of April 1, 2022, was used and downloaded from the website www.colombiaenmapas.com. The file was then rasterized, and the Euclidean distance algorithm was applied to create a raster file with a 30x30 meter resolution.

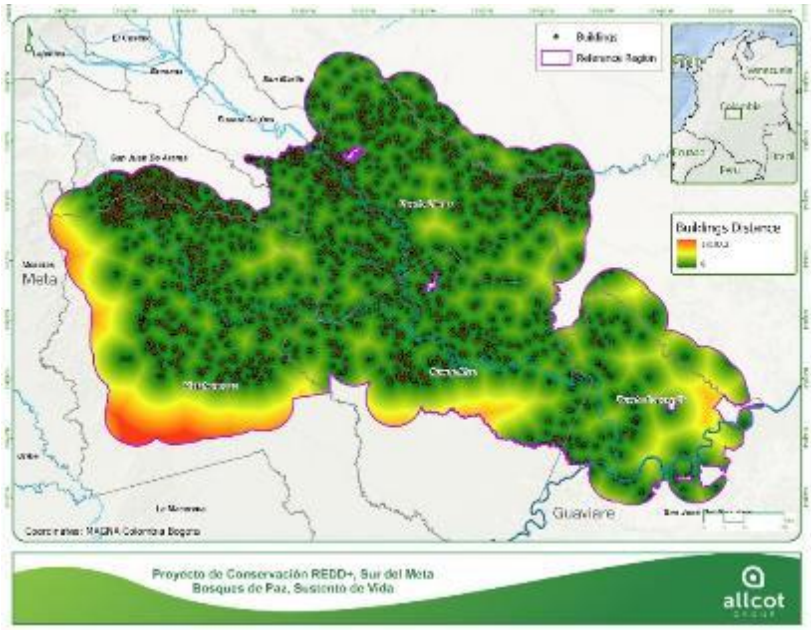


Figure 42 - Distance to the Buildings
ALLCOT, 2024

- *Distance of Drains*: Proximity to water bodes can influence deforestation risk, particularly in regions where these waterways are utilized for material transportation. For map generation, the layer titled 'Drainages' within the Basic Vector Database at a scale of 1:100,000, provided by IGAC with a report date of April 1, 2022, was employed and downloaded from the website www.colombiaenmapas.com. The file was then rasterized, and the Euclidean distance algorithm was applied to create a raster file with a 30x30 meter resolution,

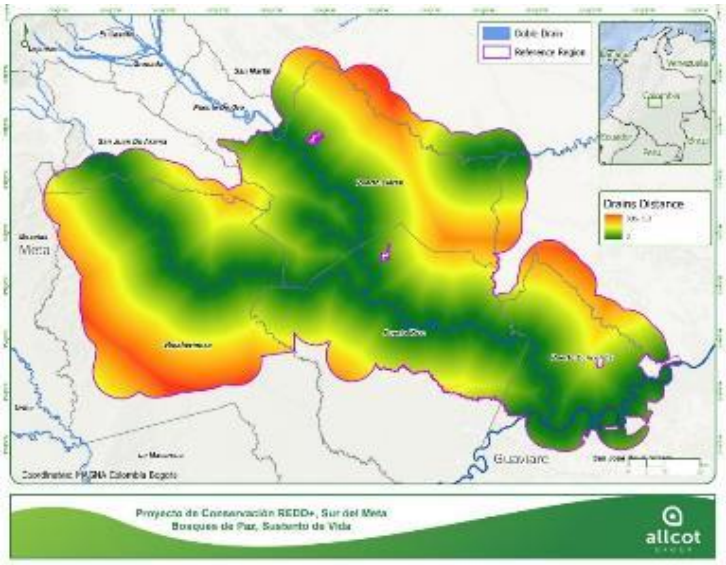


Figure 43 - Distance of water bodies.
ALLCOT, 2024

- *Distance of La Macarena Special Management Area (AMEM):* The presence of prior deforestation in areas designated for spatial management can be an indicator of land-use practices that favor deforestation. To generate the map, the layer titled 'AreaProtegida', provided by PNNC with a report date of January 1, 2020, was used and downloaded from the website www.colombiaenmapas.com. The file was then rasterized with a resolution of 30x30 meters and. categorized into 7 classes: The number one (1) in the raster file created represents the class “Macarena Norte/ Recovery for Northern Production”, class two (2), represents the “Macarena Norte/ Recovery for Northern Preservation”, class three (3) “Arari Guayabero/ Producction”, class four (4) “Arari Guayabero/ Recovery For Southern Production”, class five (5) “National Park/Sierra de la Macarena”, class six (6) “Arari Guayabero/ Preservation of the Serranía de La Lindosa” and class seven (7) no class within AMEN categorization.

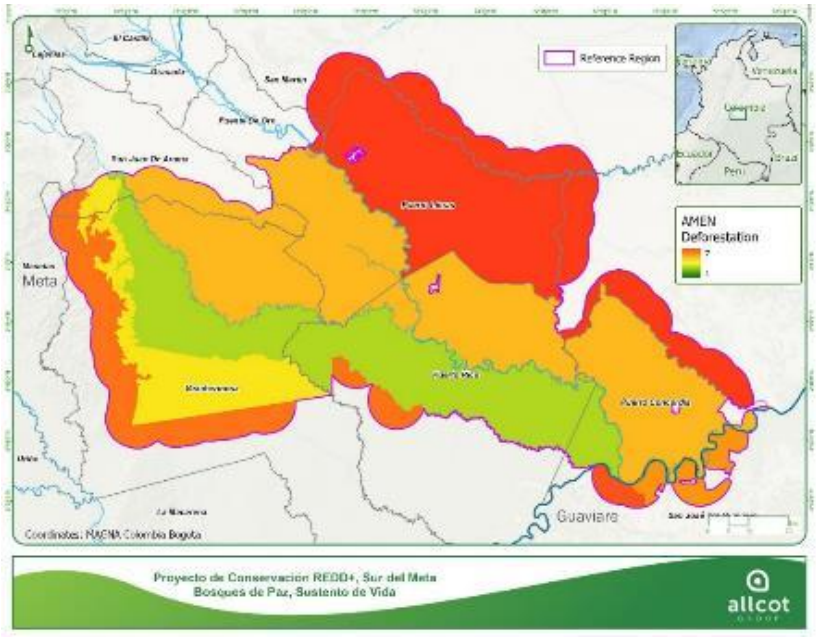


Figure 44 - Distance of La Macarena Special Management Area (AMEM)
ALLCOT, 2024

- - *Elevation:* Elevation is a key factor in microclimate and vegetation types, influencing an area's susceptibility to deforestation. To generate the map, the layer titled 'Digital Elevation Model. SRTM 30 Meters', provided by IGAC with a report date of January 1, 2011, was used and downloaded from the website www.colombiaenmapas.com. Subsequently, a resampling algorithm was applied to adjust the spatial resolution to 30x30 meters.

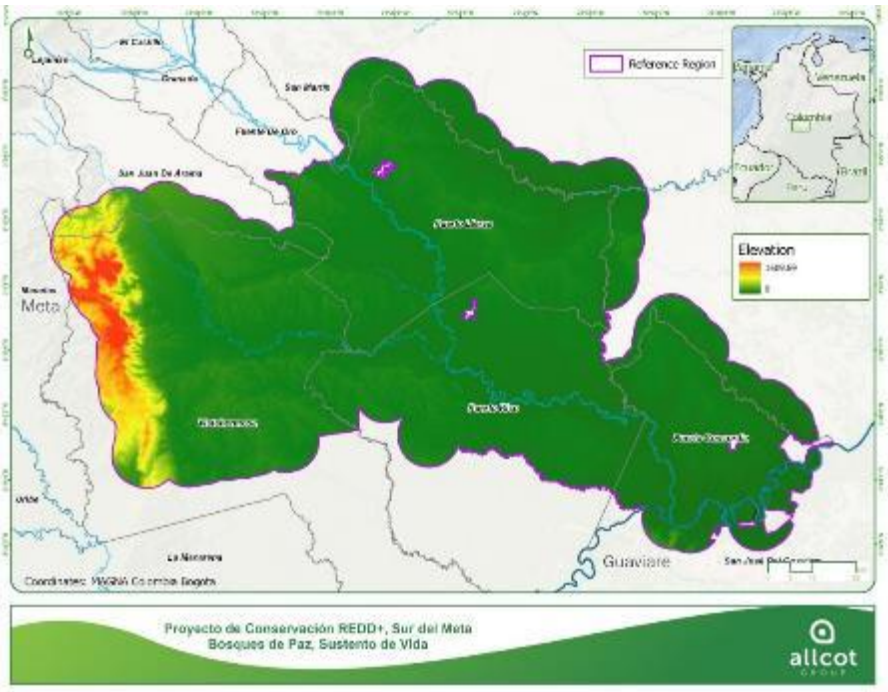


Figure 45 - Elevation.

ALLCOT, 2024

- *Slope*: Areas with pronounced slopes are generally at a lower risk of deforestation due to the difficulty of access and suitability for intensive human activities like agriculture. To generate this map, the 'Digital Elevation Model. SRTM 30 Meters', which was previously generated, was used. Utilizing this elevation model, the slope calculation algorithm (slope) was applied, configured to measure in degrees.

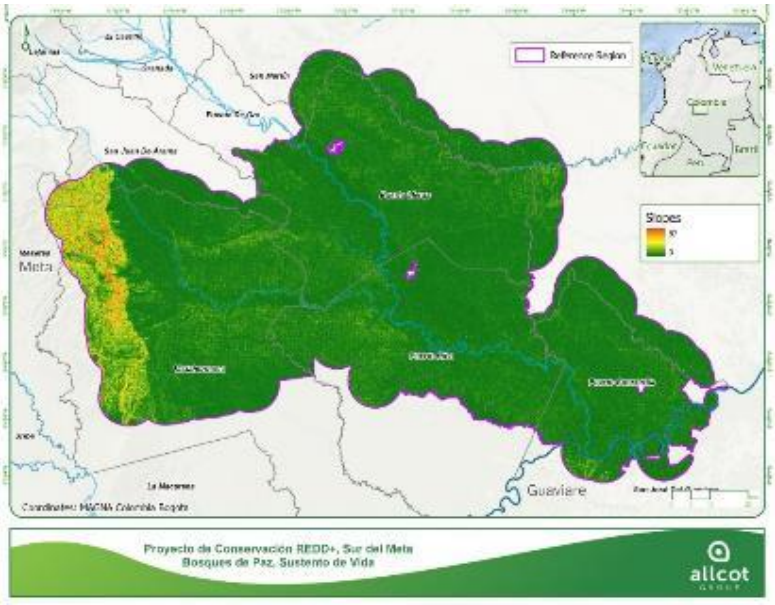


Figure 46 - Slope

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Variables such as population density, agricultural cost and low productivity were evaluated by the expert team, however since the information is found for the country by municipalities, it would bias the spatial analysis since it is not possible to assign only a portion of the density to the municipalities that are not completely within the reference region, but complementary variables that are spatially explicit were included in the modeling to represent those deforestation drivers. For example, two population variables were included in the analysis: settlements and buildings.

2) Preparation of risk maps for deforestation

In this section of the report, several deforestation risk maps are detailed, using the factor maps generated in the previous stage as a basis. This process is carried out through the implementation of the Transition Potential Modeling Module (LCM) of the IDRISI Terrset 2020 software (IDRISI, 2020).

Initially, the analysis submodel is defined, in this case, the transition from Forest to Non-Forest, referred to as the deforestation submodel. Subsequently, the variables listed in the section above "Preparation of factor maps" are incorporated. Then, a multilayer perceptron (MLP) neural network algorithm is applied to discern which variables most significantly influence the transition from forest to non-forest. To ensure the robustness of the model, a selection criterion is established based on accuracies above 70% and the inclusion of at least four independent variables. The implementation of this statistical criterion ensures greater reliability and validity in the obtained results. Once these requirements are met, the potential transition map for the set of variables that showed the best accuracy is generated. This map visually represents the areas with the highest probability of transition from forest to non-forest, which for the purposes of this document corresponds to the areas at highest risk of deforestation.

Following, the table presents the characteristics of the variables that were implemented in the forest to non-forest transition model.

Table 39. Factor Maps

Factors Map		Source	Variable represented		Meaning of the categories or pixel value		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_from_settlements	DANE	Meter	Distance from the nearest settlements	0 - 29488	the greater the distance, the less risk of deforestation	NA	NA	Distance Euclidiane	Proximity to population centers can generate greater pressure on deforestation
2	Dist_from_roads	IGAC	Meter	Distance from the road network	0-17455	Closer proximity corresponds to a higher risk of	NA	NA	Distance Euclidiane	Proximity to roads can exert greater pressure on deforestation

						deforestation				
3	Dist_from_agriculture	IDEAM	Meter	Distance from agricultural areas"	0-10352	Closer proximity corresponds to a higher risk of deforestation	NA	NA	Distance Euclidiane	Areas near crops are more prone to deforestation
4	Dist_from_pastures	IDEAM	Meter	Distance from grasslands and clean pastures areas	0-12397	Closer proximity corresponds to a higher risk of deforestation	NA	NA	Distance Euclidiane	Forests near pasture areas are more prone to deforestation
5	Dist_from_drains	IGAC	Meter	Distance from water sources	0-30511	Closer proximity corresponds to a higher risk of deforestation	NA	NA	Distance Euclidiane	Forests near main drains are more prone to deforestation
6	Dist_from_buildings	IGAC	Meter	Distance from rural constructions	0-18097	A menor distancia mayor riesgo	NA	NA	Distance Euclidiane	Forests near rural constructions are more prone to deforestation
7	Amen_deforestation	PNNC	Categorical		1-7	1=Macarena Norte 1, 2=Macarena Norte 2, 3= Ariari 1, 4= Ariari 2, 5=Parque Nacional, 6= Ariari 3, 7=No management	10	Desforestacion_10_17	Relative Frequency	Historical deforestation by each management category can help understand the deforestation process
8	Elevation	IGAC	Meter	Elevation above sea level	100-1609	Lower elevation corresponds to a higher risk of deforestation	NA	NA	NA	Elevation is an important factor that can influence deforestation patterns
9	Slope	IGAC	Degrees		0 – 87.94	Lower slope corresponds to a higher risk	8	Elevation above sea leve (DEM)	NA	Low slopes are more susceptible to deforestation

						of deforestation				
10	Desforestacion_10_17	IDEAM	Categorical		1	1 = Defotestacion	NA	NA		It is used to generate deforestation statistics by management area categories

Once the necessary information was prepared, the transition scenario from forest to non-forest was modeled. This process involved the use of various sets of variables, whose effectiveness was evaluated in terms of accuracy and statistical significance. For this purpose, an evaluation criterion was applied, which is illustrated in the following.

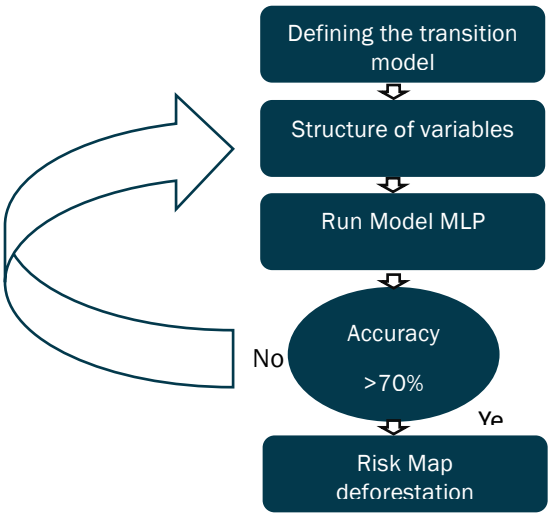


Figure 47 - Flow Risk Map.

Table 40. Risk Map Deforestation Variables

Number	Variables	Accuracy	Significance	Most influential	Less influential
1	1,2,3,4,5,6,7,8,9	67.22%	0.3444	Dist_from_pastures	Elevation
2	1,2,3,4,5,6,7,8	68.69%	0.3852	Dist_from_pastures	Dist_from_roads
3	1,3,4,5,6,7,8	70.52%	0.4103	Dist_from_pastures	Amen_deforestation
4	1,3,4,5,6,8	69.16%	0.3833	Dist_from_pastures	dist_from_buildings
5	1,3,4,5,8	70.95%	0.4190	Dist_from_pastures	Slope
6	1,3,4,5	72.15%	0.4431	Dist_from_pastures	dist_from_settlements

The results obtained indicate that the behavior of the different sets of variables is remarkably similar, exhibiting minimal variations in their performance. Specifically, differences of approximately ±2% in terms of accuracy and ±0.3 in statistical significance are observed in iterations that exceeded 70% (which is the average significance of six highest iterations Table 40). However, it is important to note that in all iterations of the multilayer perceptron (MLP) model, the variable 'distance from clean pasture areas' has

been consistently identified as the most significant. This work has allowed for the progressive elimination of less relevant variables in each successive run of the model, culminating in an optimal selection of variables. For the present case, the final variables that contributed to the most favorable outcome include distance from population centers, distance from agricultural areas, distance from pastures, and distance from drains. This refinement process allows for achieving the best model performance with the least number of variables. A deforestation risk map was generated for each set of variables where accuracy exceeded 70%, which will be validated in the next step.*48*

3) Selection of the most accurate deforestation risk map

In this step, the procedure for validating the deforestation risk models generated in the previous step is detailed. This validation ensures the accuracy and reliability of the model results. This approach provides an assessment of the model's accuracy, establishes a point for comparison, and selects the most accurate deforestation risk map.

1) For model calibration and confirmation, it was done using the technique of historical subperiods, using forest cover maps provided by IDEAM for the years 2010 and 2017 as calibration datasets and the map for the year 2020 for confirmation. This method allowed for comparing the actual deforestation observed in 2020 with the deforestation predicted by the model.

2) To evaluate the accuracy of our predictions, the Figure of Merit (FOM) technique was applied as suggested in the VVM00015 methodology section 4.2.3. This statistical technique calculates the ratio between the intersection of observed and predicted change for the forest-to-non-forest transition and the union of these changes. A higher FOM value indicates greater accuracy in the model's prediction, which is important to confirm the validity of the selected deforestation risk map.

Table 41. Deforestation Risk Map FOM

Category	Legend	Map_Risk_3	Map_Risk_5	Map_Risk_6
A	1 | 1 | 2 - Misses	31,154.4	31,683.69	30.965,31
B	1 | 2 | 2 - Hits	4,900.95	4,371.66	5.090,04
C	1 | 2 | 1 - False Alarms	14,655.42	15,184.71	14.471,19
FOM		0,0966	0.0853	0.1007

3) In the table above, the performance of the different generated deforestation risk maps is compared. Risk Map 6 Figure 49, which incorporates the variables: distance from population centers, distance from agricultural areas, distance from pasture areas, and distance from drains, shows the highest value in the Figure of Merit (FOM). With an FOM of 0.1007, this map stands out as the most accurate in predicting deforestation.

