REDD+ TAUARI FOREST CONSERVATION PROJECT

Document prepared by Mata Nativa BR

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Project Title	REDD+ Tauari Forest Conservation Project
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CONTENT

1 PROJECT DETAILS

1.1 Summary Description of the Project

The REDD+ Tauari Forest Conservation Project deals with the preservation of the Amazon rainforest in line with the traditions of local populations and the sustainable development of the region through activities that will reduce greenhouse gas emissions that contribute to increasing global warming.

The project area is located in the northern region of Brazil, more specifically in the municipality of Tarauacá, state of Acre. The 126,157.8211 ha of tropical forests that are part of the project area are located in the Amazon biome.

It is globally known that the Amazon rainforest has a close relationship with climate balance, being an important source of water vapor for the planet and the largest carbon reservoir of terrestrial ecosystems, and its conservation plays a key role in mitigating climate change.

The project area is home to a rich biodiversity and forest extensions that vary between primary forests and secondary forests in an advanced state of regeneration, performing important ecosystem services.

Seeking sustainable economic use in accordance with Brazilian environmental legislation, the owners of the "GLEBA PARANACRE PART A" farm, through the preparation of the necessary studies and projects, achieved the approval of a sustainable management plan that foresees the logging of 85% (eighty-five percent) of the existing forest area on the property or the total area of the property.

To avoid this scenario, a truly sustainable economic activity was sought, which discards the suppression, even when authorized, of the existing vegetation, and also preserves the existing biodiversity in the gleba with the cooperation of local populations through this project.

This works on the Reducing Emissions From Deforestation and Degradation and Avoided Planned Deforestation (REDD+APD) under the *Verified Carbon Standard* (VCS) development and registration conceive. Through the technical surveys carried out in the field by a multidisciplinary team, it was concluded the feasibility of the projected activities that aim at ensuring that the forest areas belonging to the project are preserved, continuing the important ecosystem generating services that exist there, such as climate regulation, protection of springs, maintenance of biodiversity, and genetic heritage, among others, and also ensuring that 119,812,777.36 tonnes of CO_2 do not release into the atmosphere.

1.2 Sectoral Scope and Project Type

Scope: Agriculture, Forestry and other land uses (AFOLU)

Category: Reducing Emissions from Deforestation and Degradation (REDD)

Methodology: VM0007 - REDD+ Methodology Framework (REDD+MF), v1.6

Type of Activity: Avoided Planned Deforestation and Degradation (APD)

Grouped Design: No

The project was developed for Verified Carbon Standard (VCS) registration with the aim of reducing emissions caused by planned deforestation and degradation and in compliance with the VCS v4.4 standard.

1.3 Project Eligibility

The REDD+ Tauari Forest Conservation Project meets all the demands necessary to ensure the eligibility and safety of the project.

Following the requirements of Section 2.1.1 of the VCS v4.4 Standard, the project seeks to reduce emissions of greenhouse gases, established by the Kyoto Protocol, that harm the ozone layer. All project activities were supported by a methodology approved under the VCS program; in addition, practices that could reasonably be considered to generate greenhouse gas emissions under the VCS program were excluded from the project.

All the fundamental principles recognized by the VCS v4.4 standard, according to ISO 14064-2:2006, have been employed in all design development processes. In this way, we attest the relevance of all selected activities so that the needs of the intended use are appropriate; the completeness of inclusion of all relevant information to support criteria and procedures; the consistency of the information provided; accuracy, so that all uncertainty bias has been reduced; transparency, ensuring that all information disclosed is appropriate and sufficient for decisions to be made with reasonable confidence and conservatism; and conservative values and procedures so that net greenhouse gas emissions and their reductions or removals are not overestimated.

Aligned to Appendix 1 of the VCS v4.4 Standard, the project qualifies as a REDD activity, eligible for reducing net greenhouse gas emissions through curbing forest degradation and deforestation. Degradation will be understood as the persistent reduction of canopy cover and/or carbon stock caused by human activities that, unlike deforestation, do not result in the total or significant suppression of forest areas.

The project area also meets the internationally accepted forest definitions established by the Food and Agriculture Organization of the United Nations (FAO), comprising forest areas as land with more than 0.5 ha with trees greater than 5 meters and a canopy cover greater than 10%, as well as trees capable of reaching these values *in situ*.

Areas with bamboo and palm trees with height and canopy cover that meet the criteria mentioned above are also included, while tree stands in agricultural production systems are excluded. All areas are classified as forests for a minimum of 10 years prior to the project start date.

The entire design of the project has been designed to disrupt planned degradation and deforestation planning; thus, the REDD activity developed here applies to the APD category (Avoided Planned Deforestation and/or Degradation), including project activities that reduce net greenhouse gas emissions by halting deforestation and/or degradation in legally authorized and documented forest areas for exploitation and suppression.

1.4 Project Design

The REDD+ Tauari Forest Conservation Project will be carried out in a single area and it is not a grouped project.

The area in question has 126,157.8211 ha covered by primary and secondary tropical forests, which show great local expression and biological diversity. For the elaboration of the project design, previous studies were carried out so that all points related to the area were considered and the most appropriate methodology applied.

For the choice of methodology, the situation of the area was evaluated as a vast forest extension of the Amazon biome, with great potential for reducing carbon emissions and preserving ecosystems and biodiversity, with a situation in which the owner has authorization to exploit the forest through a sustainable management plan in 85% of the area of the property, approved in accordance with environmental legislation of the country in which the project is being carried out. However, the owner intends to abandon logging activities in favor of the development of a carbon project, in line with the conservation of ecosystem services provided by the forest and the integration of neighboring communities to the project.

In this scenario, the methodology that best demonstrates its suitability to the demands of the area was VM0007 - REDD+ Methodology Framework, v1.6. The methodology in question is a REDD Initiative, a category for AFOLU projects (Agriculture, Forestry, and Other Land Uses), with an action line of Avoided Planned Deforestation and/or Degradation (APD).

As for the project activities, all technologies, tools, and measures were designed and chosen according to the methodology applied to the project to change the conditions that would result in greenhouse gas emissions.

The tools chosen were divided by modules that contemplate the needs of the project and were specified in Section 3.1.

The non-permanence risk analysis for AFOLU projects was addressed through the use of the Non-Permanence Risk Tool v4.0.

1.5 Project Proponent

Table 1. Data from the coordinators responsible for the project of the proposing company Mata Nativa BR.

Organization Name	Mata Nativa BR
Contact person	José Augusto de Sousa Junior
Title	CEO
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Telephone	+55 16 3624-6162
E-mail	tauari@matanativabr.com.br

Organization Name	MYCARBON3 LTDA
Contact person	Nathan de Mello Fortunato Freire

Title	CEO
Address	Street Leopoldo Couto Magalhães Jr, 758, trecho 2, sala E São Paulo, Estado de São Paulo - Brasil Zip code 04.542-000
Telephone	+55 11 3074-2444
E-mail	tauari@matanativabr.com.br

1.6 Other Entities Involved in the Project

Table 2. Other entities involved in this project.

Organization Name	x
Role in the project	x
Contact person	x
Title	x
Address	x
Telephone	x
E-mail	x

1.7 Ownership

The property is called "GLEBA PARANACRE PARTE A" and has an area of 148,630.0052 ha, according to registration certificate number 1 (one) of the Real Estate Registry Office of the Tarauacá region, state of Acre.

This property is owned by Samaúma Empreendimentos Imobiliários S/A. The proponents of this project, the companies Mata Nativa BR and MyCarbon, have the legal right to control and operate the project's activities through an agreement previously reached between the parties.

The legal documents proving the ownership of the land and the ownership of the property will be made available to the auditors during the validation process.

1.8 Project Start Date

The start date of the project is August 26, 2022, the date on which the first Exploration Authorization was issued – PMFS (Amazônia Legal) n.º 2012.2.2022.73574 and Exploration Authorization – POA (Amazônia Legal) Pleno n.º 2012.2.2022.74141, by the Instituto de Meio Ambiente do Acre — IMAC in favor of RADAN ADMINISTRAÇÃO E PARTICIPAÇÕES LTDA.

1.9 Project Crediting Period

Start date: August 26, 2022

End date: August 25, 2052

Credit period: 30 years

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Table 3. Project scale.

Project Scale	
Project	
Large Project	X

Table 4. Estimation of GHG emission reductions and removals.

Year	Estimated GHG emission reductions or removals (tCO_2e)
2023	419,619.19
2024	895,567.73
2025	6,388,014.50
2026	8,172,728.17
2027	5,327,006.07
2028	5,395,989.98
2029	6,852,368.81

2030	5,810,039.77
2031	7,209,629.26
2032	7,625,602.39
2033	7,027,302.14
2034	7,278,520.06
2035	7,915,186.73
2036	7,770,566.30
2037	6,412,976.26
2038	6,597,072.80
2039	8,412,105.89
2040	6,240,910.18
2041	8,104,555.11
2042	-3,907.63
2043	-3,907.63
2044	-3,907.63
2045	-3,907.63
2046	-3,907.63
2047	-3,907.63
2048	-3,907.63
2049	-3,907.63
2050	-3,907.63
2051	-3,907.63
2052	-3,907.63
Total estimated ERs	119,812,777.36
Total number of crediting years	30
Average annual ERs	3,933,759.25

1.11 Description of the Project Activity

The main activity carried out by the owner of the area is not to make use of the permits for logging issued by the Environment Institute of Acre (IMAC) on a voluntary basis, discarding the degradation and deforestation plans of a total of 126,157.8211 ha of tropical forests. The objective is that, through this initiative, areas that previously would have been strong emitters of carbon dioxide (CO_2), and would end up making the ecosystem balance and the preservation of biodiversity unsustainable, are preserved and maintain existing carbon stocks, in addition to continuing with their photosynthetic functions collaborating for the retention of CO_2 and the continuity of its environmental services.

In addition to the main action, the project understands the importance of aligning sustainable socio-environmental actions with the communities that reside in the regions close to the project. In view of this, consultations with communities were carried out and the parallel execution of a Climate, Community, and Biodiversity (CCB) project was designed so that best practices could be applied in order to provide net positive benefits for climate change mitigation, for local communities and for biodiversity.

Activities to achieve net GHG reductions and removals

1. Abandonment of logging activities:

As already evidenced, the logging permit is the main emitting agent of greenhouse gases (GHG). In the project scenario, the abandonment of this operation is essential for the specific objective of reducing and removing carbon dioxide emissions (CO_2) to be achieved.

Once conserved, the 126,157.8211 ha of forest areas will no longer emit an average of 3,933,759.25 tons of CO_2 per year, which would total 119,812,777.36 Ton CO_2 that would be released into the atmosphere in 30 years. In addition, the preservation of ecosystems and environmental services carried out by the forest has a direct influence on biodiversity and the surrounding forest areas, since studies have already shown that, in the Amazon, 600 million tons of greenhouse gases emitted in 10 years were caused only by the fragmentation of the forest[1].

[1] https://www.nature.com/articles/ncomms6037

2. Implementation of the Forest Monitoring and Surveillance System:

Monitoring of the area is being carried out in phases, as:

Phase 1: Identification and recognition of the area

Held from July 31, 2022 to August 28, 2022.

Image 1. During the period described above, the team of environmental engineers, biologists and security guards made contact with those responsible for the riverside communities that live on the site, including some who assisted in the entire mapping to identify deforestation/Invasion Points in regions close to the project area.

Phase 2: Development of the procedure for Forest Surveillance

1) Size and sectorization

The Forest Surveillance procedure will cover the entire area of the "GLEBA PARANACRE PARTE A " farm and not only the extension of the project area, ensuring greater control and security of the area. Given the size of the property that accumulates 148,630.0052 ha, the preliminary sectorization of the entire area was promoted. Sectorization is fundamental in the management of large territories, of which it must be carried out in such a way that it agglomerates homogeneities of occupation and use, either by natural attributes or by occupation and anthropic use.

A priori, the sectors are described in Table 5.

Table 5. Description of preliminary sectorization carried out in the area to be monitored.

SECTOR	DESCRIPTION
Acurauá	Composed by the villas along the Acurauá River.
Gregório 1	Being the river with the longest extension inside the property, with the largest number of houses; respectively, from the São Vicente bridge up to 50% of the way, to Gregório 1; following the continuity to the limit with native village to Gregório 2.
Gregório 2	
Tauari	Small stretch with villas along the Tauari river.
BR 1	On the banks of BR 364, it is the most exposed section, despite the buffer from 1 to 2 km, this place suffers intense border effect with the BR, demanding special attention; respectively, the section BR 1 follows from the Acurauá River to São Vicente; and sector BR 2, from São Vicente to the vicinity of the Tauari.
BR 2	
Interior 1	Both sites with lack of housing, elucidating intact forest in an advanced state/climax of succession, with stretches of primary forest. Respectively: Interior 1 follows from the divider in the Tauari regional to the Gregory; and the Interior 2, from BR to the limit with the native villages, to the South.
Interior 2	

All accesses will be mapped constituting important information to be stored in the Geographic Database (BDG). This BDG will be widely used by other management programs in the area, being essential for the organization of monitoring in the medium term. The construction of the BDG depends on a long effort in the field for mapping, mainly due to the volume of trails and navigable rivers that exist in the area. Farm "GLEBA PARANACRE part A".