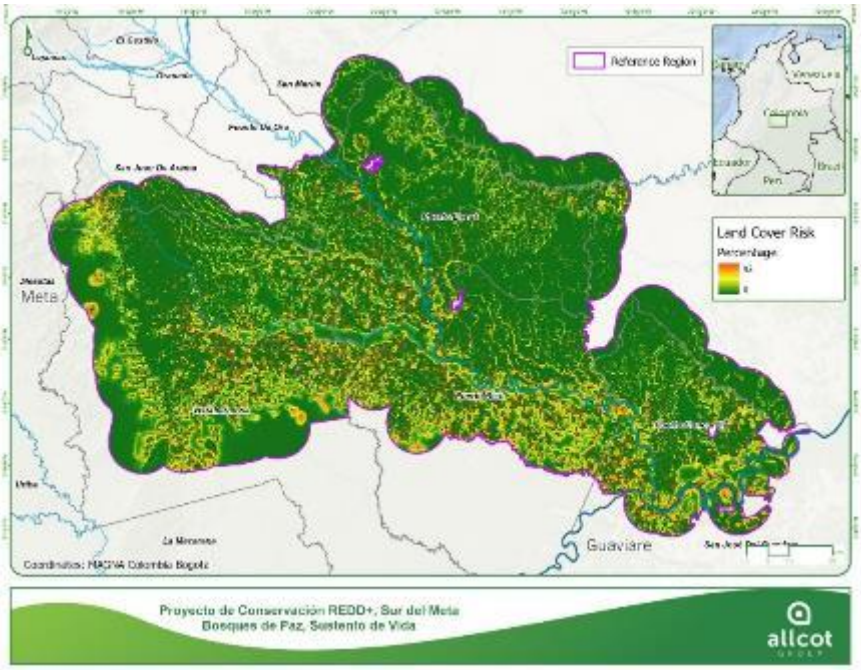


Figure 49 - Maps Risk Deforestation
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To complete the analysis, the non-forest area for the model was validated for the year of validation 2020. For this year, according to the SMByC layer. As a result, a transition or risk map that indicates the percentage of change or the ease of a forest pixel to change to a non-forest pixel is prepared. The following figure shows the red zones that have the highest risk of change over time.

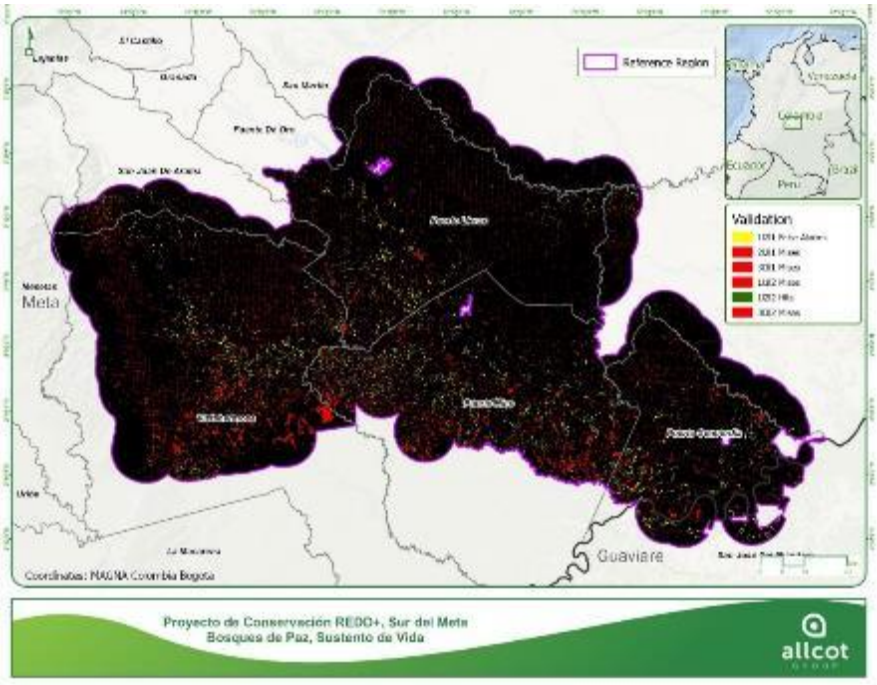


Figure 50 – Risk of change
ALLCOT, 2024

4) Mapping of the locations of future deforestation.

The modelation for the future deforestation was carried out through the 'Change Prediction' module of the IDRISI software. This module allows for the prediction of future scenarios based on the data from the previously generated deforestation risk map. In synthesis, the following maps resume the expected cumulative deforestation in the period 2020-2050, 2020-2030 period and 2030-2040 period.

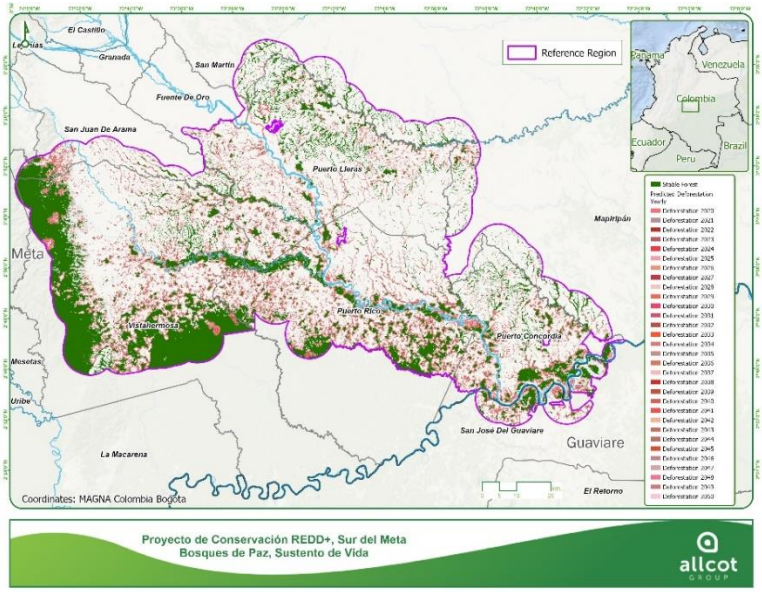


Figure 51. Expected cumulative deforestation. Years 2020-2050
ALLCOT, 2024

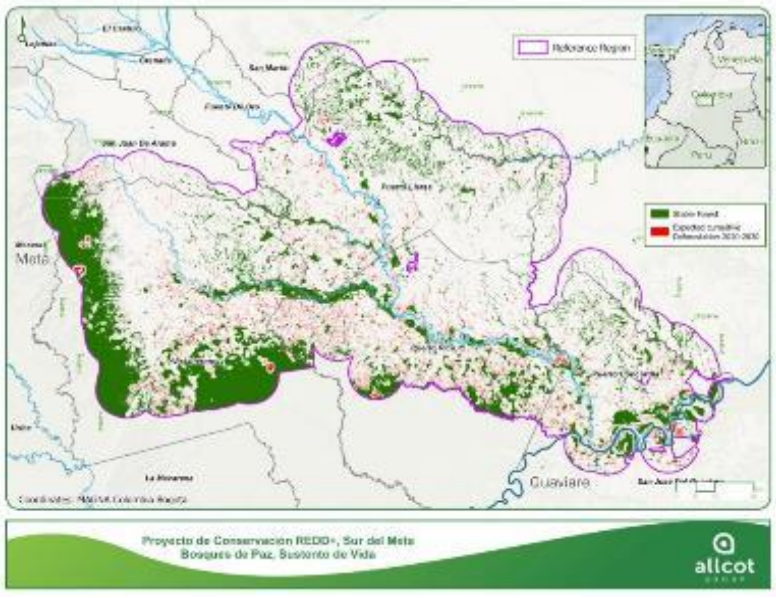


Figure 52. Expected cumulative deforestation. Years 2020-2030
ALLCOT, 2024

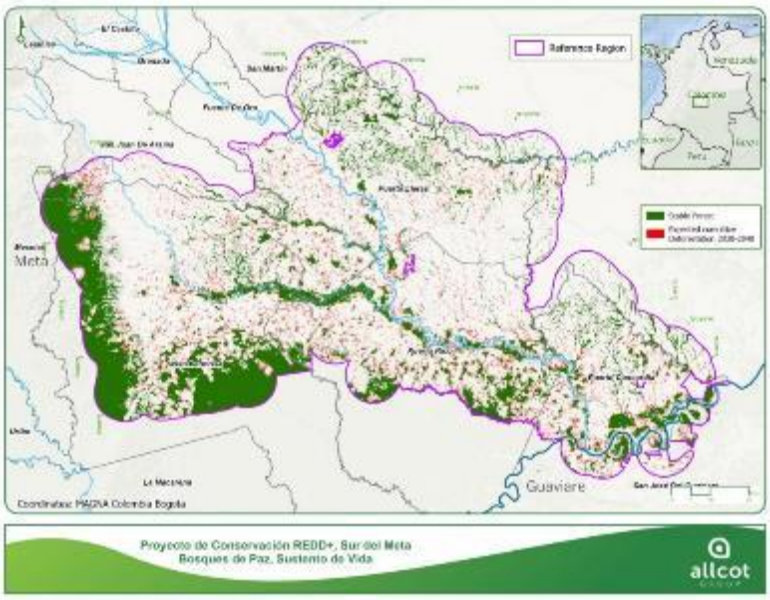


Figure 53. Expected cumulative deforestation. Years 2030-2040
ALLCOT, 2024

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 following tables for the Reference Region (11a), Project Area (11b) and Leakage (11c).

Table 42. Area deforested per forest class icl within the reference region. Years 2020-2050 (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		
Name	Tropical humid forest	Very humid Premontane forest	ABSLRRt annual	ABSLRR Cumulative
Project year t	ha	ha	ha	ha
2020	4,927.8	79.9	5,008	5,008
2021	5,061.0	83.3	5,144	10,152
2022	4,969.4	83.1	5,052	15,204

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
2023	4,879.4	82.8	4,962	20,167
2024	4,791.1	82.6	4,874	25,040
2025	4,704.3	82.4	4,787	29,827
2026	4,619.1	82.1	4,701	34,528
2027	4,535.5	81.9	4,617	39,146
2028	4,453.4	81.7	4,535	43,681
2029	4,372.8	81.4	4,454	48,135
2030	4,293.6	81.2	4,375	52,510
2031	4,215.9	81.0	4,297	56,807
2032	4,139.5	80.7	4,220	61,027
2033	4,064.6	80.5	4,145	65,172
2034	3,991.0	80.3	4,071	69,243
2035	3,918.7	80.0	3,999	73,242
2036	3,847.8	79.8	3,928	77,170
2037	3,778.1	79.6	3,858	81,027
2038	3,709.7	79.4	3,789	84,816
2039	3,642.6	79.1	3,722	88,538
2040	3,576.6	78.9	3,656	92,194
2041	3,511.9	78.7	3,591	95,784
2042	3,448.3	78.4	3,527	99,311
2043	3,385.9	78.2	3,464	102,775
2044	3,324.6	78.0	3,403	106,178
2045	3,264.4	77.8	3,342	109,520
2046	3,205.3	77.6	3,283	112,803
2047	3,147.2	77.3	3,225	116,027
2048	3,090.2	77.1	3,167	119,194
2049	3,034.3	76.9	3,111	122,306
2050	139.1	3.6	143	122,448

Source: ALLCOT, 2024

Table 43. Area deforested per forest class icl within the project area. Years 2020-2050 (11b)

Area deforested per forest class icl within the project area			Total baseline deforestation in the project area	
ID_{icl}	Deforested bh-T	Deforested bmh-PM		
Name	Tropical humid forest	Very humid Premontane forest	ABSLPAt annual	ABSLPA Cumulative
Project year t	ha	ha	ha	ha
2020	685.4	2.8	688	688
2021	703.9	3.0	707	1,395
2022	691.2	3.0	694	2,089
2023	678.7	3.0	682	2,771
2024	666.4	2.9	669	3,440
2025	654.3	2.9	657	4,098
2026	642.5	2.9	645	4,743
2027	630.9	2.9	634	5,377
2028	619.4	2.9	622	5,999
2029	608.2	2.9	611	6,610
2030	597.2	2.9	600	7,210
2031	586.4	2.9	589	7,800
2032	575.8	2.9	579	8,378
2033	565.4	2.9	568	8,947
2034	555.1	2.9	558	9,505
2035	545.1	2.9	548	10,052
2036	535.2	2.8	538	10,590
2037	525.5	2.8	528	11,119
2038	516.0	2.8	519	11,638
2039	506.7	2.8	509	12,147
2040	497.5	2.8	500	12,647
2041	488.5	2.8	491	13,139
2042	479.6	2.8	482	13,621
2043	470.9	2.8	474	14,095
2044	462.4	2.8	465	14,560
2045	454.0	2.8	457	15,017
2046	445.8	2.8	449	15,465
2047	437.8	2.8	441	15,906
2048	429.8	2.7	433	16,339
2049	422.0	2.7	425	16,763
2050	19.4	0.1	19	16,783

Source: ALLCOT, 2024

Table 44. Area deforested per forest class icl within the leakage belt area. Years 2020-2050 (11c)

Area deforested per forest class icl within the leakage belt			Total baseline deforestation in the leakage belt	
ID_{icl}	Deforested bh-T	Deforested bmh-PM		
Name	Tropical humid forest	Very humid Premontane forest	ABSLLKt annual	ABSLLK Cumulative
Project year t	ha	ha	ha	ha
2020	458.6	0.0	459	458.6
2021	471.0	0.0	471	929.7
2022	462.5	0.0	463	1,392.2
2023	454.1	0.0	454	1,846.4
2024	445.9	0.0	446	2,292.3
2025	437.9	0.0	438	2,730.1
2026	429.9	0.0	430	3,160.1
2027	422.1	0.0	422	3,582.2
2028	414.5	0.0	414	3,996.7
2029	407.0	0.0	407	4,403.7
2030	399.6	0.0	400	4,803.3
2031	392.4	0.0	392	5,195.7
2032	385.3	0.0	385	5,581.0
2033	378.3	0.0	378	5,959.3
2034	371.5	0.0	371	6,330.8
2035	364.7	0.0	365	6,695.5
2036	358.1	0.0	358	7,053.6
2037	351.6	0.0	352	7,405.3
2038	345.3	0.0	345	7,750.6
2039	339.0	0.0	339	8,089.6
2040	332.9	0.0	333	8,422.5
2041	326.9	0.0	327	8,749.4
2042	320.9	0.0	321	9,070.3
2043	315.1	0.0	315	9,385.4
2044	309.4	0.0	309	9,694.9
2045	303.8	0.0	304	9,998.7
2046	298.3	0.0	298	10,297.0
2047	292.9	0.0	293	10,590.0
2048	287.6	0.0	288	10,877.6
2049	282.4	0.0	282	11,160.0
2050	13.0	0.0	13	11,172.9

Source: ALLCOT, 2024

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 45. Area established after deforestation per zone within the reference region. Years 2020-2050 (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
2020	4,927.8	79.9	5,008	5,008
2021	5,061.0	83.3	5,144	10,152
2022	4,969.4	83.1	5,052	15,204
2023	4,879.4	82.8	4,962	20,167
2024	4,791.1	82.6	4,874	25,040
2025	4,704.3	82.4	4,787	29,827
2026	4,619.1	82.1	4,701	34,528
2027	4,535.5	81.9	4,617	39,146
2028	4,453.4	81.7	4,535	43,681
2029	4,372.8	81.4	4,454	48,135
2030	4,293.6	81.2	4,375	52,510
2031	4,215.9	81.0	4,297	56,807
2032	4,139.5	80.7	4,220	61,027
2033	4,064.6	80.5	4,145	65,172
2034	3,991.0	80.3	4,071	69,243
2035	3,918.7	80.0	3,999	73,242
2036	3,847.8	79.8	3,928	77,170
2037	3,778.1	79.6	3,858	81,027
2038	3,709.7	79.4	3,789	84,816
2039	3,642.6	79.1	3,722	88,538
2040	3,576.6	78.9	3,656	92,194
2041	3,511.9	78.7	3,591	95,784
2042	3,448.3	78.4	3,527	99,311
2043	3,385.9	78.2	3,464	102,775
2044	3,324.6	78.0	3,403	106,178
2045	3,264.4	77.8	3,342	109,520
2046	3,205.3	77.6	3,283	112,803
2047	3,147.2	77.3	3,225	116,027
2048	3,090.2	77.1	3,167	119,194

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
2049	3,034.3	76.9	3.111	122,306
2050	139.1	3.6	143	122,448

Source: ALLCOT, 2024

Table 46. Area established after deforestation per zone within the project area. Years 2020-2050 (13b)

Area established after deforestation per zone within the project area			Total baseline deforestation in the project area	
IDz	Deforested bh-T	Deforested bmh-PM		
Name	Tropical humid forest	Very humid Premontane forest	ABSLPAt annual	ABSLPA Cumulative
Project year t	ha	ha	ha	ha
2020	685.4	2.8	688	688
2021	703.9	3.0	707	1,395
2022	691.2	3.0	694	2,089
2023	678.7	3.0	682	2,771
2024	666.4	2.9	669	3,440
2025	654.3	2.9	657	4,098
2026	642.5	2.9	645	4,743
2027	630.9	2.9	634	5,377
2028	619.4	2.9	622	5,999
2029	608.2	2.9	611	6,610
2030	597.2	2.9	600	7,210
2031	586.4	2.9	589	7,800
2032	575.8	2.9	579	8,378
2033	565.4	2.9	568	8,947
2034	555.1	2.9	558	9,505
2035	545.1	2.9	548	10,052
2036	535.2	2.8	538	10,590
2037	525.5	2.8	528	11,119
2038	516.0	2.8	519	11,638
2039	506.7	2.8	509	12,147
2040	497.5	2.8	500	12,647
2041	488.5	2.8	491	13,139
2042	479.6	2.8	482	13,621
2043	470.9	2.8	474	14,095
2044	462.4	2.8	465	14,560
2045	454.0	2.8	457	15,017
2046	445.8	2.8	449	15,465

Area established after deforestation per zone within the project area			Total baseline deforestation in the project area	
IDz	Deforested bh-T	Deforested bmh-PM		
Name	Tropical humid forest	Very humid Premontane forest	ABSLPAt annual	ABSLPA Cumulative
Project year t	ha	ha	ha	ha
2047	437.8	2.8	441	15,906
2048	429.8	2.7	433	16,339
2049	422.0	2.7	425	16,763
2050	19.4	0.1	19	16,783

Source: ALLCOT, 2024

Table 47. Area established after deforestation per zone within the leakage belt area. Years 2020-2050 (13c)