2) Organizational management and instrumentation

The protection and monitoring team will be composed of access controllers and area monitors, which will be coordinated by the area manager. These should follow the guidelines of the monitoring and Evaluation Framework and its action plan, using mitigation actions, when appropriate.

In addition to ensuring effectiveness, the manager must certify that access controllers and area monitors are correctly collecting data in the field, and conducting what is up to them in relation to the mitigation of liabilities. It should also ensure the correct handling and maintenance of equipment for long-term use.

Access controllers and area monitors must exercise their activity exclusively, that is: they will not be able to merge their activities with other management programs of the "GLEBA PARANACRE PARTE A" farm, especially those that have an interface with society. Likewise, the posts should be filled by both local residents and people from another region, promoting a heterogeneity in the team and avoiding operational bias. Table 2 below describes the composition of the field patrol team, and Table 3 describes the list of equipment tied to the purpose of each position.

Table 6. Composition of the patrol team.

Position	Description	Scale	Amount	Capacity
ACCESS CONTROLLER	Fixed post, disarmed. It promotes access control to those who will enter the property by boat or other means, both on the Gregório River and on the Acurauá River. Its function is to register access to the property, generating access list, including the load of forest management equipment and machinery.	Regime: diurnal, 12/36	2 diurnal posts (generates the hiring of 4 people per post, 2 12x26)	1 post: São Vicente 1 post: Acurauá
AREA MONITOR	Hovering post, unarmed. Promotes incursions on trails, roads, and rivers in order to meet the demands of surveillance and monitoring. Its function is to diagnose environmental liabilities, in order to report to the manager for mitigation measures.	Regime: diurnal, 12x36	3 diurnal jobs (generates the hiring of 6 people per post, 12x36)	Headquarters, however, promotes incursion in all sectors

Table 7. Equipment.

ITEM	DESCRIPTION	AMOUNT
Smartphone	Blackview or Caterpillar	8
GPS	Garmin GPSMAP 65 Portable GPS - Multiband	3
Camera	Nikon Coolpix P950 4k Wifi Zoom 83x	4
Binoculars	Bushnell 10x42	6
HT radio	Motorola Dep450 Vhf 16 Channels	8
SPOT	SPOT X or GEN4	1
Notebook	Samsung Galaxy Book2 Pro	1
Desktop	Dell XPS i1200-M10D Desktop	1
RPA (drone)	Mavic Pro 2	2
4x4 vehicle	L200 Triton	1
Pick-up	Strada double cabin	1
Vessel	Gasoline boat with horizontal tail, capacity >6 people	1
Engine	12 hp	1
Trailer	Boat trailer	1
Field uniform	Complete, including clothing for incursions under forest or in boats under the sun	10
Other	General stationery items for notes	20

3) Monitoring: information collection and management

In a primary way, the monitoring will be conducted through the execution of two methods:

1. data collection in the field, by the patrol team Area Monitor and Access Controller;

2. remote data collection by the manager.

Methodological description: Field data collection

Field data collection will be carried out through incursions previously organized with the management. Such incursions shall be conducted by vehicle, on foot, and in vessels and shall proceed to the sectors designated within the Action Plan.

The field activities carried out by the Area Monitors will look for environmental illegalities, such as illegal hunting, illegal fishing, suppression of native vegetation (selective and/or shallow cutting), signs of new housing, and other irregular situations on the “GLEBA PARANACRE PARTE A” farm. This team will also promote the mapping of accesses to the area, including occupations and irregular uses, informing about the norms of conduct within the area.

The assignment of the Access Controllers is to register the entry and exit of people, their means of driving, hours, days, if they have accoutrement for biodiversity management (such as weapons, brush cutters, chainsaws, any heavier machinery), in addition to providing general guidelines on standards of conduct within the area.

Once in the field, the Area Monitors should perform survey and registration actions, both by visual means and by the use of RPAs (*Remotely Piloted Aircraft*) — drones. The RPAs will be widely used, since they survey wide stretches with low cost, since the Amazonian relief provides a great range of the equipment's radio.

Field records will be managed through the SMART app (*Spatial Monitoring and Report Tool*) - Spatial Monitoring and Reporting Tool. It is the most used tool for managing protected area management data in monitoring areas across the globe. Being a customizable platform, SMART accepts any territorial management demand by adapting its data model to the patrol objective. It has an interface with the desktop, which stores all the collected data securely, generating reports after its adequacy.

Two data models will be developed for the use of SMART: (a) one for Access Controllers to record their assignments regarding the entry and exit of people, machinery, driving (vehicles and vessels), etc.; and (b) another for Area Monitors to promote the recording of their monitoring assignments. In this way, two reports will be generated and will deal with similar topics.

In parallel to the SMART records, both by the Access Control team and the area Monitor team, RVAs (Environmental Survey Report) will be plowed for each patrol day. This report is essential to align the team's daily progress with management, as well as to elucidate emerging or urgent situations that must be addressed. Succinct, these reports will be filled in an online platform file sharing.

The RPA records will be plotted in Geographic Information System Tools, generating a specific BDG for this demand. In addition to surveying the areas, the RPAs must register points, lines, and polygons of possible environmental illicit to promote their dimensioning.

Methodological description: Remote data collection

The remote data collection will use Remote Sensing to monitor the “GLEBA PARANACRE PARTE A” farm. Monthly, maps and classification maps should be generated with vegetation indices from which the biomass of the area will be elucidated. The NDVI (*Normalized Difference Vegetation Index*) and the unsupervised classification will be mainly used.

The NDVI is expected to be applied to the "GLEBA PARANACRE PARTE" A farm around once a month, seeking comparisons between areas devoid of biomass that once indicated their presence, uncovering any deforestation in “blind spots” of the field team. The classification can be applied within a longer period of time.

Concomitantly, the biomass index will be recorded each month for the area as a whole, whose result will bring conditions to observe the fluctuation of vegetation over time.

The biomass index map will also bring the area management *hotspots*, either for the Protection Program, the Natural Heritage Management Program, or the Socio-Environmental Interaction Program.

The classification map seeks only to determine the volume by class within the "GLEBA PARANACRE PARTE A" farm, bringing an important thematic map used in the elaboration of action plans.

Satellite images will be acquired monthly through the platforms:

- Earth Explorer (http://earthexplorer.usgs.gov), which provides *Landsat* images with 30 meters of accuracy; and/or,
- Sentinels (http://sentinels.copernicus.eu/web/sentinel/home), which provides *Sentinel* image 2 with 10 meters accuracy.

It should be noted that the data collected in the field and those collected remotely should be compiled and analyzed in the office, for reporting.