Area established after deforestation per zone within the leakage belt area			Total baseline deforestation in the leakage belt area	
IDz	Deforested bh-T	Deforested bmh-PM		
Name	Tropical humid forest	Very humid Premontane forest	ABSLLKt annual	ABSLLK Cumulative
Project year t	ha	ha	ha	ha
2020	458.6	0.0	459	458.6
2021	471.0	0.0	471	929.7
2022	462.5	0.0	463	1,392.2
2023	454.1	0.0	454	1,846.4
2024	445.9	0.0	446	2,292.3
2025	437.9	0.0	438	2,730.1
2026	429.9	0.0	430	3,160.1
2027	422.1	0.0	422	3,582.2
2028	414.5	0.0	414	3,996.7
2029	407.0	0.0	407	4,403.7
2030	399.6	0.0	400	4,803.3
2031	392.4	0.0	392	5,195.7
2032	385.3	0.0	385	5,581.0
2033	378.3	0.0	378	5,959.3
2034	371.5	0.0	371	6,330.8
2035	364.7	0.0	365	6,695.5
2036	358.1	0.0	358	7,053.6
2037	351.6	0.0	352	7,405.3
2038	345.3	0.0	345	7,750.6
2039	339.0	0.0	339	8,089.6
2040	332.9	0.0	333	8,422.5
2041	326.9	0.0	327	8,749.4
2042	320.9	0.0	321	9,070.3
2043	315.1	0.0	315	9,385.4

Area established after deforestation per zone within the leakage belt area			Total baseline deforestation in the leakage belt area	
IDz	Deforested bh-T	Deforested bmh-PM		
Name	Tropical humid forest	Very humid Premontane forest	ABSLLKt annual	ABSLLK Cumulative
Project year t	ha	ha	ha	ha
2044	309.4	0.0	309	9,694.9
2045	303.8	0.0	304	9,998.7
2046	298.3	0.0	298	10,297.0
2047	292.9	0.0	293	10,590.0
2048	287.6	0.0	288	10,877.6
2049	282.4	0.0	282	11,160.0
2050	13.0	0.0	13	11,172.9

Source: ALLCOT, 2024

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 48. Activity data per LU/LC category ct within the reference region. Years 2020-2050 (14a)

Activity data per LU/LC category ct within the reference region					Total baseline deforestation in the reference region	
ID_{ct}	1	2	...	Ict		
Name >	Tropical humid forest	Very humid Premontane forest			$ABSLRR_t$ annual	ABSLRR cumulative
Project year t	ha	ha	ha	ha	ha	ha
2020	4,927.8	79.9			5,008	5,008
2021	5,061.0	83.3			5,144	10,152
2022	4,969.4	83.1			5,052	15,204
2023	4,879.4	82.8			4,962	20,167
2024	4,791.1	82.6			4,874	25,040
2025	4,704.3	82.4			4,787	29,827
2026	4,619.1	82.1			4,701	34,528
2027	4,535.5	81.9			4,617	39,146
2028	4,453.4	81.7			4,535	43,681
2029	4,372.8	81.4			4,454	48,135
2030	4,293.6	81.2			4,375	52,510
2031	4,215.9	81.0			4,297	56,807
2032	4,139.5	80.7			4,220	61,027
2033	4,064.6	80.5			4,145	65,172
2034	3,991.0	80.3			4,071	69,243

Activity data per LU/LC category ct within the reference region					Total baseline deforestation in the reference region	
ID_{ct}	1	2	...	Ict		
Name >	Tropical humid forest	Very humid Premontane forest			$ABSLRR_t$ annual	ABSLRR cumulative
Project year t	ha	ha	ha	ha	ha	ha
2035	3,918.7	80.0			3,999	73,242
2036	3,847.8	79.8			3,928	77,170
2037	3,778.1	79.6			3,858	81,027
2038	3,709.7	79.4			3,789	84,816
2039	3,642.6	79.1			3,722	88,538
2040	3,576.6	78.9			3,656	92,194
2041	3,511.9	78.7			3,591	95,784
2042	3,448.3	78.4			3,527	99,311
2043	3,385.9	78.2			3,464	102,775
2044	3,324.6	78.0			3,403	106,178
2045	3,264.4	77.8			3,342	109,520
2046	3,205.3	77.6			3,283	112,803
2047	3,147.2	77.3			3,225	116,027
2048	3,090.2	77.1			3,167	119,194
2049	3,034.3	76.9			3,111	122,306
2050	139.1	3.6			143	122,448

Source: ALLCOT, 2024

Table 49. Activity data per LU/LC category ct within the project area. Years 2020-2050 (14b)

Activity data per LU/LC category ct within the project area					Total baseline deforestation in the project area	
ID_{ct}	1	2	…	Ict		
Name >	Tropical humid forest	Very humid Premontane forest			$ABSLPA_t$ annual	ABSLPA cumulative
Project year t	ha	ha	ha	ha	ha	ha
2020	685.4	2.8			688	688
2021	703.9	3.0			707	1,395
2022	691.2	3.0			694	2,089
2023	678.7	3.0			682	2,771
2024	666.4	2.9			669	3,440
2025	654.3	2.9			657	4,098
2026	642.5	2.9			645	4,743
2027	630.9	2.9			634	5,377
2028	619.4	2.9			622	5,999
2029	608.2	2.9			611	6,610
2030	597.2	2.9			600	7,210
2031	586.4	2.9			589	7,800
2032	575.8	2.9			579	8,378
2033	565.4	2.9			568	8,947
2034	555.1	2.9			558	9,505
2035	545.1	2.9			548	10,052
2036	535.2	2.8			538	10,590
2037	525.5	2.8			528	11,119
2038	516.0	2.8			519	11,638
2039	506.7	2.8			509	12,147
2040	497.5	2.8			500	12,647
2041	488.5	2.8			491	13,139
2042	479.6	2.8			482	13,621
2043	470.9	2.8			474	14,095
2044	462.4	2.8			465	14,560
2045	454.0	2.8			457	15,017
2046	445.8	2.8			449	15,465
2047	437.8	2.8			441	15,906
2048	429.8	2.7			433	16,339
2049	422.0	2.7			425	16,763
2050	19.4	0.1			19	16,783

Source: ALLCOT, 2024

Table 50. Activity data per LU/LC category ct within the leakage belt area. Years 2020-2050 (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	...	Ict		
Name >	Tropical humid forest	Very humid Premontane forest			$ABSLLK_t$ annual	ABSLLK cumulative
Project year t	ha	ha	ha	ha	ha	ha
2020	458.6	0.0			459	458.6
2021	471.0	0.0			471	929.7
2022	462.5	0.0			463	1,392.2
2023	454.1	0.0			454	1,846.4
2024	445.9	0.0			446	2,292.3
2025	437.9	0.0			438	2,730.1
2026	429.9	0.0			430	3,160.1
2027	422.1	0.0			422	3,582.2
2028	414.5	0.0			414	3,996.7
2029	407.0	0.0			407	4,403.7
2030	399.6	0.0			400	4,803.3
2031	392.4	0.0			392	5,195.7
2032	385.3	0.0			385	5,581.0
2033	378.3	0.0			378	5,959.3
2034	371.5	0.0			371	6,330.8
2035	364.7	0.0			365	6,695.5
2036	358.1	0.0			358	7,053.6
2037	351.6	0.0			352	7,405.3
2038	345.3	0.0			345	7,750.6
2039	339.0	0.0			339	8,089.6
2040	332.9	0.0			333	8,422.5
2041	326.9	0.0			327	8,749.4
2042	320.9	0.0			321	9,070.3
2043	315.1	0.0			315	9,385.4
2044	309.4	0.0			309	9,694.9
2045	303.8	0.0			304	9,998.7
2046	298.3	0.0			298	10,297.0
2047	292.9	0.0			293	10,590.0
2048	287.6	0.0			288	10,877.6
2049	282.4	0.0			282	11,160.0
2050	13.0	0.0			13	11,172.9

Source: ALLCOT, 2024

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:

a) STEP 1. Identification of alternative land use scenarios to the AFOLU project activity;

b) 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

c) STEP 3. Barriers analysis; and

d) 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.

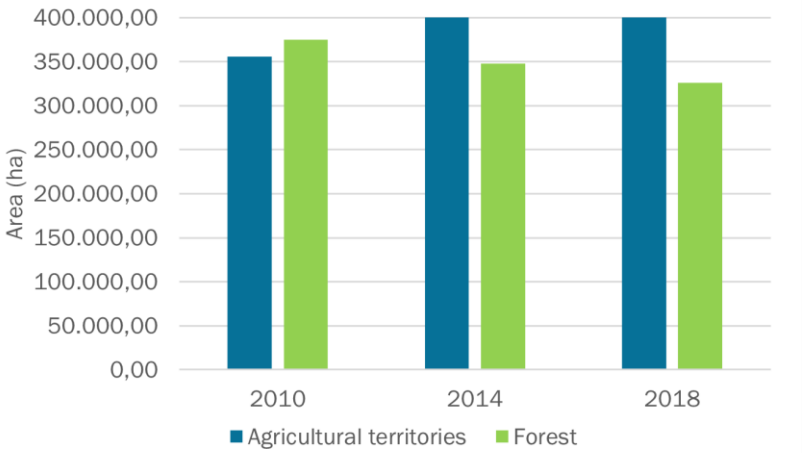


Figure 54. Change on LC/LU

Source: ALLCOT, 2024

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, among others. 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 around 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 like cacao or palm oil. In the case of cacao, its plantation area in the country has increased by more than 30,000 ha between 2014 and 2020 (MinAgricultura, 2021). The Meta department, unfortunately, has one of the lowest yields in the country, only before Tolima, 0.3 ton/ha, and in evident decline from 2015 to the current date (MinAgricultura, 2021). In the same period, its crop area increased from 6100 ha to 7023 ha (MinAgricultura, 2021).

The trend 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 not been linked in the department as a threat to forests or a cause of deforestation, as shown on the study of deforestation base line of palm oil 2011 – 2017 by IDEAM as it shows than less than 0.4% of total national deforestation is caused by palm oil and for the whole department represents less than 0.1% (Annex_3.1_Linea base deforestación – Palma). 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 peasants decide to conservate their forest, receiving no financial compensation for it from VCS registration, and continue having the same agriculture and pasture hectares.

Scenario 4: 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. Even at national level, the National Determined Contribution[43], recognizes this as a National Circumstance the post conflict, and considers it will increase deforestation in former areas conflict.

[43] https://www.minambiente.gov.co/wp-content/uploads/2022/05/NDC_Libro_final_digital-1.pdf

- 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, , in the scenarios presented, the common practice on (illegal/unplanned) 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. It is common practice to change the land use without the permission of the environmental authorities.

For Scenario 2, something similar to Scenario 1 occurs, since, the national organic law of land planning (1454/2011) commands municipalities to have this planning document, which includes stratification for protected forest, avoidance of land use 'change, there is a common practice to deforest without taking into account this planning process, 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, but only in areas that will not cause deforestation, as per the Zero deforestation agreement signed by FEDEPALMA. . 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, There are programs looking to stop deforestation in Colombia, that come directly from the governments, but there are no projects or programs that recognize payment for ecological services in the area that include people with no clear legal tenure. Therefore, it is unlikely for more than 70% of the PA landowners to access to any kind of support on conservation. And as the opportunity cost presents, the current model is not sustainable and drives to deforestation.

Scenario 4 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 regarding the regulated use of the forest, and that in the Reference Region, as even though they exist, it is common practice due to lack of enforcement and monitoring. Prove of this are the reports for deforestation by IDEAM (National System for Monitoring Carbon and Forest), where the 4 or at least one of the municipalities is reported on the top of deforestation rates.

- 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.

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 this additionality analysis. the generation of the baseline scenario analysis is explained on 3.3. For additionality, it will be based on investment analysis, and its correlation with barrier analysis.

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) as the Project Sur del Meta does not expect 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 Conservation project REDD+ Sur del Meta, 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.

$$\boldsymbol{PPN = S\$n - PCn - CTn}$$

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. Following table 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. The source is the National Agricultural and Livestock Survey, performed by DANE (National Administrative Department of Statistics)[44] and Fedecacao [45]

Table 51. List of agricultural and livestock products in the work area

Product	Yield(Ton /ha)	Production costs (COP/ha)	Selling price (COP /Ton/ha)	Transport cost Vistahermosa (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
Cocoa	0.66	7,837,000	3,854,400	261,000

[44] http://microdatos.dane.gov.co/index.php/catalog/670/get_microdata

[45] https://agronet.gov.co/Noticias/Paginas/Precio-de-referencia-semanal-de-compra-de-cacao---Fuente-Industria.aspx

https://www.sic.gov.co/sites/default/files/files/Cacao.pdf

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 considered 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.
- For the development of the spatial phase for the additionality analysis, the information layers were 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.

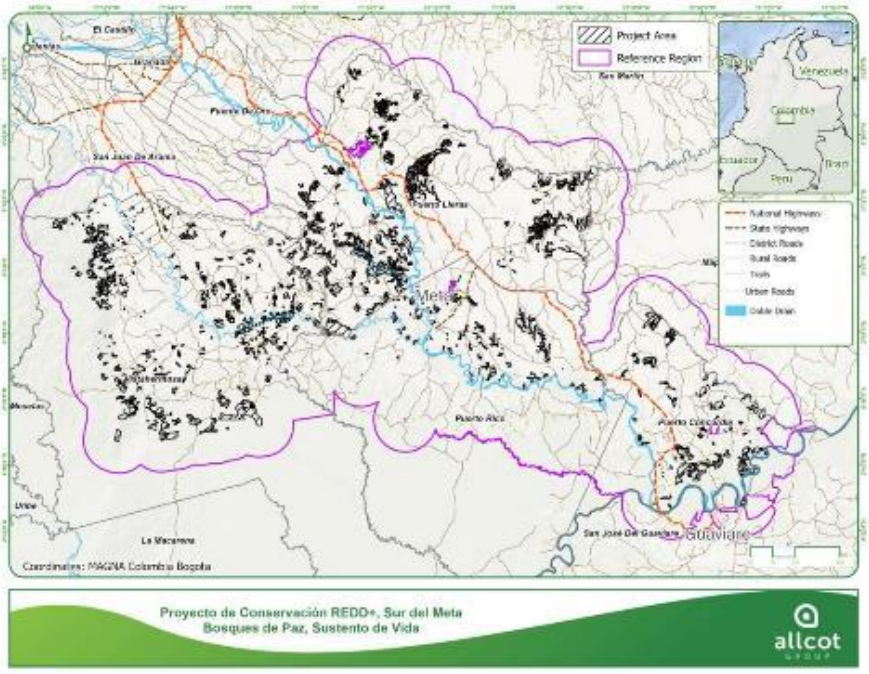


Figure 55. Layer of tracks for the study area

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 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.

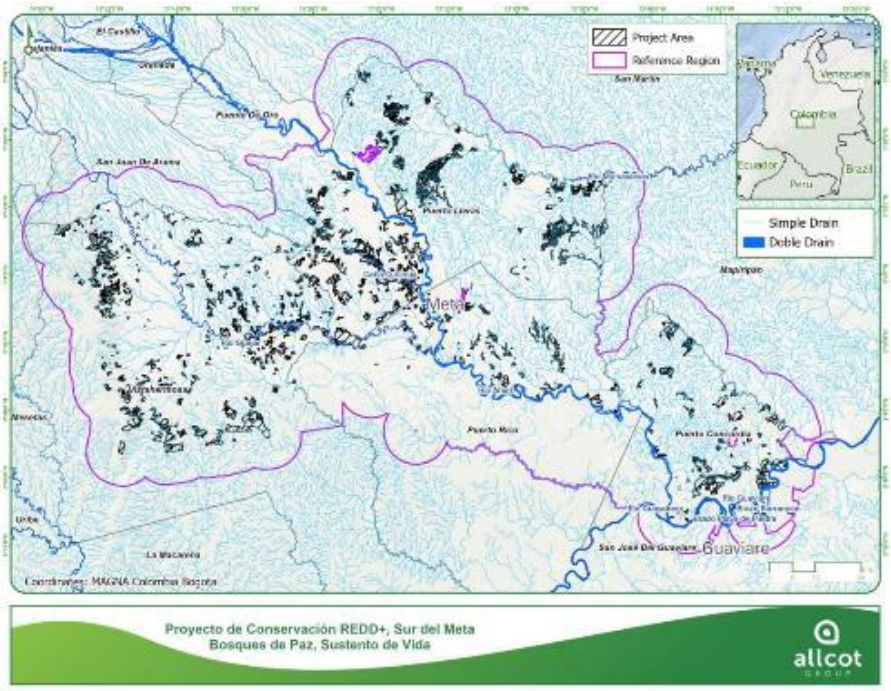


Figure 56. Rivers

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.

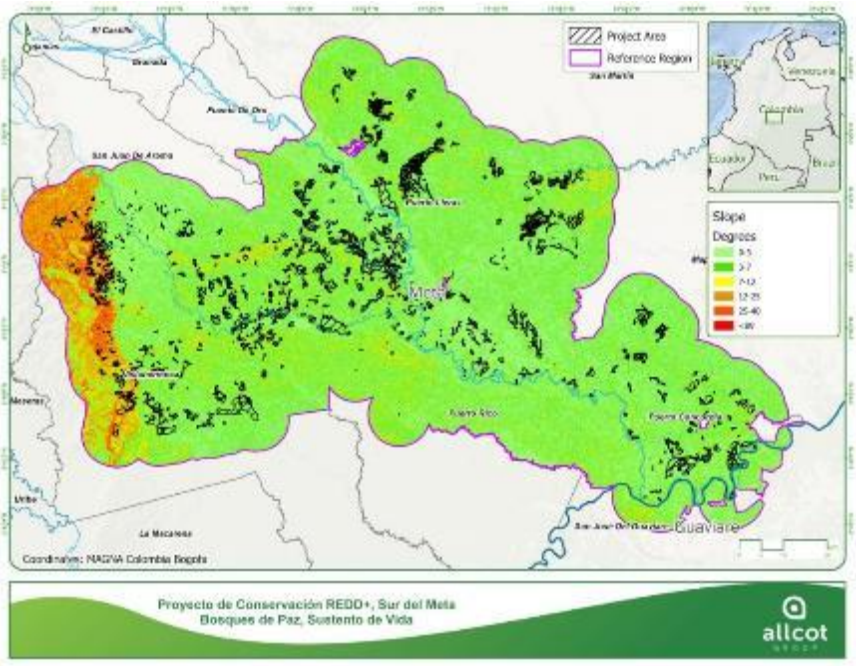


Figure 57. Slopes

Source: ALLCOT, 2024

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.