4) Monitoring and Evaluation Framework: steps and conduct

It should be noted that the methods will be applied for protection and monitoring of the area, both in the protection of biodiversity and in maintaining the order inside the "GLEBA PARANACRE PARTE A" farm. Thus, the methods will answer, as a specific goal, the following question:

> What was the reduction of an area devoid of native vegetation (which underwent restoration process) and, taking the baseline, what was the avoided area of suppression of native vegetation (which ceased to suffer deforestation)?

To answer this question, some guidelines must be followed, these being:

Table 8. Guidelines.

GUIDELINE 1 Pre-monitoring	Preparation of the diagnosis of the current state of the farm "GLEBA PARANACRE PARTE A": determination of the baseline and determination of the goal.
GUIDELINE 2 Monitoring	Use monitoring methods and other Management Programs of the area, especially activities aimed at reducing suppression of native vegetation (indicators).
GUIDELINE 3 Evaluation	Verification of the state of the area after the result of Guideline 2, in the medium term (check the effectiveness of monitoring through indicators).
GUIDELINE 4 Adaptive management	Management and analysis of the Action Plan (Monitoring and Evaluation Framework): intensify positive results and correct errors.

The implementation of the guidelines will take the Monitoring and Evaluation Framework (Table 10) and the Work Plan – Protection Program (Annex 1).

The field and cabinet performance metrics described in Table 5 are highlighted.

Table 9. Description of the periodicity of monitoring activities.

POSITION	FREQUENCY	WORKLOAD	ACTION
Access Controller	Diurnal/24h – 7 days a week	24h	Record input and output, types of conduits, and machinery involved.
Area Monitor	Daytime/12h – 7 days week	12h	Promote the monitoring of the area through the implementation of an action plan.
Manager	Daytime/8h – 5 days week	8h	Coordinate Access Controllers and Area Monitors, tabulate, analyze, and manage data, issue reports; restructure Action Plan; interface with Environmental Policing.

Table 10. Monitoring and Evaluation Structure of the Protection and Monitoring Program.

MONITORING AND EVALUATION STRUCTURE OF THE PROTECTION AND MONITORING PROGRAM								
	Action	Product	Indicator	Means of Verification	Frequency of verification	Baseline	Goal	Observation
1	Monitor anthropogenic occupations and uses of "GLEBA PARANACRE PARTE A" farm	Spreadsheet filled with the list of residents in the interior	Number of total dwellings in the area; total number of residents	Field data collection	Annual	-	Maintain or reduce the number of dwellings in the interior	Action aimed at determining the baseline
2	Monitor area devoid of native vegetation	Map of areas devoid of vegetation	Hectares devoid of native vegetation	Field data collection	Annual	-	Reduce hectares devoid of native vegetation	Action aimed at determining the baseline
3	Monitor biomass and vegetation classification	Maps with vegetation indexes and classes	Index average number per sector; index number for whole area; number of classes per sector	Remote data collection	Semiannual	-	Increase the biomass index and decrease the number of classes	Action aimed at determining the baseline
4	Control of the main accesses to "GLEBA PARANACRE PARTE A" farm	Spreadsheet filled with the list of accesses, means of driving, and, accoutrement of biodiversity management	Flow of people, flow of conduits, flow of machinery/by type	Field data collection	Monthly	-	Reduce the flow of machinery/by type of forest management	-
5	Monitor environmental liabilities	Environmental liabilities report	Number of occurrences of poaching, illegal fishing, suppression of native vegetation, harvesting and trade of biodiversity, number of accoutrements	Field data collection	Monthly	-	Decrease the number of occurrences	Action aimed at determining the baseline

Study for implementation of community benefits and climate mitigations (CCB)

A study was conducted *in loco* with socioeconomic diagnosis of communities located in Vale do Juruá, BR 364, state of Acre, Brazil

This report aimed to characterize the reality of life of producers living in the region regarding social, economic, cultural, and environmental aspects: Way of Life; Infrastructure; Education; Health; Public Safety; Environment; Land Use; Use of Natural Resources; Production Runoff; Commercialization of agro-extractive production; Credit and financing of production, Technical Assistance, and Rural Extension. In addition, the improvement solutions proposed by local residents, as well as technical recommendations, are highlighted.

With the use of semi-structured interviews, 109 questionnaires were applied in 4 (four) regions of the area: Acurauá river, Gregório river, Tauari river (areas located on BR 364, Cruzeiro do Sul direction) and surrounding areas, located in the state forests of Mogno and Gregório.

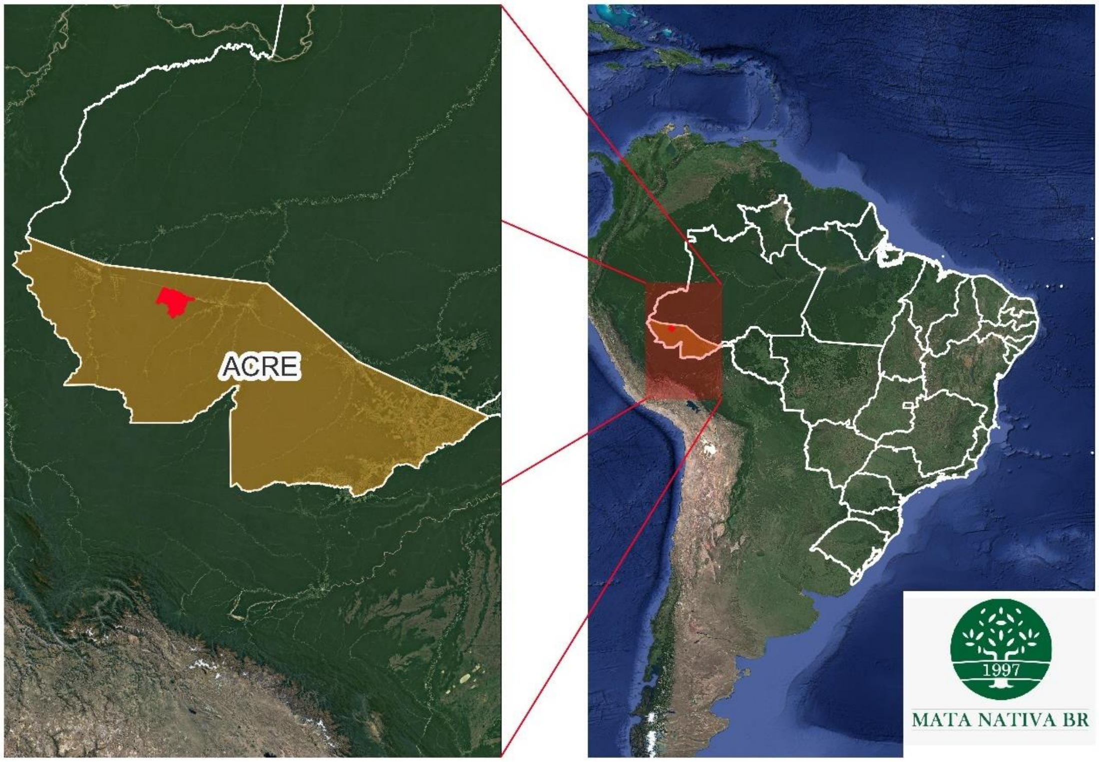
The project REDD+ Tauari Forest Conservation Project starts with the VCS standard, however, these studies already carried out will be the foundation for the implementation, soon, of a social project that is in accordance with the parameters of the Climate, Community, and Biodiversity (CCB) standard.