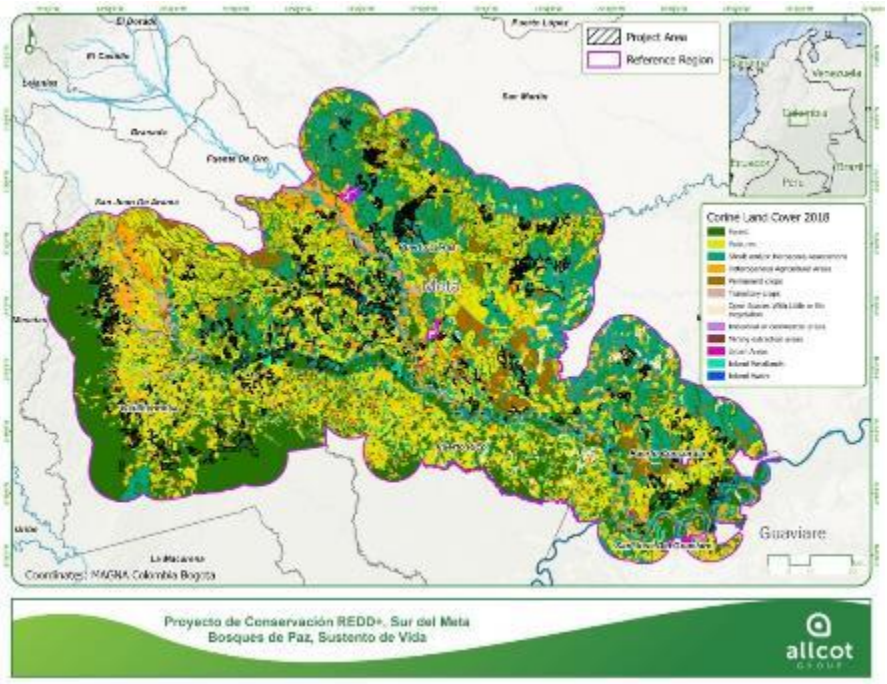


Figure 58. Land Cover.
Source: ALLCOT, 2024

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 %.

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 cocoa 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.

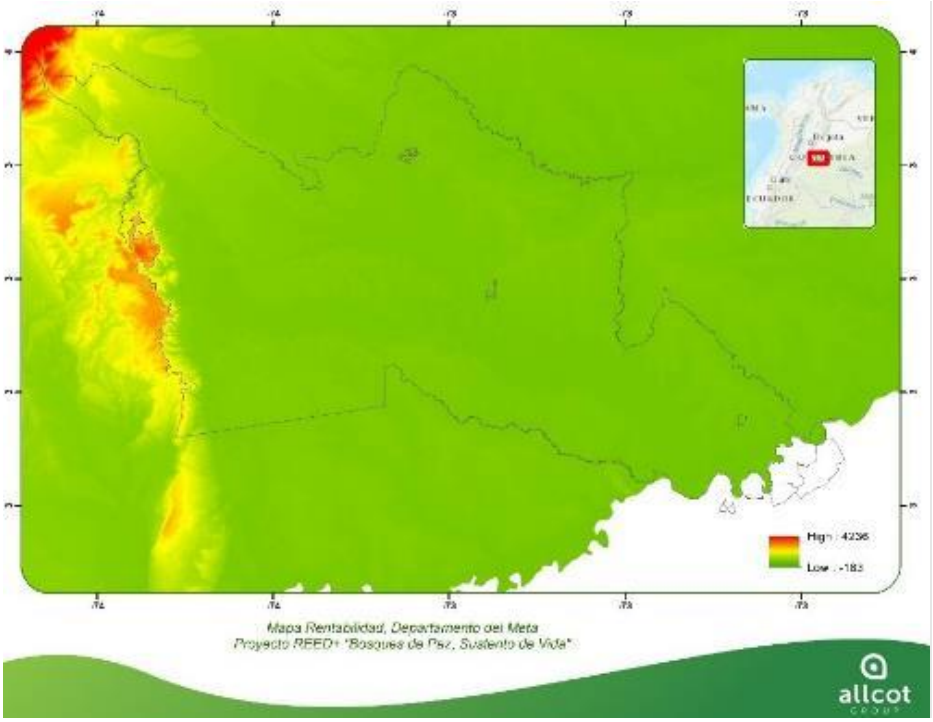


Figure 59. Coca profitability

Source: ALLCOT, 2021

Following figure 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.

Conclusion

In this section we described in detail the costs associated to the production of many products that are present within the project area. The main takeaway from this section is that these activities outlined are financially attractive, this is because the income of the activity outweigh the production costs and the transport costs.

Within this we will be identifying the activities that are taking place in the project area and its financial indicators.

In the following table we display the respective NPV for each of the activities.

Table 52. NVP per activity in the reference region

Indicator	NVP year
Plantain	$26.155.625,12

Indicator	NVP year
Coca leaf	$14.054.039,77
Cassava	$13.162.006,94
Rubber	$4.554.888,85
cocoa	$5.927.050,03
Dual Purpose Livestock	$145.666,43
Traditional corn	$135.696,69
Dairy Cattle	-$446.845,46

Source: Values calculated by ALLCOT

From these results we can see the annual net benefits per hectare that were obtained for each of the economic activities developed in the project area, which gives us an approximate measure of the opportunity cost of producers.

Given that all of the activities, except for Dairy Cattle, have a positive net present value of the benefits we can argue that these economic activities are financially attractive. Conservation, having no support due to the lack of opportunities and access to projects and programs, has no competition against this model, which causes the forested lands to be perceived as no productive and to be slash and burned to generate income as agricultural or pastureland.

One analysis from this section, that is going to be referenced below, is that these are the indicators that can be reached with a really good productivity. The existent soils are not in the best conditions, which generates the opening of new areas (forest to no forest use) The problem in the case of these activities is that to reach this level of productivity to get these financially attractive benefits, the landowners have to overcome many barriers. With this in mind, we have a closer look at this analysis.

Step 3. Barrier analysis

According to tool VT0001, the application of this step seeks to complement the previous step 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.

One of the main requirements the banks have for them to give out loans, is that the corresponding person asking for it has an adequate credit history. This can result in an issue given the level of banking conditions in the country of origin of the project, Colombia. According to a study made by Asobancaria in

2020, in Colombia about 87% of its population has access to credit products, such as credit cards or loans. When we look at a more precise figure for the project location, that is considered a rural area, this number decreases to about 55%. This is a basic indication that refers to the difficulty for the people enclosed in the project to access proper funding.

A Thesis from EAFIT University, studies this phenomenon, which is summarized as:

"(Estrada & Sandoval, 2014) affirm that there is a scarce presence of banking entities in the granting of agricultural and rural loans in developing countries. This reflects how complicated it is for small farmers to access to financing, as there are no structures for offering profitable products.

The requirement for collateral and the practical legal problems related to the seizure of assets in the case of a loan default add to the lack of experience of credit analysts of private and public bank credit analysts, without assessing the solvency of the prospective borrower, and it is possible to determine collateral substitutes based on closely monitoring the borrower's loan repayment.

In addition, the information systems are based financial risk calculation by penalizing the cost structure and risks associated with agriculture, which is an activity rich in uncertainty variables for the banking business" (Sanchez, 2021)[46]

The most important takeaway from this section is that these investment barriers are impeding producers to reach the potential benefits shown above in the analysis, given that they do not have enough resources to fund these activities and thus reaching this productivity. This is where the additionality of the project has an effect, in overcoming these barriers.

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[47].

Again, the conclusion for this sub section, is that the landowners simply cannot reach their potential productivity and do not have enough money to hired skilled labor force that could help them to achieve the productivity needed to maintain forest intact inside their farms.

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):

The barriers identify in the section above do not prevent the implementation of these land uses, except scenario 1 and scenario 4. In both cases there are no need of financial support and/or skilled or trained labor force. These two scenarios take forest land, usually burn the area, and then use it for as long as

[46] https://repository.eafit.edu.co/bitstream/handle/10784/30240/Alejandro_SanchezOspino_2021.pdf?sequence=8&isAllowed=y

[47] https://www.undp.org/es/latin-america/publications/caracterizaci%C3%B3n-de-las-principales-causas-y-agentes-de-la-deforestaci%C3%B3n-nivel-nacional-per%C3%ADodo-2005-2015

the productivity maintains, without any type of remediation or investment beyond the basic (seed, and family labor force).

What is proposed by the REDD+ project is the further development of these activities to help them reach their potential productivity without having a negative impact on the forest, seeing this as an effect of the additionality.

Now, the solution given to this problem by the landowners to overcome the barriers described above is to mainly clear cut the 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.

With this in mind, we continue to the next step of methodology.

d) 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.

e) Conclusion

In summary, 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.

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 AFOLU 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.

- **Step 4. Common practice analysis**

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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.

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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.

Considering 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 (assuming 2020 as the initial date, study from 2011 and 2010 comply);

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. Nevertheless, the project developed an inventory in the PA, following the same methodology by IDEAM, which updated the carbon contents of the two forest classes included.

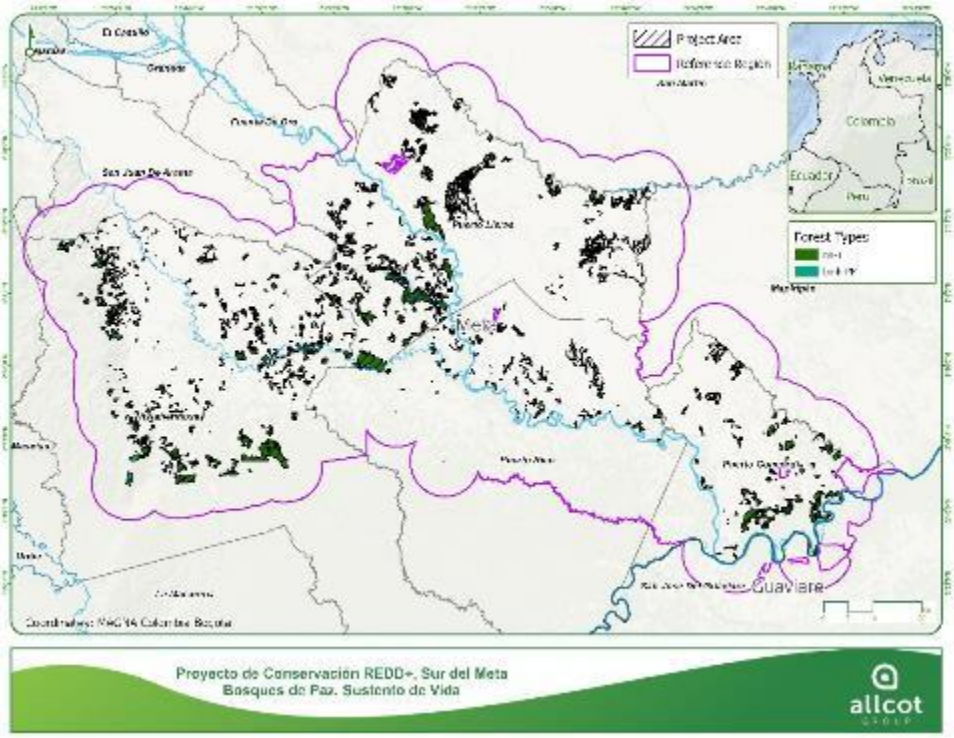


Figure 60 - Types of forest by life zones.

Source: ALLCOT, 2024

Using information of IDEAM (2011) 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.

Table 53. Carbon stocks stored in aboveground biomass in natural forests of Colombia.

Tipo de bosque	A_i (ha)	Eq.2	n	Área (ha)	BA_i (t ha^{-1})	I.C. (t ha^{-1})	BA_i (t)
Bosque muy seco tropical	55.814	1	7	4,0	126,3	36,3	7.050.456
Bosque seco tropical	565.621	1	163	19,7	58,5	22,8	33.074.742
Bosque húmedo tropical	44.343.684	2	984	302,4	284,6	14,4	12.620.805.177
Bosque muy húmedo tropical	5.514.120	2	933	285,0	164,9	13,0	909.306.898
Bosque pluvial tropical	206.147	3	18	21,0	121,8	6,2	25.101.935
Bosque seco premontano †	4.451	4	10	0,7	126,8	35,4	564.452
Bosque húmedo premontano	987.370	4	117	6,6	200,0	68,7	197.485.061
Bosque muy húmedo premontano	2.217.396	4	297	31,7	172,2	40,4	381.915.340
Bosque pluvial premontano	565.600	4	8	3,2	232,7	53,6	131.597.541
Bosque seco montano bajo †	19.145	5	6	1,4	216,3	49,1	4.140.388
Bosque húmedo montano bajo	1.357.183	5	378	30,6	301,8	106,9	409.585.259
Bosque muy húmedo montano bajo	1.411.289	5	290	56,4	259,5	22,8	366.194.143
Bosque pluvial montano bajo	109.803	5	8	1,4	107,2	10,9	11.772.532
Bosque húmedo montano †	25.713	6	7	2,4	103,2	15,7	2.652.371
Bosque muy húmedo montano	861.919	6	111	13,1	98,3	22,5	84.736.810
Bosque pluvial montano	356.666	6	10	4,5	88,7	0,2	31.652.318
Total	**58.601.922**	-	**3.347**	**783,8**	**259,7**	**43,4**	**15.217.635.423**

Source: Estimation of current (2010) carbon stocks stored in aboveground biomass in natural forests of Colombia; Stratification, allometry and analytical methods. *Estimación de las reservas actuales (2010) de carbono almacenadas en la biomasa aérea en bosques naturales de Colombia; Estratificación, alometría y métodos análiticos. IDEAM, 2011. (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: Ai = Extent of forest in the country for 2010;

Eq= Allometric equation used for determination; n= Number of plots; Area = Total area sampled; Baj= Aboveground biomass in natural forests in Colombia ; C.I. = Confidence interval.

For the calculation of belowground carbon content, the ratio of aboveground biomass to belowground biomass will be used with a factor of 0.31. That is, for each ton of aboveground biomass, the belowground biomass corresponds to 30% of the aboveground biomass, 0.29 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 to 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 number 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:

$$C_{total} \times 3.67 = O_{2Eq}$$

For Tropical rain forest (bh-T in Spanish):

- Carbon for above-ground biomass:

bh-T Cab_{icl}:

$$210.15\frac{tC}{ha}\times\frac{44}{12}\times 0.50 = 385.27\frac{tCO_2e}{ha}$$

- Carbon for below-ground biomass:

bh-T Cbb_{icl}:

$$210.15\frac{tC}{ha}\times\frac{44}{12}\times 0.50\ \times 0.29 = 111.73\frac{tCO_2e}{ha}$$

For Very humid premontane forest (bmh-PM in Spanish):

- Carbon for above-ground biomass:

bmh-PM Cab_{icl}:

$$271.78\frac{tC}{ha}\times\frac{44}{12}\times 0.50 = 498.26\frac{tCO_2e}{ha}$$

- Carbon for below-ground biomass:

bmh-PM Cbb_{icl}:

$$271.78\frac{tC}{ha}\times\frac{44}{12}\times 0.50\times 0.29 = 144.50\frac{tCO_2e}{ha}$$

The Confidence Interval (CI) was taken of the study by IDEAM (2011) for each type of forest, being for the Tropical humid forest (bh-T) of 11.1 tCO_2e/ha and for the Very humid premontane forest (bmh-PM) of 14.3 tCO_2e/ha, these values with a confidence interval of 90% associates to value of significance of 0.05 and $Z_{\alpha/2}$=1,6542; greater confidence than the VM0015 methodological requirements indicates in the table 15 of the methodology. As with the content of above-ground biomass, was used the values of dry matter carbon fraction and the relation Carbon -Oxygen to convert these values to CO_2 equivalent. And for the belowground confidence interval, in addition this value was multiplicate for the ratio of aboveground to belowground biomass of 0.31. Having like results of CI for bh-T in aboveground a value of 24.8 tn CO_2 eq/ha and for belowground of 7.7 tn CO_2 eq/ha. And the CI for bmh-PM of 69.6 tn CO_2 eq/ha and 21.6 tn CO_2 eq/ha, respectively.

Taking into account the date of the IDEAM's information specified for the time condition of the carbon contents information by the methodology. The forest types were used like strata to generate a new inventory.

The results obtained of the inventory and the carbon calculations for the tropical humid forest an average carbon content of 385.27 tCO_2e per hectare was calculated. As for the very humid premontane forest, it presents an average carbon content of 498.26 tCO_2e per hectare.

For the calculation of belowground carbon content, the ratio of aboveground biomass to belowground biomass will be used with a factor of 0.31. That is, for each ton of aboveground biomass, the belowground biomass corresponds to 31% of the aboveground biomass, 0.29 tons. Thus, the belowground carbon content for the tropical humid forest an average carbon content was 111.73 tCO2e per hectare and for

the very humid premontane forest of 498.26 tCO2e per hectare. As indicate the methodology in the section 6.1.1 letter f, was done an uncertainty assessment.

For the confidence intervals of the calculate carbon per each forest type. Was used a confidence level of 90%, obtaining for this probability a t or $Z_{\alpha/2}$=1.6542. This information was used to calculate the admissible error using the formula.

$$E = Z_{\alpha/2} * \frac{\sigma}{\sqrt{n}}$$

Where:

E is the Error.

$Z_{\alpha/2}$ is the quantile of the standard normal distribution that carries a probability of α/2 with α significance level set.

σ is the standard desviation, and

n is the sample size

With this assumption, project's forest inventory information for each forest type, the sampling error was calculated under a stratified sampling type. The calculated error was 12.88 % (Carbon calculation - Forest inventory), and the relevant sampling statistics are presented below.

Table 54 - Error calculation of the carbon estimations

Type Forest	No. Plots	Standard Error	Muestral Error	Muestral Error (%)
		tCO2e/ha		
bh-T	137	13.72	22.69	12.88%
bmh-PM	28			

Source: ALLCOT, 2021

Stratified random sampling is a technique for randomly selecting elements of a population in a uniform manner, as it involves dividing the population into homogeneous subgroups called strata and then randomly selecting samples from each stratum. This stratified approach more accurately captures the variability in the population by ensuring that each subgroup is represented in the final sample. For the REDD+ Sur del Meta project, monitoring was used with two strata (Tropical humid forest-bh-T and Tropical very humid forest according to the Holdridge climate classification), which were selected due to the heterogeneity present among the project's forests. In each of the strata, 137 and 28 plots were monitored, respectively, and a sampling error of 12.88% was obtained.

Considering that the sampling error exceeds the 10% allowed by the VM0015 methodology, the project applied the lower limit of the confidence intervals for each of the strata as an emission factor.

Table 55 - Confidence intervals by stratum and reservoir type

Stratum	Carbon Pool	tCO_2e/ha	Higher CI (tCO_2e/ha)	Lower CI (tCO_2e/ha)
bh-T	AGB	385.27	396.37	374.18
	BGB	111,73.42	114.95	108.51
bmh-T	AGB	498.26	512.61	483.91
	BGB	144.50	148.66	140.33

The previous table 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 3.3 Project Boundary. 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 56 57. Estimated values for carbon stock per hectare of forest classes icl existent in project area and leakage belt (15a)

Project year *t*	Initial forest class *icl* Name: Tropical humid forest 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	385.3	11.1	111.7	3.2	497.0	14.3

Project year *t*	Initial forest class *icl* Name: Very humid premontano forest *ID icl: bmh-PM* 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	498.3	14.3	144.5	4.2	642.8	18.5

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%.