Image 2. Images that are part of the socioeconomic diagnosis.

1.12 Project Location

The project is located in Brazil, more specifically in the municipality of Tarauacá, state of Acre. This area has the Federal Highway BR 364 as a reference point (northern limit) in the section that connects the municipality of Tarauacá to Cruzeiro do Sul. To the South, it is bordered by the Praia do Carapanã and Iawanawa/Katukina and Gleba Taquari II (União) Indigenous Reserves; to the East, there is the Acurauá river and Igarapé São João, and finally, as a Western limit, it is Gleba Taquarí I (União).

Image 3. Map indicating the location of the project area in relation to the state of Acre and the country.



1.13 Conditions Prior to Project Initiation

Economic context of land use

In the Amazon, the timber market is highly influential, especially with regard to the use and occupation of land that directly impacts the conservation of Natural Resources. The Brazilian Amazon is among the world's leading producers of tropical timber, along with Malaysia and Indonesia. Production remains relatively stable: approximately 24.5 million m3 between 2010 and 2011 (ITTO, 2011). Logging and industrial wood processing, along with mining and agriculture, are the main economic activities in the region (LENTINI et al., 2005). The logging sector is a direct economic engine for dozens of municipalities in the Amazon.

Description of the environmental aspects of the property

CLIMATE

The climate of Acre is hot and humid equatorial type, characterized by high temperatures, high rainfall, and high relative humidity. The annual temperature is around 24.5 ºC, while the maximum is around 32 ºC, approximately uniform for the entire state (ACRE, 2010A). According to Acre (2010a), the total annual rainfall in the period 1980-2002 in the state ranged from 623 mm in the driest year to 3,589 mm in the wettest year. The pattern of rainfall distribution is irregular, with a markedly dry period, low monthly average rainfall, and a small range of variation in the months of June, July, and August, and another rainy period, with high monthly average rainfall and a large range of variation in the months of September to May.

The main characteristic of rainfall in the state is the progressive decrease in the intensity of the dry period in the southeast-northwest direction (Brasília - Cruzeiro do Sul), with three dry months in the Southeast sector and less than one in the Northwest (ACRE, 2010a). The Köppen classification method divides Acre into two main climate subtypes (CUNHA; DUARTE, 2005, p. 21-22), which are: 65

- Tropical humid (Af): it is characterized by intense rainfall (annual accumulated amount greater than 1.500 mm). The total rainfall of the driest month is more than 60 mm (CUNHA; DUARTE, 2005, p.21-22).

- Tropical monsoon (Am): predominant in the rest of the state, divided into Am1 (dry period of one to two months in the year) and Am2 (annual dry period of 3 months). It is a transition between the climatic type Af and Aw (CUNHA; DUARTE, 2005, p.21-22).

The Köppen climate classification defines the municipality as having a humid Tropical climate (FA).

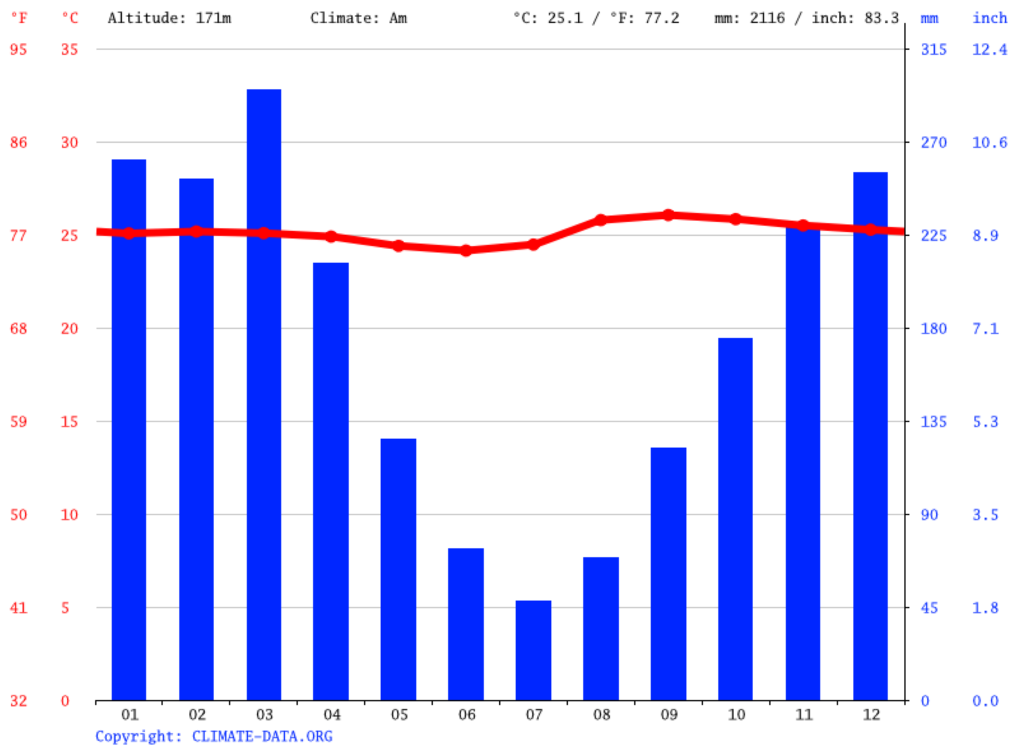
TEMPERATURE AND PRECIPITATION

Acre is characterized by high temperatures, high rainfall, and high relative humidity. The annual temperature is around 24.5 ºC, while the maximum is around 32 ºC, approximately uniform for the entire state (ACRE, 2010a). The maximum temperatures for Tarauacá occur in September, with averages of 33.6 ºC, while the minimum temperature of the coldest month is recorded in July, with average values of 19.5 ºC (DE SOUZA, 2020).

The average annual temperature in Tarauacá is 25.1 °C, with an average annual rainfall of 2116 mm.

The driest month is July with 48 mm. With an average of 295 mm, the most precipitation falls in March.

Image 1. Average temperature and rainfall / Tarauacá.



The lowest value for relative humidity is measured in August (74.20 %). The relative humidity is highest in March (89.30 %). On average, the least rainy days are measured in July (10.47 days). The wettest month is January (26.97 days).