And the following table presents the values for above and belowground carbon contents adjusted by the uncertainly.

Table 58 59 - Values to be used after discounts for uncertainties (15b)

Project year t	Initial forest class icl Name: Tropical humid forest ID icl: bh-T Average carbon stock per hectare + 90% CI					
	Cab icl		Cbb icl		Ctot icl	
	C stock t CO2 e ha-1	C stock change t CO2e ha -1	C stock t CO2 e ha-1	C stock change t CO2e ha -1	C stock t CO2 e ha-1	C stock change t CO2e ha -1
T0 a 30	374.2	0.0	108.5	0.0	482.7	0.0
Notes	For the bh-T the error percent is higher than 10%, being of 12.8%. Therefore, the values were adjust to the inferior limit of the confidence interval to 374.18 tCO2e/ha and 108.51 tCO2e/ha for the belowground carbon contents. Thus, the carbon stock values going on a constant in time 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 3.3 Project Boundary					

Project year t	Initial forest class icl Name: Very humid premontano forest ID icl: bmh-PM Average carbon stock per hectare + 90% CI					
	Cab icl		Cbb icl		Ctot icl	
	C stock t CO2 e ha-1	C stock change t CO2e ha -1	C stock t CO2 e ha-1	C stock change t CO2e ha -1	C stock t CO2 e ha-1	C stock change t CO2e ha -1
T0 a 30	483.9	0.0	140.3	0.0	624.2	0.0
Notes	For the bmh-PM the error percent is higher than 10%, being of 12.8%. Therefore, the values were adjust to the inferior limit of the confidence interval to 483,9 tCO2e/ha and 140,33 tCO2e/ha for the belowground carbon contents. Thus, the carbon stock values going on a constant in time 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 3.3 Project Boundary					

Source: ALLCOT, 2024

For the post deforestation classes were identified four principal classes. Three in relation with agricultural land and other one with meadows. The aboveground carbon contents for each post deforestation class was taken from the study tittle "*Estimación de las reservas de dioxido de carbono generadas por la deforestación durante el periodo 2005-2010*" by IDEAM. This information is the more recent, and actually is the official information in the colombian territory. Citing the study "for cover types other than natural forests, data were obtained from reports in scientific literature, preferably studies conducted in

Colombia." And the emission factors were calculated as the difference in carbon content or stocks due to the change from one cover to another, for example, the change from natural forest to permanent crops.

In the present project, the post deforestation classes associated with the loss of forest are: 1) areas Agriculture Territories, 2) Urban Fabric, 3) Scrub and/or herbaceous associations, and 4) Open spaces with little or no vegetation. IDEAM reports the followings contents:

Table 60. Carbon dioxide stocks by LU

Cover		BA	± DE	C	± DE
Agricultural land **	Heterogeneous agricultural areas	11.5	-	5.8	-
	Permanent crops	57.8	47.5	28.9	23.8
	Transitional crops	8.4	2.2	4.2	1.1
Meadows **	Pastures	12.7	15.5	6.4	7.8
	Grasslands	28.2	35.7	14.1	17.9
Settlements **	Urbanized areas	0	-	0	-
Other lands **	Other areas without vegetation	0	-	0	-

Source: Estimation of carbon dioxide stocks generated by deforestation during the period 2005-2010. *Estimación de las reservas de dioxido de carbono generadas por la deforestación durante el periodo 2005-2010*. IDEAM, 2011

Where BA is the aerial biomass in tons per hectare, C is the carbon stored in tons per hectare and SD is the standard deviation of each one. To obtain the carbon stock of the agricultural territories, the following categories reported by IDEAM were averaged:

- Heterogeneous agricultural areas
- Permanent crops
- Transient crops
- Pastures

For Scrub and/or herbaceous associations, the data was taken from the category "*Herbazales*", for Urban Fabric the category Urbanized areas and for Open spaces with little or no vegetation the category other areas without vegetation. Since the IDEAM study only presents the standard deviations for each value of biomass content by cover, and although the studies referred to by IDEAM for post-deforestation content indicate a confidence level in the statistical tests that varies from 0.1 to 0.05, i.e., a confidence interval of 90% to 95%. In the official document no reference is made to the number of samples used, therefore, it is not possible to calculate the confidence interval, and therefore don't exist certainty about the confidence level or their error. Thus, the section 6.1.1 letter f, in relation to this situation indicates that "When defaults are used, the lowest value of the range given in the literature source (or the value reduced by 30%) must be used for the forest classes, and the highest value (or the value augmented by 30%) for non-forest classes".

In this sense, each biomass content per hectare was converted to equivalent carbon for aboveground stock using the relation 44/12 (3.67) and a dry matter factor of 0.47 refer previously in this document, and for the belowground carbon contents using the relation 0.31. Obtaining the followings values mentioned in the following table according with the Table 16 of the VM0015 Methodology.

Table 61. Average carbon stock long term (30 years) per hectare for each icl forest (16)

Project year *t*	Post deforestation class fcl Name: Heterogeneous agricultural areas *ID icl: Agt* 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	38.9	N.A	11.1	N.A	50.0	5.0
Average	38.9	N.A	11.1	N.A	50.0	5.0
Average to be used in calculations	38.9	N.A	11.1	N.A	50.0	5.0

Project year *t*	Post deforestation class fcl Name: Urban Fabric *ID icl: Uf* 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	0.0	N.A	0.0	N.A	0.0	0.0
Average	0.0	N.A	0.0	N.A	0.0	0.0
Average to be used in calculations	0.0	N.A	0.0	N.A	0.0	0.0

Project year *t*	Post deforestation class fcl Name: Scrub and/or herbaceous associations *ID icl: Sha* 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	48.6	N.A	13.8	N.A	62.4	6.2
Average	48.6	N.A	13.8	N.A	62.4	6.2

Project year *t*	Post deforestation class fcl Name: Scrub and/or herbaceous associations *ID icl: Sha* 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
Average to be used in calculations	48.6	N.A	13.8	N.A	62.4	6.2
Project year *t*	Post deforestation class fcl Name: Open spaces with little or no vegetation *ID icl: Nv* 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	0.0	N.A	0.0	N.A	0.0	0.0
Average	0.0	N.A	0.0	N.A	0.0	0.0
Average to be used in calculations	0.0	N.A	0.0	N.A	0.0	0.0

Since the values of carbon content are estimated by official study 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 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 integrate the adjust of the contents for each post deforestation class by 30% like the methodology indicates. Notice that the refence region is assumed like only one zone.

Table 62 -Carbon stock average long term per hectare (17)

	Post -deforestation LU/LC-classes *fcl*	Area weighted long-term (30 years) average carbon

										stocks per zone z	
		Name:	Agriculture Territories	Name:	Urban Fabric	Name:	Scrub and/or herbaceous associations	Name:	Open spaces with little or no vegetation		
Zone		*ID fcl*	*Agt*	*ID fcl*	*Uf*	*ID fcl*	*Sha*	*ID fcl*	*Nv*		
		Cab fcl	*Cbb fcl*	*Cab fcl*	*Cbb fcl*	*Cab fcl*	*Cbb fcl*	*Cab fcl*	*Cbb fcl*	*Cab z*	*Cbb z*
IDz	Name	*C stock t CO2 e ha-1*	*C stock t CO2 e ha-1*	*C stock t CO2 e ha-1*	*C stock t CO2 e ha-1*	*C stock t CO2 e ha-1*	*C stock t CO2 e ha-1*	*C stock t CO2 e ha-1*	*C stock t CO2 e ha-1*	*C stock t CO2 e ha-1*	*C stock t CO2 e ha-1*
1	Zone 1	50.6	14.4	0.0	0.0	63.2	17.9	0.0	0.0	28.5	8.1
Note: Values adjusted in 30% for uncertainty according with the methodology, section 6.1.1 letter b											

Source: ALLCOT, 2024

The Project does not consider dead wood biomass carbon pool, litter carbon, soil organic carbon pool, and harvested wood products carbon. For the calculation of carbon stock change factors is necessary consider the following aspects:

- The carbon contents for the initial forest classes and the final post deforestation classes for above and belowground pools are constant for all the crediting periods.
- According to the IPCC guidelines, the carbon content in the post deforestation classes takes into account only the conversion of natural forests to cropland or permanent pasture. With the clarity that a transient crop is grown on the same site on a cyclical basis. For this reason, the decrease of carbon stocks of the initial classes to the post deforestation classes is considered in each year by the total conversion of the land cover and is not distributed for fractions, because the transformation is permanent in the reference baseline scenario without project.
- The transition of one forest class to any of the four post deforestation classes obey to a lot of variables and factors described in the drivers and agents' analysis. Therefore, the potential of transition is determined by the historical change of forest and its ponderation in proportion of the transformed area between the periods conformed by 2010-2012, 2012-2014 and 2014-2018

Using the aspects presented previously, for the calculation of carbon stock change factors were used the initial forest classes and the classes post deforestation presented in the following table being mentioned previously in the following tables:

Table 63 . List of land-use and land-cover change categories (18)

			Initial LU/LC class *icl*	
		ID_{cl}	1	2
	ID_z	Name	Tropical humid forest (bh-T)	Very humid Premontane forest (bmh-PM)
Zone *z*	Agriculture Territories (Agt)	Zone 1	bh-T to Agt	bmh-PM to Agt
	Urban Fabric (Uf)		bh-T to Uf	bmh-PM to Uf
	Scrub and/or herbaceous associations (Sha)		bh-T to Sha	bmh-PM to Sha
	Open spaces with little or no vegetation (Nv)		bh-T to Nv	bmh-PM to Nv

Source: ALLCOT, 2021

It should be noted that IDEAM's Forest/Non Forest information considers in its legend three classes: Forest, Non Forest and No Information. The No Forest information groups all those coverages that differ from the official definition of Forest for Colombia. However, since this information was used in modeling the location of future deforestation it is not possible to determine for the project boundaries which type of forest will become which type of class post deforestation. Therefore, the historical weights in proportion of forest areas converted to the four identified post deforestation classes will be used to adjust the emission factors. As following shows:

The behavior of the change in coverage between 2010-2012, 2012-2014 and 2014-2018 is shown in the following table.

Table 64 . Weighted weight of aboveground carbon content for post deforestation classes

Historical Post -deforestation LU/LC-classes *fcl (hectares)*											
Period	Initial Class	Agriculture Territories		Urban Fabric		Scrub and/or herbaceous associations		Open spaces with little or no vegetation		Total Surface (ha)	Total %
		Agt (Surface hectares)	%	Uf (Surface hectares)	%	Sha (Surface hectares)	%	Nv (Surface hectares)	%		
2010-2012	Forest	19,558.65	78.26	8.27	0.03	5,344.01	21.38	79.78	0.32	24.990,72	100
2012-2014		4,066.44	80.55	0.00	0.00	851.80	16.87	130.28	2.58	5.048,51	100
2014-2018		14,474.64	86.59	0.08	0.00	1,690.21	10.11	550.55	3.29	16.715,47	100
Mean		12.699,91	81.80	2.78	0.01	2,628.67	16.12	253.54	2.06	15,584.90	100
Carbon content (ton CO_2e/ha)		38.9		0.0		48.6		0.0			
Carbon content weighted weight (ton CO_2e/ha)		31.9		0.0		7.8		0.0			
Total Mean above ground carbon content post deforestation classes (ton CO_2e/ha)		39.7									
Adjusted total mean above ground carbon content post deforestation classes*(ton CO_2e/ha)		51.6									
Note: *Values adjusted in 30% for uncertainty according with the methodologyx section 6x1xx1 letter b											

Source: ALLCOT, 2024

In consequence, the value of the above ground carbon for the post deforestation classes is 51,6 tCO_2e/ha. And using the relation of 0.29 between the above ground and the below ground biomass, the content of the below ground carbon is of 14.7 tCO_2e/ha

In consider of the exposed, the schema of the tables 19 don't apply because the deforested areas of initial forest classes to non forest are the same of the schema associated to the tables 14 a,b,c.

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 performed because for each period, adjusted with the discount of the carbon content for the post deforestation classes 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[48] is, for reference region, project area and leakage area for the total carbon accountant period fixed:

$$\Delta CabBSLRR = \sum ABSLRR_{ct,t\ bht} \times C\ stock \frac{tCO2e}{ha}_{bht} + \sum ABSLRR_{ct,t\ bmhPM} \times C\ stock \frac{tCO2e}{ha}_{bmhPM}$$

$$\Delta CabBSLRR = \left[\left(120{,}043.02\ Ha \times 374.17 \frac{tCO2e}{Ha}\right) - \left(120.043{,}02\ ha \times 51.60 \frac{tCO2e}{ha}\right)\right] + \left[\left(2{,}405.34\ ha \times 483.91 \frac{tCO2e}{ha}\right) - \left(2.405{,}34\ ha \times 51.60 \frac{tCO2e}{ha}\right)\right]$$

$\Delta CabBSLRR = 39{,}762{,}518$ tCO_2e 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 following tables:

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

Table 65. 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}	bmh-PM	annual	cumulative
	$ABSLRR_{ct,t}$	$Cab_{ct,t}$	$ABSLRR_{ct,t}$	$Cab_{ct,t}$	$CabBSLRR_t$	CabBSLRR
	ha	tCO_2-e ha-1	ha	tCO_2-e ha-1	tCO_2-e	tCO_2-e
2,020	4,927.75	1,589,561	79.89	34,538	1,624,099	1,624,099
2,021	5,061.00	1,632,542	83.33	36,022	1,668,565	3,292,664
2,022	4,969.37	1,602,985	83.09	35,919	1,638,904	4,931,568
2,023	4,879.40	1,573,963	82.85	35,816	1,609,779	6,541,347
2,024	4,791.06	1,545,467	82.61	35,713	1,581,180	8,122,528
2,025	4,704.32	1,517,486	82.37	35,611	1,553,097	9,675,625
2,026	4,619.14	1,490,012	82.14	35,509	1,525,521	11,201,146
2,027	4,535.52	1,463,036	81.90	35,407	1,498,443	12,699,588
2,028	4,453.40	1,436,548	81.67	35,305	1,471,853	14,171,441
2,029	4,372.77	1,410,539	81.43	35,204	1,445,743	15,617,185
2,030	4,293.60	1,385,001	81.20	35,103	1,420,104	17,037,289
2,031	4,215.87	1,359,926	80.97	35,002	1,394,928	18,432,218
2,032	4,139.54	1,335,305	80.73	34,902	1,370,207	19,802,424
2,033	4,064.59	1,311,129	80.50	34,802	1,345,931	21,148,355
2,034	3,991.00	1,287,391	80.27	34,702	1,322,093	22,470,449
2,035	3,918.75	1,264,083	80.04	34,603	1,298,686	23,769,134
2,036	3,847.80	1,241,197	79.81	34,503	1,275,700	25,044,835
2,037	3,778.13	1,218,725	79.58	34,404	1,253,130	26,297,964
2,038	3,709.73	1,196,660	79.35	34,306	1,230,966	27,528,930
2,039	3,642.57	1,174,995	79.13	34,207	1,209,202	28,738,133
2,040	3,576.62	1,153,722	78.90	34,109	1,187,831	29,925,963
2,041	3,511.86	1,132,834	78.67	34,012	1,166,845	31,092,808
2,042	3,448.28	1,112,324	78.45	33,914	1,146,238	32,239,046
2,043	3,385.85	1,092,185	78.22	33,817	1,126,002	33,365,048
2,044	3,324.55	1,072,411	78.00	33,720	1,106,131	34,471,179
2,045	3,264.36	1,052,995	77.78	33,623	1,086,618	35,557,797
2,046	3,205.26	1,033,931	77.55	33,527	1,067,457	36,625,255
2,047	3,147.23	1,015,212	77.33	33,430	1,048,642	37,673,897
2,048	3,090.25	996,831	77.11	33,335	1,030,166	38,704,063
2,049	3,034.30	978,784	76.89	33,239	1,012,023	39,716,085
2,050	139.15	44,885	3.58	1,548	46,433	39,762,518

Table 66. 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
	$ABSLRR_{ct,t}$	$Cbb_{ct,t}$	$ABSLRR_{ct,t}$	$Cbb_{ct,t}$	$CbbBSLRR_t$	CbbBSLRR
	ha	tCO_2-e ha-1	ha	tCO_2-e ha-1	tCO_2-e	tCO_2-e
2,020	4,927.75	462,498	79.89	10,041	472,539	472,539
2,021	5,061.00	475,004	83.33	10,472	485,477	958,016
2,022	4,969.37	466,404	83.09	10,442	476,847	1,434,862
2,023	4,879.40	457,960	82.85	10,412	468,372	1,903,235
2,024	4,791.06	449,669	82.61	10,382	460,051	2,363,286
2,025	4,704.32	441,528	82.37	10,353	451,880	2,815,166
2,026	4,619.14	433,534	82.14	10,323	443,857	3,259,023
2,027	4,535.52	425,685	81.90	10,293	435,978	3,695,001
2,028	4,453.40	417,978	81.67	10,264	428,242	4,123,242
2,029	4,372.77	410,410	81.43	10,234	420,645	4,543,887
2,030	4,293.60	402,980	81.20	10,205	413,185	4,957,072
2,031	4,215.87	395,684	80.97	10,176	405,860	5,362,932
2,032	4,139.54	388,520	80.73	10,147	398,667	5,761,598
2,033	4,064.59	381,486	80.50	10,118	391,603	6,153,202
2,034	3,991.00	374,579	80.27	10,088	384,668	6,537,869
2,035	3,918.75	367,797	80.04	10,060	377,857	6,915,726
2,036	3,847.80	361,138	79.81	10,031	371,169	7,286,895
2,037	3,778.13	354,600	79.58	10,002	364,602	7,651,497
2,038	3,709.73	348,180	79.35	9,973	358,153	8,009,651
2,039	3,642.57	341,876	79.13	9,945	351,821	8,361,472
2,040	3,576.62	335,687	78.90	9,916	345,603	8,707,074
2,041	3,511.86	329,609	78.67	9,888	339,497	9,046,571
2,042	3,448.28	323,642	78.45	9,859	333,501	9,380,072
2,043	3,385.85	317,782	78.22	9,831	327,613	9,707,685
2,044	3,324.55	312,029	78.00	9,803	321,831	10,029,517
2,045	3,264.36	306,379	77.78	9,775	316,154	10,345,671
2,046	3,205.26	300,832	77.55	9,747	310,579	10,656,250
2,047	3,147.23	295,386	77.33	9,719	305,105	10,961,354
2,048	3,090.25	290,038	77.11	9,691	299,729	11,261,083
2,049	3,034.30	284,787	76.89	9,663	294,450	11,555,533
2,050	139.15	13,060	3.58	450	13,510	11,569,043

Regarding the estimated equivalent carbon content for above and belowground biomass within the Project Area in the reference period. These are presented in the following tables:

$$\Delta CabBSLPA = \left[\left(16.697{,}1\ Ha \times\ 374.17\frac{tCO2e}{Ha}\right) - \left(16.697{,}1\ ha \times\ 51.60\frac{tCO2e}{ha}\right)\right] + \left[\left(85.74\ ha \times\ 483.91\frac{tCO2e}{ha}\right) - \left(85.74\ ha \times\ 51.60\frac{tCO2e}{ha}\right)\right]$$

$\Delta CabBSLPA$=5,423,108 tCO_2e cumulative 30 years

Table 67. 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
	$ABSLPA_{ct,t}$	$Cab_{ct,t}$	$ABSLPA_{ct,t}$	$Cab_{ct,t}$	$CabBSLPA_t$	CabBSLPA
	ha	tCO_2-e ha-1	ha	tCO_2-e ha-1	tCO_2-e	tCO_2-e
2,020	685.4	221,096	2.85	1,231	222,328	222,328
2,021	703.9	227,075	2.97	1,284	228,359	450,686
2,022	691.2	222,964	2.96	1,280	224,244	674,930
2,023	678.7	218,927	2.95	1,277	220,204	895,134
2,024	666.4	214,963	2.94	1,273	216,236	1,111,370
2,025	654.3	211,071	2.94	1,269	212,341	1,323,711
2,026	642.5	207,250	2.93	1,266	208,516	1,532,227
2,027	630.9	203,498	2.92	1,262	204,760	1,736,986
2,028	619.4	199,813	2.91	1,259	201,072	1,938,058
2,029	608.2	196,196	2.90	1,255	197,451	2,135,509
2,030	597.2	192,644	2.89	1,251	193,895	2,329,404
2,031	586.4	189,156	2.89	1,248	190,404	2,519,807
2,032	575.8	185,731	2.88	1,244	186,975	2,706,783
2,033	565.4	182,369	2.87	1,241	183,609	2,890,392
2,034	555.1	179,067	2.86	1,237	180,304	3,070,695
2,035	545.1	175,825	2.85	1,233	177,058	3,247,754
2,036	535.2	172,641	2.85	1,230	173,871	3,421,625
2,037	525.5	169,516	2.84	1,226	170,742	3,592,367
2,038	516.0	166,447	2.83	1,223	167,670	3,760,037
2,039	506.7	163,433	2.82	1,219	164,653	3,924,690
2,040	497.5	160,474	2.81	1,216	161,690	4,086,380
2,041	488.5	157,569	2.80	1,212	158,781	4,245,161
2,042	479.6	154,716	2.80	1,209	155,925	4,401,086
2,043	470.9	151,915	2.79	1,205	153,120	4,554,207
2,044	462.4	149,165	2.78	1,202	150,367	4,704,573
2,045	454.0	146,464	2.77	1,199	147,663	4,852,236
2,046	445.8	143,812	2.76	1,195	145,007	4,997,243
2,047	437.8	141,209	2.76	1,192	142,400	5,139,643
2,048	429.8	138,652	2.75	1,188	139,840	5,279,484
2,049	422.0	136,142	2.74	1,185	137,327	5,416,810
2,050	19.4	6,243	0.13	55	6,298	5,423,108

Table 68. Carbon stock change facto below ground biomass in the project area

Project year *t*	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	
	ID_{ct}	bh-T	ID_{ct}	bmh-PM	annual	cumulative
	$ABSLPA_{ct,t}$	$Cbb_{ct,t}$	$ABSLPA_{ct,t}$	$Cbb_{ct,t}$	$CbbBSLPA_t$	$CbbBSLPAl$
	ha	tCO_2-e ha-1	ha	tCO_2-e ha-1	tCO_2-e	tCO_2-e
2,020	685.4	64,330	2.85	358	64,688	64,688
2,021	703.9	66,070	2.97	373	66,443	131,131
2,022	691.2	64,873	2.96	372	65,246	196,377
2,023	678.7	63,699	2.95	371	64,070	260,447
2,024	666.4	62,546	2.94	370	62,916	323,363
2,025	654.3	61,413	2.94	369	61,782	385,145
2,026	642.5	60,301	2.93	368	60,669	445,814
2,027	630.9	59,210	2.92	367	59,577	505,391
2,028	619.4	58,138	2.91	366	58,504	563,894
2,029	608.2	57,085	2.90	365	57,450	621,344
2,030	597.2	56,052	2.89	364	56,415	677,760
2,031	586.4	55,037	2.89	363	55,399	733,159
2,032	575.8	54,040	2.88	362	54,402	787,561
2,033	565.4	53,062	2.87	361	53,423	840,984
2,034	555.1	52,101	2.86	360	52,461	893,444
2,035	545.1	51,158	2.85	359	51,517	944,961
2,036	535.2	50,232	2.85	358	50,589	995,550
2,037	525.5	49,322	2.84	357	49,679	1,045,229
2,038	516.0	48,429	2.83	356	48,785	1,094,014
2,039	506.7	47,553	2.82	354	47,907	1,141,921
2,040	497.5	46,692	2.81	353	47,045	1,188,966
2,041	488.5	45,846	2.80	352	46,199	1,235,165
2,042	479.6	45,016	2.80	351	45,368	1,280,532
2,043	470.9	44,201	2.79	350	44,552	1,325,084
2,044	462.4	43,401	2.78	349	43,750	1,368,834
2,045	454.0	42,615	2.77	348	42,964	1,411,798
2,046	445.8	41,844	2.76	347	42,191	1,453,989
2,047	437.8	41,086	2.76	346	41,432	1,495,421
2,048	429.8	40,342	2.75	345	40,688	1,536,109
2,049	422.0	39,612	2.74	344	39,956	1,576,065
2,050	19.4	1,817	0.13	16	1,833	1,577,898

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 the following tables:

$$\Delta CabBSLLB = \left[\left(11{,}172.9\ Ha \times\ 374.17\frac{tCO2e}{Ha}\right) - \left(11{,}172.9\ ha \times\ 51.60\frac{tCO2e}{ha}\right)\right] + \left[\left(0\ ha \times\ 483.91\frac{tCO2e}{ha}\right) - \left(0\ ha \times\ 51.60\frac{tCO2e}{ha}\right)\right]$$

$\Delta CabBSLLB = 3{,}604{,}092$ tCO_2-e cumulative 30 years

Table 69. Carbon stock change factor for above ground biomass in the leakage belt

Project year *t*	Activity data per category x Carbon stock change factor for above-ground biomass in the leakage area				Total baseline carbon stock change in the leakage area	
	ID_{ct}	bh-T	ID_{ct}	bmh-PM	annual	cumulative
	$ABSLLK_{ct,t}$	$Cab_{ct,t}$	$ABSLLK_{ct,t}$	$Cab_{ct,t}$	$CabBSLLK_t$	CabBSLLK
	ha	tCO_2-e ha-1	ha	tCO_2-e ha-1	tCO_2-e	tCO_2-e
2,020	458.6	147,948	0	0	147,948	147,948
2,021	471.0	151,948	0	0	151,948	299,896
2,022	462.5	149,197	0	0	149,197	449,093
2,023	454.1	146,496	0	0	146,496	595,588
2,024	445.9	143,844	0	0	143,844	739,432
2,025	437.9	141,239	0	0	141,239	880,671
2,026	429.9	138,682	0	0	138,682	1,019,353
2,027	422.1	136,171	0	0	136,171	1,155,525
2,028	414.5	133,706	0	0	133,706	1,289,231
2,029	407.0	131,285	0	0	131,285	1,420,516
2,030	399.6	128,908	0	0	128,908	1,549,424
2,031	392.4	126,574	0	0	126,574	1,675,998
2,032	385.3	124,283	0	0	124,283	1,800,281
2,033	378.3	122,033	0	0	122,033	1,922,314
2,034	371.5	119,823	0	0	119,823	2,042,137
2,035	364.7	117,654	0	0	117,654	2,159,791
2,036	358.1	115,524	0	0	115,524	2,275,315
2,037	351.6	113,432	0	0	113,432	2,388,747
2,038	345.3	111,379	0	0	111,379	2,500,125
2,039	339.0	109,362	0	0	109,362	2,609,487
2,040	332.9	107,382	0	0	107,382	2,716,869
2,041	326.9	105,438	0	0	105,438	2,822,307
2,042	320.9	103,529	0	0	103,529	2,925,836
2,043	315.1	101,655	0	0	101,655	3,027,491
2,044	309.4	99,814	0	0	99,814	3,127,305
2,045	303.8	98,007	0	0	98,007	3,225,312
2,046	298.3	96,233	0	0	96,233	3,321,544
2,047	292.9	94,490	0	0	94,490	3,416,035
2,048	287.6	92,780	0	0	92,780	3,508,814
2,049	282.4	91,100	0	0	91,100	3,599,914
2,050	13.0	4,178	0	0	4,178	3,604,092

Table 70. 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				Total baseline carbon stock change in the leakage belt	
	ID_{ct}	bh-T	ID_{ct}	bmh-PM	annual	cumulative
	$ABSLLK_{ct,t}$	$Cbb_{ct,t}$	$ABSLLK_{ct,t}$	$Cbb_{ct,t}$	$CbbBSLLK_t$	$CbbBSLLK$
	ha	tCO_2e ha-1	ha	tCO_2e ha-1	tCO_2e	tCO_2e
2,020	458.6	43,047	0	0	43,047	43,047
2,021	471.0	44,211	0	0	44,211	87,258
2,022	462.5	43,410	0	0	43,410	130,668
2,023	454.1	42,624	0	0	42,624	173,292
2,024	445.9	41,853	0	0	41,853	215,145
2,025	437.9	41,095	0	0	41,095	256,240
2,026	429.9	40,351	0	0	40,351	296,591
2,027	422.1	39,620	0	0	39,620	336,211
2,028	414.5	38,903	0	0	38,903	375,114
2,029	407.0	38,199	0	0	38,199	413,313
2,030	399.6	37,507	0	0	37,507	450,820
2,031	392.4	36,828	0	0	36,828	487,648
2,032	385.3	36,161	0	0	36,161	523,810
2,033	378.3	35,507	0	0	35,507	559,316
2,034	371.5	34,864	0	0	34,864	594,180
2,035	364.7	34,233	0	0	34,233	628,412
2,036	358.1	33,613	0	0	33,613	662,025
2,037	351.6	33,004	0	0	33,004	695,029
2,038	345.3	32,407	0	0	32,407	727,436
2,039	339.0	31,820	0	0	31,820	759,256
2,040	332.9	31,244	0	0	31,244	790,500
2,041	326.9	30,678	0	0	30,678	821,178
2,042	320.9	30,123	0	0	30,123	851,301
2,043	315.1	29,577	0	0	29,577	880,878
2,044	309.4	29,042	0	0	29,042	909,920
2,045	303.8	28,516	0	0	28,516	938,436
2,046	298.3	28,000	0	0	28,000	966,436
2,047	292.9	27,493	0	0	27,493	993,929
2,048	287.6	26,995	0	0	26,995	1,020,924
2,049	282.4	26,506	0	0	26,506	1,047,430
2,050	13.0	1,216	0	0	1,216	1,048,646

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 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 26 are omitted as required by the methodology.

Regarding Ex ante estimation of carbon stock changes due to unavoidable unplanned deforestation within the project area, The estimated reduction in emissions resulting from unplanned logging in the project region is estimated based on the goals of reduction rates of historical deforestation that has been identified. However, reduction of rates will depend on the effectiveness of the activities proposed. The methodology proposes to multiply the annual changes in carbon contents for each forest class avoided of being deforested by the factor (1-E), where E is the effectiveness of the proposed measure, which varies between zero and one. That is, the effectiveness is related to the reduction target expected from the project implementation at times t, t + 1, t + 2, However, conservatively, project proponents have set goals of deforestation reduction on 70% within the first five years, and from then onwards a reduction of deforestation by 80% to the identified historical rates, until achieving a reduction of 90% between year 10 to 30 of the project.(27)

Table 71 Ex ante estimated net carbon stock change in the project area under the project (27)

Project year *t*	*Total carbon stock decrease due to planned activities*		*Total carbon stock increase due to planned activities*		*Total carbon stock decrease due to unavoided unplanned deforestation*	
	annual	cumulative	annual	cumulative	annual	cumulative
	ΔCPAdPAt	*ΔCPAdPA*	*ΔCPAiPAt*	*ΔCPAiPA*	*ΔCUDdPAt*	*ΔCUDdPA*
	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO2-e
2,020	-	-	-	-	86,105	86,105
2,021	-	-	-	-	88,441	174,545
2,022	-	-	-	-	86,847	261,392
2,023	-	-	-	-	85,282	346,674
2,024	-	-	-	-	83,746	430,420
2,025	-	-	-	-	54,825	485,244
2,026	-	-	-	-	53,837	539,081
2,027	-	-	-	-	52,867	591,949
2,028	-	-	-	-	51,915	643,864
2,029	-	-	-	-	50,980	694,844
2,030	-	-	-	-	25,031	719,875
2,031	-	-	-	-	24,580	744,455
2,032	-	-	-	-	24,138	768,593

Project year *t*	*Total carbon stock decrease due to planned activities*		*Total carbon stock increase due to planned activities*		*Total carbon stock decrease due to unavoided unplanned deforestation*	
	annual	cumulative	annual	cumulative	annual	cumulative
	ΔCPAdPAt	*ΔCPAdPA*	*ΔCPAiPAt*	*ΔCPAiPA*	*ΔCUDdPAt*	*ΔCUDdPA*
	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO2-e
2,033	-	-	-	-	23,703	792,296
2,034	-	-	-	-	23,276	815,573
2,035	-	-	-	-	22,857	838,430
2,036	-	-	-	-	22,446	860,876
2,037	-	-	-	-	22,042	882,918
2,038	-	-	-	-	21,645	904,564
2,039	-	-	-	-	21,256	925,820
2,040	-	-	-	-	20,874	946,693
2,041	-	-	-	-	20,498	967,191
2,042	-	-	-	-	20,129	987,320
2,043	-	-	-	-	19,767	1,007,088
2,044	-	-	-	-	19,412	1,026,499
2,045	-	-	-	-	19,063	1,045,562
2,046	-	-	-	-	18,720	1,064,282
2,047	-	-	-	-	18,383	1,082,665
2,048	-	-	-	-	18,053	1,100,718
2,049	-	-	-	-	17,728	1,118,446
2,050	-	-	-	-	813	1,119,259

Total ex ante estimations for the project area are presented on the next table, corresponding to table 29 for VM0015.

Table 72 Total ex ante estimated actual net carbon stock changes and emissions of non-CO_2

Project year *t*	Total ex ante carbon stock decrease due to planned activities		Total ex ante carbon stock increase due to planned activities		Total ex ante carbon stock decrease due to unavoided unplanned deforestation		Total ex ante net carbon stock change		Total ex ante estimated actual non-CO2 emissions from forest fires in the project area	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	ΔCPAdPAt	ΔCPAdPA	ΔCPAiPAt	ΔCPAiPA	ΔCUDdPAt	ΔCUDdPA	Δ CPSPAt	Δ CPSPA	EBBPSPAt	EBBPSPA
	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2,020	-	-	-	-	86,105	86,105	86,105	86,105	-	-
2,021	-	-	-	-	88,441	174,545	88,441	174,545	-	-
2,022	-	-	-	-	86,847	261,392	86,847	261,392	-	-
2,023	-	-	-	-	85,282	346,674	85,282	346,674	-	-
2,024	-	-	-	-	83,746	430,420	83,746	430,420	-	-
2,025	-	-	-	-	54,825	485,244	54,825	485,244	-	-
2,026	-	-	-	-	53,837	539,081	53,837	539,081	-	-
2,027	-	-	-	-	52,867	591,949	52,867	591,949	-	-
2,028	-	-	-	-	51,915	643,864	51,915	643,864	-	-
2,029	-	-	-	-	50,980	694,844	50,980	694,844	-	-
2,030	-	-	-	-	25,031	719,875	25,031	719,875	-	-
2,031	-	-	-	-	24,580	744,455	24,580	744,455	-	-
2,032	-	-	-	-	24,138	768,593	24,138	768,593	-	-
2,033	-	-	-	-	23,703	792,296	23,703	792,296	-	-
2,034	-	-	-	-	23,276	815,573	23,276	815,573	-	-
2,035	-	-	-	-	22,857	838,430	22,857	838,430	-	-
2,036	-	-	-	-	22,446	860,876	22,446	860,876	-	-
2,037	-	-	-	-	22,042	882,918	22,042	882,918	-	-
2,038	-	-	-	-	21,645	904,564	21,645	904,564	-	-
2,039	-	-	-	-	21,256	925,820	21,256	925,820	-	-
2,040	-	-	-	-	20,874	946,693	20,874	946,693	-	-

Project year *t*	Total ex ante carbon stock decrease due to planned activities		Total ex ante carbon stock increase due to planned activities		Total ex ante carbon stock decrease due to unavoided unplanned deforestation		Total ex ante net carbon stock change		Total ex ante estimated actual non-CO2 emissions from forest fires in the project area	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	ΔCPAdPAt	ΔCPAdPA	ΔCPAiPAt	ΔCPAiPA	ΔCUDdPAt	ΔCUDdPA	Δ CPSPAt	Δ CPSPA	EBBPSPAt	EBBPSPA
	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2,041	-	-	-	-	20,498	967,191	20,498	967,191	-	-
2,042	-	-	-	-	20,129	987,320	20,129	987,320	-	-
2,043	-	-	-	-	19,767	1,007,088	19,767	1,007,088	-	-
2,044	-	-	-	-	19,412	1,026,499	19,412	1,026,499	-	-
2,045	-	-	-	-	19,063	1,045,562	19,063	1,045,562	-	-
2,046	-	-	-	-	18,720	1,064,282	18,720	1,064,282	-	-
2,047	-	-	-	-	18,383	1,082,665	18,383	1,082,665	-	-
2,048	-	-	-	-	18,053	1,100,718	18,053	1,100,718	-	-
2,049	-	-	-	-	17,728	1,118,446	17,728	1,118,446	-	-
2,050	-	-	-	-	813	1,119,259	813	1,119,259	-	-

4.3 Leakage

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

For the development of this project, the ex-ante leakage estimation procedure was used in accordance with the step 8 of VM0015.

As it previously described, deforestation and degradation of forest ecosystems in the area occurred due to historical issues as lack of governance, poor social organization, and insufficient funding. All this adds to climate change territorial signs like the increasing risk of hazardous meteorological events, loss of seasonality, and temperature rise. As part of the theory of change, different lines of action directly or indirectly related to the project were prioritized for the leakage management, which not only will preclude the migration of deforestation- or degradation-related activities outside the project area and the leakage belt but impulse a transformative trend towards more sustainable, inclusive, and climate-resilient livelihoods.