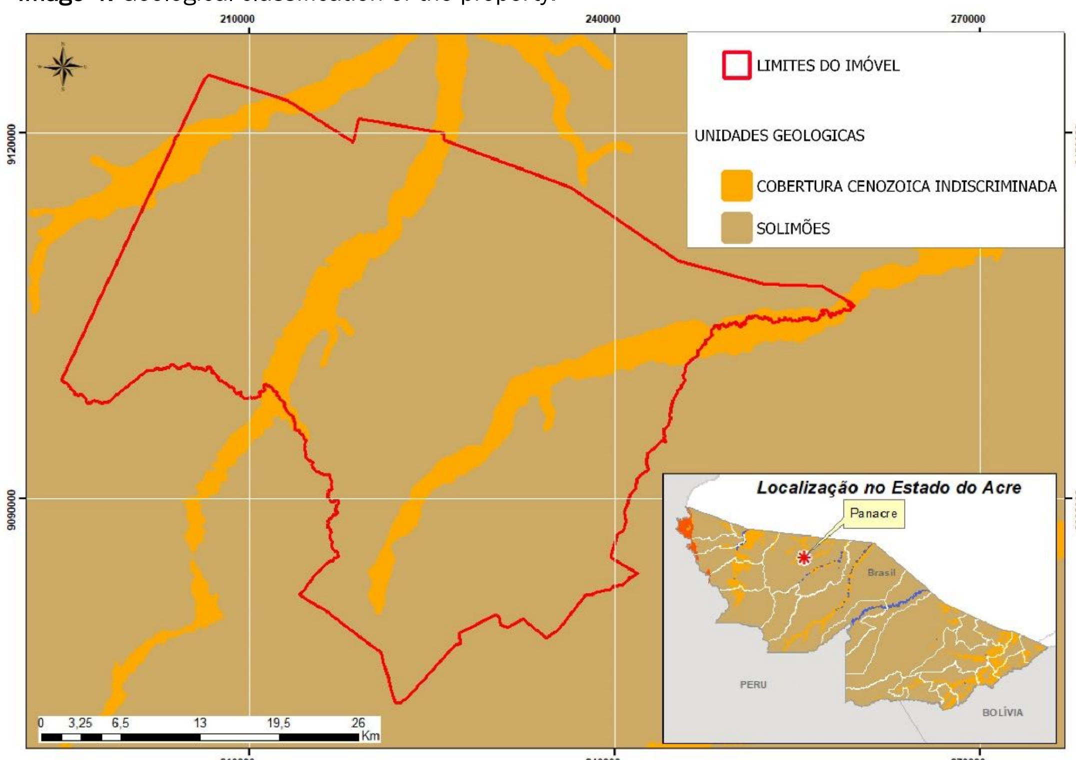
GEOLOGY AND GEOMORPHOLOGY

The most important geotectonic unit in the state of Acre is the Acre Basin, which comprises, on the surface, essentially cenozoic units. However, in its western portion, there are Mesozoic and even Precambrian remnants. Its geological history primarily involves open pericratonic and marginal deposition in the Paleozoic, resulting in continental sediments interspersed with marine sediments (ACRE, 2010b).

Among the geological units, the Solimões Formation stands out, occupying 85% of the Acre territory. This formation originated from sediments coming from the Cretaceous period rivers that gave way to large fresh and shallow water lakes, with few movements, fed by a low-energy meandering river system with a close connection with the West Sea (to the Pacific Ocean side) and source area coming from the East (in the arc of Iquitos).

During the process of local evolution, the municipality of Tarauacá presents two geological regions: Solimões, with 91.79% of coverage and the Indiscriminate Cenozoic Coverage, with 8.16% of the territory (Environmental Information Database, 2022). The property, object of the PMFS, presents the two geological regions mentioned (Solimões and Indiscriminate Cenozoic), most of it formed by the geological region of Solimões.

Image 4. Geological classification of the property.



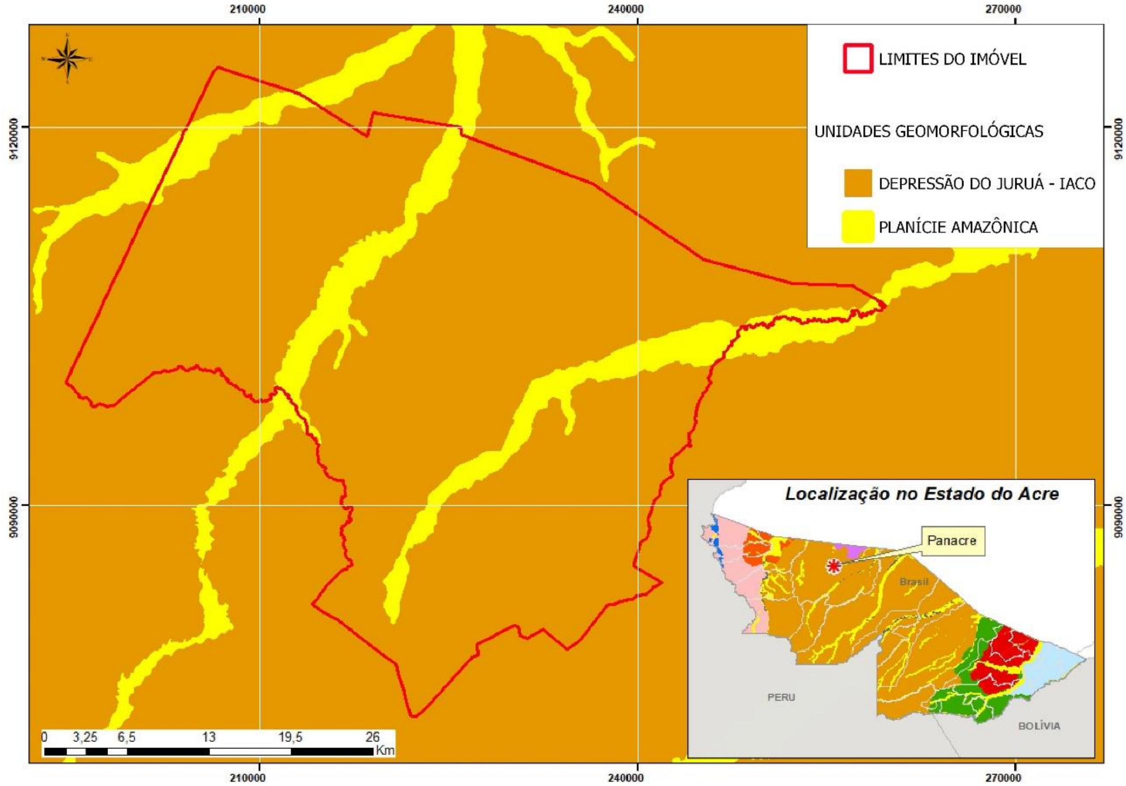
Regarding the geomorphological units, according to Acre (2010b), the state is divided into nine geomorphological units: the Amazonian Plain, the Endimari-Abunã Depression, the Iaco-Acre Depression, the Rio Branco Depression, the Tarauacá-Itaquaí Depression, the Marginal da Serra do Divisor Depression, the Tabular Surface of Cruzeiro do Sul, and the Residual Plateaus of Serra do Divisor. In the municipality of Tarauacá, three geomorphological units occur in it, they are: the Juruá Depression (87.44%) and the Amazonian Plain (8.17%), and the Tarauacá – Itaquaí Depression (4.34%) (BDIA, 2022).