The design of the Theory of Change considered land formalization as one of the priorities, but also including monitoring of communities, biodiversity, and forest. The way of considering them is formulating individualized and articulated farm plans for project participants with the aim of closing the agricultural frontier by supporting the sustainability of four priority commodities: citrus, coffee, cocoa, and sustainable livestock. The native agricultural system, "Pancoger," will also be part of this supportive effort.

The annex 8.1 includes Leakage theoretical and quantitative evidence to describe the leakage, which can be summarized as:

- Productive lines of coffee, cocoa, citrus, and sustainable livestock managed by the project are more likely to succeed under different future conditions than current, non-sustainable schemes, which makes them a more probable status quo for the second half of the century and beyond.
- Coffee, cocoa, citrus, and sustainable livestock production lines managed by the project will cut down on the land needed for its production and then reduce deforestation. Thus, GHG emissions will be less under the project scenario than in the baseline scenario.
- Coffee, cocoa, citrus, and sustainable livestock production lines managed by the project will reduce their GHG emissions on lands already subjected to Agricultural use. Thus, GHG emissions will be less under the project scenario than in the baseline scenario.
- The displacement factor related to the baseline most-common activities will be less than 100 in the project scenario.

The proposed and approved activities are described on the project's theory of change matrix detailed in the Annex. 1.1.11_ 211104_CO_Teoria 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 systems.[49]

The following objectives are stated:

[49] 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.

- **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, this line of action has two objectives:

4) 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.

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

These 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.

- **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. After the 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. 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 to continue with the project.

- **Consolidation of territorial governance**

The third objective is the 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.

- **Good practices training program**

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

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 strengthen 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

This 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 by products 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.

The first step will be to identify the most appropriate productive projects that will improve positive social and environmental impacts, which will imply the 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.

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.

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 is expected. 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 will allow 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.

With this background, the conclusion is:

- Cocoa and Citrus crops thrive in present conditions and will expand their presence further under a sustainable future (SSP245) or a business-as-usual (SSP585) future scenario. However, crop expansion does not necessarily mean higher productivity and economic profitability. Cocoa flowering and fruiting are especially sensitive to drought and temperature maxima which are more probable in the future regardless of the scenario. Citrus fruiting is prone to respond poorly to water availability changes, also more likely to be common in the future. It is Allcot's will to recover and grow wild varietals with heat-resistant or water-stress-resistant capabilities and establish climate-smart, economic-appropriate agriculture.
- Coffea arabica will probably lose its scarce current habitat distribution over the following decades. Regardless, Allcot recognizes this species' cultural importance in the country and, therefore, is supporting and will support coffee growers to reach the quality standards among special coffees, but at the same time, will impulse their transition towards Coffea robusta or another varietal with better performance on warm, hot weathers like the one in the Meta department.
- Despite sustainable livestock having better pastures in future scenarios, it will suffer the severities of a notably warmer climate. Allcot is already pursuing the establishment of live fences and silvopastoral systems as a proven option to reduce heat stress. The use of more productive breeds and shifting livestock species is being examined.

- Cocoa, citrus, coffee, and livestock business lines managed with sustainable and resilient criteria by the project will be necessary mainly due to the pressure related to mean and maxima temperature increase, and not only because of its higher economic and social benefits.
- Sustainable and resilient criteria for implementing transformative and corrective measures on cocoa, citrus, coffee, and livestock business lines will halter its geographic expansion by raising productivity on land already under agricultural or livestock use.
- According to peer-reviewed data, sustainable and resilient practices on cocoa, citrus, coffee, and livestock business lines are less polluting and less intensive in the use of resources, as well as lower GHG emissions.
- Project participants that reach the aimed positive externalities of sustainable agriculture will likely stay in the project area. Therefore, in the project scenario, the displacement factor related to the baseline most-common activities will be less than 100 because the baseline activities will not exist in the first place, and project participants will not move easily.

However, we assume conservatively these lands will remain as non-forest lands, and therefore carbon stocks will remain unchanged throughout the life of the project. Similarly, emissions from the application of organic fertilizers are considered insignificant, eg composting uses anaerobic decomposition and a combination of garbage and organic waste from crops, that because of their small-scale feature, do not generate large emissions.

The leakage prevention activities are not associated with other projects registered under VCS or the UNFCCC. Emissions from fossil fuel consumption for the implementation of activities that will avoid deforestation, do not need to be counted and recorded for total carbon balances, as stated by the methodology. Therefore, leakage net estimates are considered as zero as it is shown in the following table:

Table 73 - Carbon content changes due to activities implemented in the leakage management areas (30a)

Project year t	Total carbon stock change and non-CO2e emissions in leakage management areas in the baseline case		Total carbon stock changes and non-CO2 emissions in leakage management areas in the project case		Net carbon stock change due to leakage prevention measures	
	annual	cumulative	annual	cumulative	annual	cumulative
	DCBSLLKt	DCBSLLK	DCPSLKt	DCPSLK	DCLPMLK	DCLPMLK
	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e
2020	0	0	0	0	0	0
2021	0	0	0	0	0	0
2022	0	0	0	0	0	0
2023	0	0	0	0	0	0
2024	0	0	0	0	0	0
2025	0	0	0	0	0	0
2026	0	0	0	0	0	0
2027	0	0	0	0	0	0
2028	0	0	0	0	0	0
2029	0	0	0	0	0	0

The Project design does not promote activities that increase emissions derived from enteric fermentation or biomass burning. Therefore, Ex –ante CH4 and N2O emissions estimates due to the increase in number of grazing animals will not be considered.

Total estimates of changes in carbon content and increases in emissions due to the leakage prevention in the ex - ante phase are considered as not significant, due to the leakage management, and therefore they were not estimated.

In accordance with section 8.2 of VM0015, 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 spatial boundaries. In accordance with the methodology, 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. Considering deforestation is caused by each individual owner on its own land, agents

of deforestation are considered, and they will not displace their activities to other lands. The information supporting this consideration is included in Annex Stakeholder consultation, free, prior and informed consent. Annex1.11_211104_CO_Teoria del cambio, Herramienta de implementación acciones sostenibles and Annex2.1.8_ 211103_CO_StakeholderMappingSurdelMeta.xlsx

Following these assumptions and putting them into practice, the Meta Sur, Forests of Peace, Livelihoods Project is not expected to generate displacement leakage as the Project activities are designed to provide all deforestation agents that reach the Project Boundary the opportunity to participate in Project activities. Nevertheless, the ex-ante calculations will include a 15% Displacement Factor in order to be conservative. It is important to acknowledge that monitoring ang ex post calculation will detect and any leakage displacement as well as be reflected in correction actions towards the project. See table (34 VM0015)

Table 74 Ex ante estimated leakage due to activity displacement (34)

Project year t	Total ex ante estimated decrease in carbon stocks due to displaced deforestation		Total ex ante estimated increase in GHG emissions due to displaced forest fires	
	annual	cumulative	annual	cumulative
	ΔCADLKt	ΔCADLK	EADLKt	EADLK
	tCO2e	tCO2e	tCO2e	tCO2e
2,020	43,052	43,052	-	-
2,021	44,220	87,273	-	-
2,022	43,423	130,696	-	-
2,023	42,641	173,337	-	-
2,024	41,873	215,210	-	-
2,025	41,118	256,328	-	-
2,026	40,378	296,706	-	-
2,027	39,650	336,357	-	-
2,028	38,936	375,293	-	-
2,029	38,235	413,528	-	-
2,030	37,547	451,075	-	-
2,031	36,870	487,945	-	-
2,032	36,207	524,152	-	-
2,033	35,555	559,706	-	-
2,034	34,915	594,621	-	-
2,035	34,286	628,907	-	-
2,036	33,669	662,576	-	-
2,037	33,063	695,639	-	-
2,038	32,468	728,108	-	-
2,039	31,884	759,992	-	-
2,040	31,310	791,302	-	-
2,041	30,747	822,049	-	-
2,042	30,194	852,243	-	-

Project year t	Total ex ante estimated decrease in carbon stocks due to displaced deforestation		Total ex ante estimated increase in GHG emissions due to displaced forest fires	
	annual	cumulative	annual	cumulative
	ΔCADLKt	ΔCADLK	EADLKt	EADLK
	tCO2e	tCO2e	tCO2e	tCO2e
2,043	29,651	881,894	-	-
2,044	29,118	911,011	-	-
2,045	28,594	939,605	-	-
2,046	28,080	967,685	-	-
2,047	27,575	995,260	-	-
2,048	27,079	1,022,339	-	-
2,049	26,592	1,048,931	-	-
2,050	1,220	1,050,151	-	-

Step 8.3 Ex ante estimation of total leakage

Table 75 Ex ante estimated total leakage (35)

Project year t	Total ex ante GHG emissions from increased grazing activities		Total ex ante increase in GHG emissions due to displaced forest fires		Total ex ante decrease in carbon stocks due to displaced deforestation		Carbon stock decrease due to leakage prevention measures		Total net carbon stock change due to leakage		Total net increase in emissions due to leakage	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	EgLKt	EgLK	EADLKt	EADLK	ΔCADLKt	ΔCADLK	ΔCLPMLK t	ΔCLPMLK	ΔCLKt	CLKt	ELKt	ELK
	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e
2,020	-	-	-	-	43,052	43,052	-	-	43,052	43,052	-	-
2,021	-	-	-	-	44,220	87,273	-	-	44,220	87,273	-	-
2,022	-	-	-	-	43,423	130,696	-	-	43,423	130,696	-	-
2,023	-	-	-	-	42,641	173,337	-	-	42,641	173,337	-	-
2,024	-	-	-	-	41,873	215,210	-	-	41,873	215,210	-	-
2,025	-	-	-	-	41,118	256,328	-	-	41,118	256,328	-	-
2,026	-	-	-	-	40,378	296,706	-	-	40,378	296,706	-	-
2,027	-	-	-	-	39,650	336,357	-	-	39,650	336,357	-	-
2,028	-	-	-	-	38,936	375,293	-	-	38,936	375,293	-	-
2,029	-	-	-	-	38,235	413,528	-	-	38,235	413,528	-	-
2,030	-	-	-	-	37,547	451,075	-	-	37,547	451,075	-	-
2,031	-	-	-	-	36,870	487,945	-	-	36,870	487,945	-	-
2,032	-	-	-	-	36,207	524,152	-	-	36,207	524,152	-	-
2,033	-	-	-	-	35,555	559,706	-	-	35,555	559,706	-	-
2,034	-	-	-	-	34,915	594,621	-	-	34,915	594,621	-	-
2,035	-	-	-	-	34,286	628,907	-	-	34,286	628,907	-	-
2,036	-	-	-	-	33,669	662,576	-	-	33,669	662,576	-	-
2,037	-	-	-	-	33,063	695,639	-	-	33,063	695,639	-	-
2,038	-	-	-	-	32,468	728,108	-	-	32,468	728,108	-	-
2,039	-	-	-	-	31,884	759,992	-	-	31,884	759,992	-	-
2,040	-	-	-	-	31,310	791,302	-	-	31,310	791,302	-	-

Project year t	Total ex ante GHG emissions from increased grazing activities		Total ex ante increase in GHG emissions due to displaced forest fires		Total ex ante decrease in carbon stocks due to displaced deforestation		Carbon stock decrease due to leakage prevention measures		Total net carbon stock change due to leakage		Total net increase in emissions due to leakage	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	EgLKt	EgLK	EADLKt	EADLK	ΔCADLKt	ΔCADLK	ΔCLPMLK t	ΔCLPMLK	ΔCLKt	CLKt	ELKt	ELK
	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e
2,041	-	-	-	-	30,747	822,049	-	-	30,747	822,049	-	-
2,042	-	-	-	-	30,194	852,243	-	-	30,194	852,243	-	-
2,043	-	-	-	-	29,651	881,894	-	-	29,651	881,894	-	-
2,044	-	-	-	-	29,118	911,011	-	-	29,118	911,011	-	-
2,045	-	-	-	-	28,594	939,605	-	-	28,594	939,605	-	-
2,046	-	-	-	-	28,080	967,685	-	-	28,080	967,685	-	-
2,047	-	-	-	-	27,575	995,260	-	-	27,575	995,260	-	-
2,048	-	-	-	-	27,079	1,022,339	-	-	27,079	1,022,339	-	-
2,049	-	-	-	-	26,592	1,048,931	-	-	26,592	1,048,931	-	-
2,050	-	-	-	-	1,220	1,050,151	-	-	1,220	1,050,151	-	-

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 3.3 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:

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

$$\Delta REDDt = (7{,}001{,}006 + 0) - (1{,}119{,}259 + 0) - (1{,}050{,}151 - 0)$$

$$\Delta REDDt = 4{,}831{,}596$$

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

Where:

ΔREDD$_t$: Net GHG emission reductions by the project in a year t (tCO2$_{CO2}$e);

ΔCBSLPA$_t$: Sum of carbon stock change in the base line on the Project area year t tCO2$_{CO2}$e);

EBBBSLPA$_t$: Sum of carbon stock change from biomass burning from base line on the Project area year t (tCO2$_{CO2}$e);

ΔCPSPA$_t$: Sum of real carbon stock change estimated ex ante in the Project area on the year t (tCO2$_{CO2}$e);

EBBPSPAt: Sum of real carbon stock change from biomass burning estimated ex ante in the Project area on the year (tCO2$_{CO2}$e);

ΔCLK$_t$: Sum of net carbon stock change estimated of leakage ex ante in the Project area on the year t (tCO2$_{CO2}$e);

ELK$_t$: Sum of leakage estimated ex ante year t (tCO2$_{CO2}$e);

$_t$: 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%.

$$VCUt = \Delta REDDt - VBCt$$

$$VBCt = (\Delta CBSLPAt - \Delta CPSPAt) \times RFt$$

$$VCUt = 4{,}831{,}596 - 1{,}062{,}951$$

$$VCUt = \mathbf{3{,}768{,}645}$$

Equation 2 (20): Number of buffer credits deposited in the VCS buffer at the moment t (t $CO2_{CO2}$-e).

Where:

VCU_t: Number of VCUs that can be trade in the moment t (t$CO2_{CO2}$e);

$\Delta REDD_t$: net GHG emission reduction ex ante by the project year t (t$CO2_{CO2}$e);

VBC_t: number of buffer credit to be on the VCS buffer on time t (t $CO2_{CO2}$-e);

$\Delta CBSLPA_t$: Sum on carbon stock change on the baseline on the project area in the year t(t$CO2_{CO2}$e);

$\Delta CPSPA_t$: sum of real carbon stock change estimated ex ante on the project area year t (t$CO2_{CO2}$e);

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 VM0015_v3, 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 VCUs penalized by the risk factor of the AFOLU non-permanence risk tool, corresponding to 22%. The following table presents the resumed ex ante estimated net anthropogenic GHG emission reductions (REDDt) and Verified Carbon Units (VCUt)

Table 76 Ex ante estimated net anthropogenic GHG emission reductions (REDDt) and Verified Carbon Units (VCUt)(36)

Project year *t*	Baseline carbon stock changes		Ex ante project carbon stock changes		*Ex ante* leakage carbon stock changes		*Ex ante* net anthropogenic GHG emission reductions		*Ex ante buffer credits*		*Ex ante* VCUs tradable	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$CBSLPA_t$	*CBSLPA*	$CPSPA_t$	*CPSPA*	CLK_t	*CLK*	$REDD_t$	*REDD*	VBC_t	*VBC*	VCU_t	*VCU*
	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e
2,020	287,016	287,016	86,105	86,105	43,052	43,052	157,859	157,859	34,729	34,729	123,130	123,130
2,021	294,802	581,817	88,441	174,545	44,220	87,273	162,141	320,000	35,671	70,400	126,470	249,600
2,022	289,490	871,307	86,847	261,392	43,423	130,696	159,219	479,219	35,028	105,428	124,191	373,791
2,023	284,274	1,155,581	85,282	346,674	42,641	173,337	156,351	635,569	34,397	139,825	121,953	495,744
2,024	279,152	1,434,733	83,746	430,420	41,873	215,210	153,534	789,103	33,777	173,603	119,756	615,500
2,025	274,123	1,708,856	54,825	485,244	41,118	256,328	178,180	967,283	39,200	212,802	138,980	754,481
2,026	269,185	1,978,041	53,837	539,081	40,378	296,706	174,970	1,142,253	38,493	251,296	136,477	890,958
2,027	264,336	2,242,377	52,867	591,949	39,650	336,357	171,819	1,314,072	37,800	289,096	134,019	1,024,976
2,028	259,575	2,501,953	51,915	643,864	38,936	375,293	168,724	1,482,796	37,119	326,215	131,605	1,156,581
2,029	254,901	2,756,853	50,980	694,844	38,235	413,528	165,685	1,648,481	36,451	362,666	129,235	1,285,815
2,030	250,310	3,007,163	25,031	719,875	37,547	451,075	187,733	1,836,214	41,301	403,967	146,432	1,432,247
2,031	245,803	3,252,966	24,580	744,455	36,870	487,945	184,352	2,020,566	40,557	444,525	143,795	1,576,042
2,032	241,377	3,494,344	24,138	768,593	36,207	524,152	181,033	2,201,599	39,827	484,352	141,206	1,717,247
2,033	237,032	3,731,375	23,703	792,296	35,555	559,706	177,774	2,379,373	39,110	523,462	138,664	1,855,911
2,034	232,765	3,964,140	23,276	815,573	34,915	594,621	174,573	2,553,946	38,406	561,868	136,167	1,992,078
2,035	228,575	4,192,715	22,857	838,430	34,286	628,907	171,431	2,725,377	37,715	599,583	133,716	2,125,794
2,036	224,461	4,417,175	22,446	860,876	33,669	662,576	168,346	2,893,723	37,036	636,619	131,310	2,257,104
2,037	220,421	4,637,596	22,042	882,918	33,063	695,639	165,316	3,059,039	36,369	672,989	128,946	2,386,050
2,038	216,454	4,854,051	21,645	904,564	32,468	728,108	162,341	3,221,380	35,715	708,704	126,626	2,512,676
2,039	212,560	5,066,611	21,256	925,820	31,884	759,992	159,420	3,380,799	35,072	743,776	124,347	2,637,023
2,040	208,735	5,275,346	20,874	946,693	31,310	791,302	156,551	3,537,351	34,441	778,217	122,110	2,759,134
2,041	204,980	5,480,326	20,498	967,191	30,747	822,049	153,735	3,691,086	33,822	812,039	119,913	2,879,047
2,042	201,293	5,681,618	20,129	987,320	30,194	852,243	150,970	3,842,055	33,213	845,252	117,756	2,996,803
2,043	197,672	5,879,290	19,767	1,007,088	29,651	881,894	148,254	3,990,309	32,616	877,868	115,638	3,112,441
2,044	194,117	6,073,407	19,412	1,026,499	29,118	911,011	145,588	4,135,897	32,029	909,897	113,558	3,226,000
2,045	190,626	6,264,034	19,063	1,045,562	28,594	939,605	142,970	4,278,867	31,453	941,351	111,516	3,337,516
2,046	187,198	6,451,232	18,720	1,064,282	28,080	967,685	140,399	4,419,265	30,888	972,238	109,511	3,447,027