• Juruá Depression – Iaco: this depression has variable altitude from 150 to 440 m and chemical morphogenesis. Its main characteristic is to present itself as a dissected surface with high first-order drainage density and dendritic pattern (CAVALCANTE, 2005).

• Amazonian Plain: with altitudes ranging between 110 and 270 m, situated along the main rivers (Juruá, Moa, Liberdade, Gregório, Tarauacá, and Envira), the Amazonian Plain presents chemical and mechanical morphogenesis. The drainage patterns present in it are meandering and anastomosing (CAVALCANTE, 2005).

• Tarauacá Depression – Itaquaí: there are reliefs of elongated sharp tops, also occurring convex shapes, with high drainage density of the first order. It presents spatial discontinuity by the Juruá plain and by the lower reliefs of the neighboring units. In the Paranacre property, these two geomorphological units occur, most of which are represented by the Amazonian Plain.

Image 5. Geomorphological classification of the property.

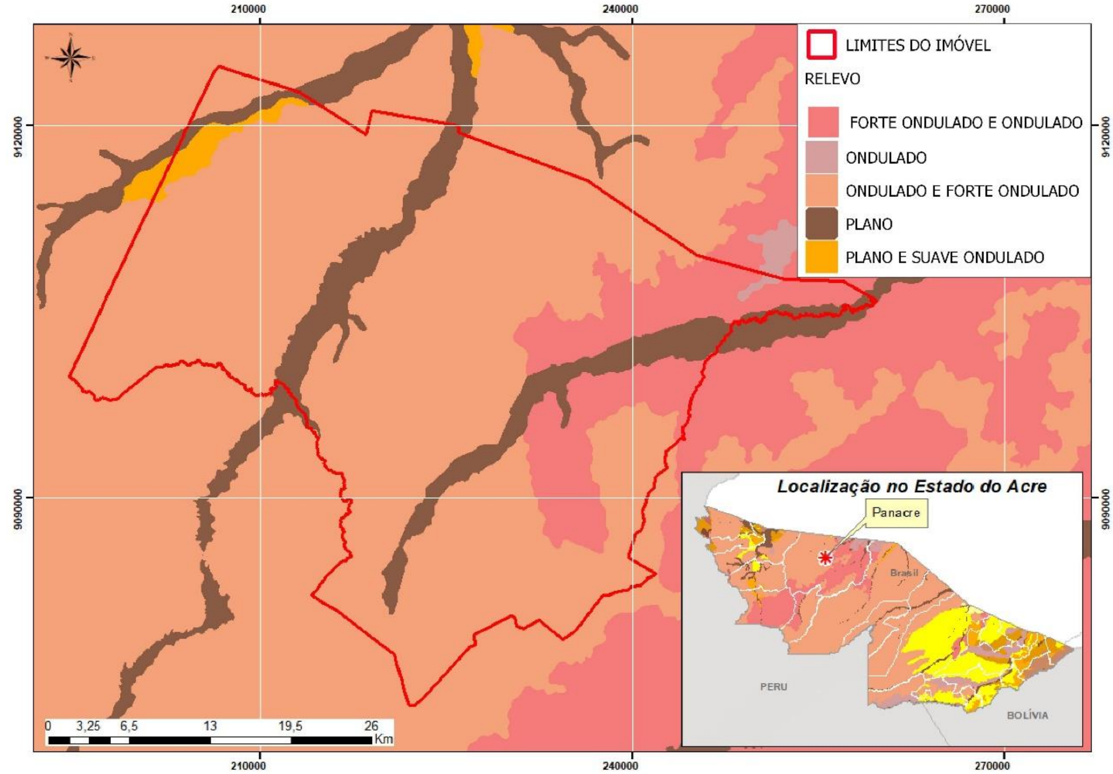


RELIEF

The relief of Acre is composed predominantly of sedimentary rocks, which form a regular platform that descends gently at elevations of the order of 300 m at the international borders to just over 110 m at the limits with the state of Amazonas. At the western end is the culminating point of the state, where the relief structure is modified by the presence of the Serra do Divisor, a branch of the Serra Peruana de Contamana, with a maximum altitude of 734 m.

The property has five relief classes: Strong Undulating and Undulating; Undulating; Undulating and Strong Undulating; Flat; and Flat and Soft Undulating.

Image 6. Relief Classes.



PEDOLOGY

Soil can be considered one of the most important natural resources of ecosystems, in that it performs some basic functions for the reproduction of animal and plant life, such as supporting growth and providing water and nutrients to plants. These functions are fundamental for human beings, in particular with regard to the production of food and other goods necessary for their lives (ACRE, 2010a).

The main classes of soils in Acre, in descending order of territorial expression are: Argisols, Cambisols, Luvisols, Gleisols, Latosols, Vertisols, Plinths, Fluvicneosols, and Quartzarenicneosols (ACRE, 2010b).

At the municipal level, the predominant soil in the municipality of Tarauacá is of the Haplic Luvisol type that occupies just over 44.41% of the region, followed by Chromic Luvisol (42.65%), Haplic Gleisol (7.83%), and Red-Yellow Argisol (5.06%) (BDIA, 2022).