Project year *t*	Baseline carbon stock changes		Ex ante project carbon stock changes		*Ex ante* leakage carbon stock changes		*Ex ante* net anthropogenic GHG emission reductions		*Ex ante buffer credits*		*Ex ante* VCUs tradable	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$CBSLPA_t$	*CBSLPA*	$CPSPA_t$	*CPSPA*	CLK_t	*CLK*	$REDD_t$	*REDD*	VBC_t	*VBC*	VCU_t	*VCU*
	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e
2,047	183,833	6,635,065	18,383	1,082,665	27,575	995,260	137,875	4,557,140	30,332	1,002,571	107,542	3,554,569
2,048	180,528	6,815,592	18,053	1,100,718	27,079	1,022,339	135,396	4,692,536	29,787	1,032,358	105,609	3,660,178
2,049	177,283	6,992,875	17,728	1,118,446	26,592	1,048,931	132,962	4,825,498	29,252	1,061,610	103,710	3,763,888
2,050	8,131	7,001,006	813	1,119,259	1,220	1,050,151	6,098	4,831,596	1,342	1,062,951	4,757	3,768,645

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 – 2020 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 stablish, on a yearly basis model, the number of hectares not deforested thanks to the project
Purpose of Data	- Determination of baseline scenario - Calculation of baseline emissions - Calculation of project emissions - Calculation of leakage
Comments	*N.A*

Data / Parameter	CF
Data unit	*T*
Description	Carbon contained in dry biomass
Source of data	*2019 IPCC Guidelines for National Greenhouse Gas Inventories CHAPTER 4* https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_04_Ch4_Forest_Land.pdf
Value applied	*0.47*

Justification of choice of data or description of measurement methods and procedures applied	Value found in scientific literature
Purpose of Data	- Determination of baseline scenario - Calculation of baseline emissions - Calculation of project emissions - Calculation of leakage
Comments	*N.A*

Data / Parameter	ABSLRRt
Data unit	*Hectares (ha)*
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_v3
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	*Hectares (ha)*
Description	Cumulative area of baseline deforestation in the reference region at year t
Source of data	*Calculated*
Value applied	Table 22a, Annex VM0015 tables_v3
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	ABSLPAt
Data unit	Ha
Description	Annual area of baseline deforestation in the project area at year t
Source of data	*Calculated*
Value applied	Table 9b, 22a Annex VM0015 tables_v3
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	ABSLPAicl,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	*Calculated*
Value applied	Table 22b Annex VM0015 tables_v3
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	ABSLPAi,t
Data unit	Ha
Description	Annual baseline deforestation area by forest type in the project area in the year t
Source of data	*Calculated*
Value applied	Table 9b, 22b Annex VM0015 tables_v3
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	*Calculated*
Value applied	Table 9a, Annex VM0015 tables_v3
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 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	*Calculated*
Value applied	Table 13a, b and c Annex VM0015 tables_v3
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	ABSLLKt
Data unit	Ha
Description	Annual area of baseline deforestation within the leakage belt at year t
Source of data	*Calculated*
Value applied	Table 22c, Annex VM0015 tables_v3
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	ABSLLKicl,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	*Calculated*
Value applied	Table 14c, Annex VM0015 tables_v3
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 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	*Calculated*
Value applied	Table 16, Annex VM0015 tables_v3
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	*Calculated*
Value applied	Table 22c, Annex VM0015 tables_v3
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	*Dimensionless*
Description	Cumulative area of baseline deforestation within the leakage belt at year t
Source of data	*Calculated*
Value applied	*Table 15 a, b* Annex VM0015 tables_V3
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	$tCO2_{CO2}e$ ha-1
Description	Average carbon stock per hectare in the above-ground biomass carbon pool of LU/LC class cl
Source of data	*Calculated*
Value applied	*Table 15 a, b, 16 and 17* Annex VM0015 tables_v3
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	*R*elation 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 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Table 4.4
Purpose of Data	Calculation of baseline emission
Comments	Belowground biomass estimation

Data / Parameter	Cbbcl
Data unit	$tCO2_{CO2}e$ 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	*Table 15 a* Annex VM0015 tables_v3
Justification of choice of data or description of measurement methods and procedures applied	*Calculated by correlation*
Purpose of Data	Calculation of baseline emission
Comments	Emissions factors for estimating GHG emissions from deforestation.

Data / Parameter	Ctot(icl)
Data unit	$tCO2_{CO2}e$ ha-1
Description	Average carbon stock per hectare in the below-ground biomass carbon pool of LU/LC class cl
Source of data	*Calculated*
Value applied	*Table 15 a* Annex VM0015 tables_v3

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

Data / Parameter	Ctoticl,t
Data unit	$tCO2_{CO2}e$ ha-1
Description	Average carbon stock of all accounted carbon pools in forest class icl at time t
Source of data	*Calculated*
Value applied	*D*eemed de-minimus
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	Cabfcl
Data unit	$tCO2_{CO2}e$ ha-1
Description	Average carbon stock per hectare in the above-ground biomass carbon pool of final post-deforestation class fcl
Source of data	*Calculated*
Value applied	*Table 17* Annex VM0015 tables_v3
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	Cp
Data unit	$tCO2_{CO2}e$ 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_v3
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	Ctotfcl, t
Data unit	$tCO2_{CO2}e$ ha-1
Description	Average carbon stock of all accounted carbon pools in non-forest class fcl at time t;
Source of data	Table 16. Annex VM0015_v3
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	ΔCabABSLKK
Data unit	$tCO2_{CO2}e$

Description	Cumulative baseline carbon stock changes for the above-ground biomass pool in the leakage belt
Source of data	*T*able 21.c.1, Annex VM0015_v3
Value applied	See Table 21.c.1, Annex VM0015_v3
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	ΔCbbABSLKK
Data unit	$tCO2_{CO2}e$ 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_v3
Value applied	See Table 21.c.1 Annex VM0015_v3
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	ΔCabBSLPA
Data unit	$tCO2_{CO2}e$
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_v3
Value applied	See Table 21.b.1 Annex VM0015_v3

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	ΔCbbABSLPA
Data unit	$tCO2_{CO2}e$
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_v3
Value applied	See Table 21.b.1 Annex VM0015_v3
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	ΔCADLK
Data unit	$tCO2_{CO2}e$
Description	Cumulative total decrease in carbon stocks due to displaced deforestation
Source of data	Table 34, 35, Annex VM0015_v3
Value applied	See Table 34, 35, Annex VM0015_v3
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	$tCO2_{CO2}e$
Description	Total baseline carbon stock changes in the project area
Source of data	Table 36, Annex VM0015_v3
Value applied	See Table 36, Annex VM0015_v3
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	$tCO2_{CO2}e$
Description	Cumulative project carbon stock change within the project area at year t
Source of data	See Tables 27 and 36, Annex VM0015_v3
Value applied	Tables 27 and 36, Annex VM0015_v3
Justification of choice of data or description of measurement methods and procedures applied	Calculation of net GHG emissions reductions
Purpose of Data	Calculation of baseline emissions
Comments	*N.A.*

Data / Parameter	ΔCUDdPA
Data unit	$tCO2_{CO2}e$

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_v3
Value applied	Table 36, Annex VM0015_v3
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	$tCO2_{CO2}e$
Description	Net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year t
Source of data	See Table 36, Annex VM0015_v3
Value applied	Table 36, Annex VM0015_v3
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_v3
Value applied	2
Justification of choice of data or description of	ex-ante leakage

measurement methods and procedures applied	
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	70 (2020-2024)-80(2025-2029)-90(2030-2050)
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	$tCO2_{CO2}e$
Description	Cumulative sum of ex-ante estimated leakage emissions at year t
Source of data	Table 35, 36 Annex VM0015_v3
Value applied	Table 35, 36 Annex VM0015_v3
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	Leakage Management Area
Data unit	Ha
Description	Area for the implementation of leakage prevention activities, aligned with the four strategic lines proposed (see 1.17.1).

Source of data	Field delimitation of each of the areas and later reviewed with satellite images.
Description of measurement methods and procedures to be applied	Initially, the limits of each of the properties of the participants involved in the project will be delimited, obtaining the non-forest areas subject to the implementation of management activities. Subsequently, together with each of the participants, we will delineate which strategic lines can be implemented on the property and define specific zones for this purpose. Finally, constant monitoring of the implementation of the activities will be carried out, as well as each of the respective indicators that will show the progress of the implementation of the project activities (see Theory of Change), as well as the GHG emissions associated with the activities to be implemented.
Frequency of monitoring/recording	The LMA will be adjusted in each verification period with the advances of the implementation of the Theory of Change performed up to each verification period.
Value applied	27,058.59 ha (ex ante transitory value)
Monitoring equipment	GIS Software and GPS
QA/QC procedures to be applied	Double check controls using satellite images and site visits.
Purpose of data	1. Verify the implementation of productive activities to avoid the appearance of leaks in the project. 2. Activity data for calculating GHG emissions. Calculated according to requirements of VM0015 v1.1
Calculation method	LMA calculation
Comments	The monitoring plan for measuring the implementation of the activities framed within the LMA is specified in the document Theory of Change, with each of the indicators to be monitored during implementation.

Data / Parameter	ABSLLKt
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 charge of the monitoring according to the methodology VM0015 v1.1. Table 9c, 11c, 13c of Annex VM0015_v3.
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. *P*
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_v3.
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_v3.
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 $CO2_{CO2}$-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	ALLCOT will be in charged for the climate monitoring according to the methodology VM0015 v1.1. Table 27 and Table 36, Annex VM0015_v3 Additionally, the survey of sample plots is carried out following the methodology for the survey of plots of the National Forest Inventory.
Frequency of monitoring/recording	At each verification period
Value applied	See Table 27 and Table 36, Annex VM0015_v3.
Monitoring equipment	*N.A.*
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. The GPS equipment will be calibrated based on the manufacturer's indications
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 $CO2_{CO2}$-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_v3

Description of measurement methods and procedures to be applied	According to the methodology VM0015 v1.1. Table 36, Annex VM0015_v3.
Frequency of monitoring/recording	At each verification period
Value applied	See VM0015 v1.1. Table 36, Annex VM0015_v3
Monitoring equipment	*N.A.*
QA/QC procedures to be applied	*QA/QC coordinator*
Purpose of data	Calculation of project emissions
Calculation method	$\Delta REDDt = (\Delta CBSLPAt + EBBBSLAPAt) - (\Delta CPSPAt + EBBPSAt) - (\Delta CLKt - ELKt)$
Comments	*N.A.*

Data / Parameter	ΔREDDt
Data unit	t $CO2_{CO2}$-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_v3
Description of measurement methods and procedures to be applied	According to the methodology VM0015 v1.1. Table 36, Annex VM0015_v3
Frequency of monitoring/recording	At each verification period
Value applied	VM0015 v1.1. Table 36, Annex VM0015_v3.
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 analyses
Description of measurement methods and procedures to be applied	AFOLU Non permanence Risk Tool v.4.0
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 $CO2_{CO2}$-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_v3.
Description of measurement methods and procedures to be applied	According to the methodology VM0015 v1.1. Table 36, Annex VM0015_v3.
Frequency of monitoring/recording	At each verification period
Value applied	See Table 36, Annex VM0015_v3.
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 $CO2_{CO2}$-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_v3.
Description of measurement methods and procedures to be applied	According to the methodology VM0015 v1.1. Table 36, Annex VM0015_v3.
Frequency of monitoring/recording	At each verification period
Value applied	See VM0015 v1.1. Table 36, Annex VM0015_v3.
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*

5.3 Monitoring Plan

The VM0015 methodology was used to plan the monitoring of 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 areas 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 2.4 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 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.

- 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). The following table 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 77 - 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 ±10% is allowed, with 90% 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.

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

tα/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.

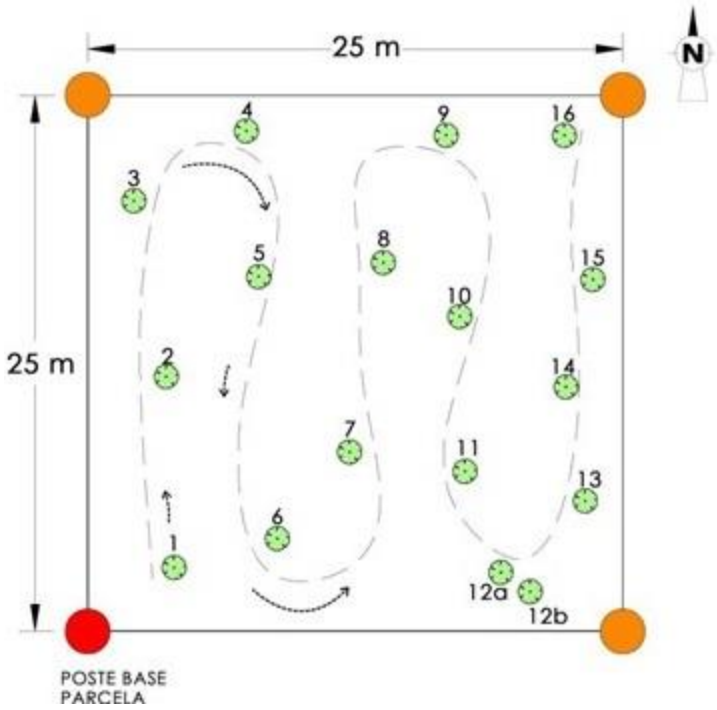


Figure 61. Sequence diagram of the route sequence in the plots

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:

a) Numbering

b) Common name of the individual.

c) Scientific name of the individual.

d) 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.

e) 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 Vistahermosa

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.

- Methods storing

The information registered in the field is stored in two ways: the first is physical and corresponds to the inventory field forms. These forms, as has already been mentioned, are scanned and their originals are taken to the ALLCOT offices in the city of Bogota to be filed. These are the original backup to perform quality control on the data that is tabulated. That is, in the event that at the time of analyzing the data a "different" or atypical value is presented, this data or data set can be confirmed on the original source, that is, the first field record.

The scanner of these forms, in addition to being part of the information backup, will allow the clarification of the data mentioned.

The measurement equipment for data collection will be verified day by day. It is estimated that the only measuring equipment is the GPS. The calibration of this will be done based on the manufacturer's instructions.

Part of the GPS calibration is the unification of the geographic coordinate systems, which corresponds to DATUM WGS84, this will prevent the uploading and downloading of data from presenting significant differences when making the referencing map of the parcels..

- 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[50] will be applied for each type of forest:

Tropical humid forest

[50] Phillips J.F., Duque A.J., Yepes A.P., Cabrera K.R., García M.C., Navarrete D.A., Álvarez E., Cárdenas D. 2011. Estimación de las reservas actuales (2010) de carbono almacenadas en la biomasa aérea en bosques naturales de Colombia. Estratificación, alometría y métodos análiticos. Instituto de Hidrología, Meteorología, y Estudios Ambientales -IDEAM-. Bogotá D.C., Colombia. [12:54] Jeimmy Rossmary Avendaño Reyes.
https://cms.dm.uba.ar/academico/materias/verano2022/probabilidades_y_estadistica_C/tablas/tabla_tstudent.pdf

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

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.

- General inventory coordination

The field work will be carried out by a company whose main activity is the preparation of forest inventories and which has proven experience in this area. In addition to this experience, and in order to carry out quality control, ALLCOT appoints a general inventory coordinator, who will be in charge of reviewing and approving:

- Number of plots to survey

- Field Forms

- Digitized data

- Number of parcels delivered and number of parcels planned

The profile of the General Coordinator is:

- Forestal engineer

- More than 15 years of general experience

- More than 10 years of experience in forest inventories

- Control policies and accountability for monitoring activities

Periodically, maximum every 15 days, a progress report will be requested from the forest inventory group, which will include field records, files with digitized information, tabulated files, photographic records and files with the georeferencing of the plots.

This information is received and reviewed by the general inventory coordinator. With the results of the documentary review, a report is made with the results. This is shared with the inventory company and adjustments are requested.

After identifying the inconsistencies or doubts found in the review of the data and having issued the report to the consulting company, a meeting will be held to clarify doubts and the dates for delivery of the adjustments will be set.

It is important to mention that the "errors" identified do not harm the objective of the inventory in terms of number of data required, number of plots by forest type, or any information that harms the estimates of carbon content by forest type.

In cases where one of the plots must be moved due to force majeure, the decision will be made after a meeting and technical review with the inventory company, the General Inventory Coordinator and a delegate from ALLCOT Geographic Information Systems.

When performing the quality control of the data recorded in the field, it is possible that some values are atypical or do not meet the required conditions, such as, for example, stems with a diameter at breast height of less than 10 cm, or heights that come out of the logical range of the forest structure.

The review will identify each of the atypical data, with these the original source will be reviewed to compare the values, if these present differences (between what is observed and what is digitized), a meeting will be held with the inventory group to clarify each point.
In the group review, it is possible that some data was recorded without meeting the minimum ranges, therefore, and if these do not exceed 3% of the total data recorded, these values will be eliminated. Atypical records above 3% will require a direct review in the field.

Regarding the monitoring of the potential increase of GHG emissions due to increase of livestock, three activities will be performed to detect any potential increase.

- Use of high-resolution satellite imagery to monitor changes in land use and land cover.

- Identification of indicator of Change like expansion of pastures or increase in infrastructure associated with livestock.

- Participatory Monitoring involving local communities in monitoring to provide valuable information on changes in livestock and deforestation-related activities

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	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) The vulnerability to the climatic impacts generated by human activities is 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.	According to the high risk of climate change, the municipalities of Puerto Lleras, Puerto Rico and Vistahermosa 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. 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.
Public order and security	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. 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 extensions of forests and cut them down for livestock or other uses.	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.
Leaks, felling of trees	Risk to biodiversity. In this sense, two cases can be presented: 1) the owners	The monitoring of forest areas linked to the project, for which the

Identify Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
	will use the areas outside the forests involved in the project for forest exploitation to avoid intervention in these areas. 2) The owners will use wood from the project's forest area for activities such as firewood and wood for construction or home improvement.	Community Action Boards have an important role, will be part of the control of extractions in a manner. 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.
Carbon market fluctuations	There are risks in the carbon markets since they can fluctuate and not meet expectations in relation to the desired income, which would have the following impacts: In the community since it would continue with the current trend in relation to deforestation and ways of life. In the climate: CO_2 emissions would remain according to the current trend or increase taking into account that there is no mechanism that allows incentives	The uncertainty generated by the fluctuation of the carbon markets is solved by guaranteeing the resources 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.

Identify Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
	to conservation or a process of governance and cultural change. 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.	The project has the necessary financial resources before the project reaches breakeven.
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.	Structure flexible training programs and methodologies for members according to their resources and availability. The project will maintain communication with the partners informing in time about changes and status.
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	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.
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