The dominant soils, where the Paranacre property is located, belong to the class of:

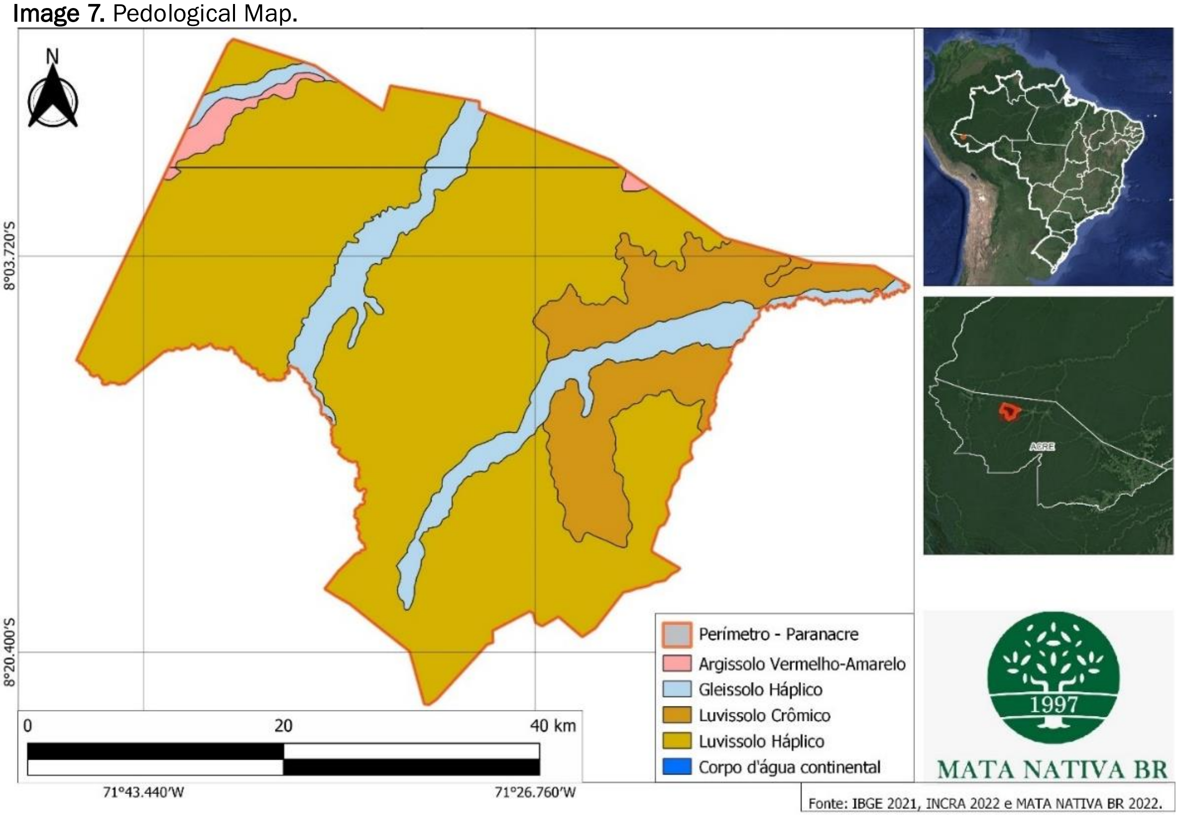
- Aluminum Red-Yellow Argisol: from Latin *argilla*, connoting soils with clay accumulation process. Grouping of soils with textural horizon B, with clay of low activity, or high activity since conjugated with saturation by low bases or aluminum character. Soils of red-yellow color. Soils with aluminum character in most of the first 100 cm of Horizon B (including BA).

• Eutrophic Haplic Gleisol: from Russian *gley*, pasty soil mass; connotative of excess water. Grouping of soils with expressive gleization. Soils not distinguished in the preceding classes. They have high clay activity and saturation by bases greater than 50%.

• Chromico Ortico Luvisol: from Latin *luere*, to wash; connotative of clay accumulation. Grouping of soils with textural horizon B, with clay of high activity and saturation by high bases. Soils of chromic character. Soils not distinguished in the preceding classes.

• Haplicum Orthic Luvisol: from Latin *luere*, to wash; connotative of clay accumulation. Grouping of soils with textural horizon B, with clay of high activity and saturation by high bases. Soils not distinguished in the preceding classes. Soils not distinguished in the preceding classes.

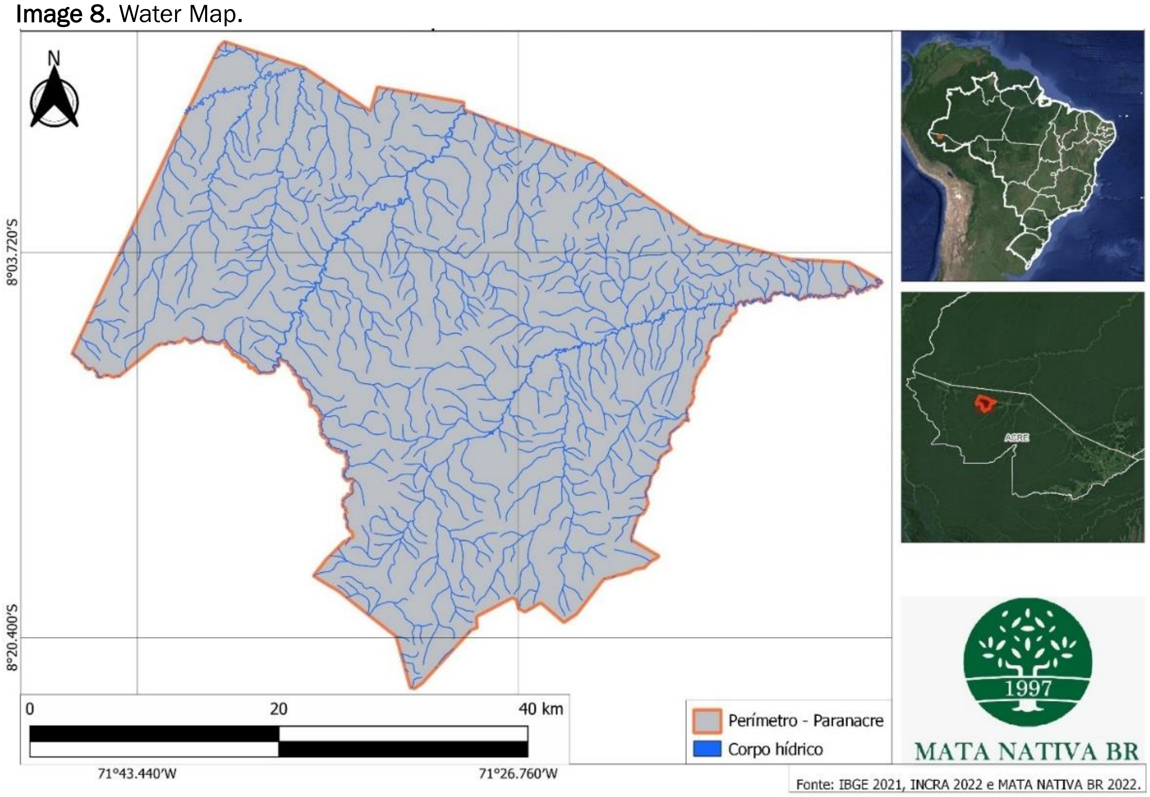
Image 7. Pedological Map.



HYDROLOGY

The Juruá river basin is a basin shared between Brazil and Peru, specifically with the Peruvian Department of Ucayali and with the Brazilian states of Acre and Amazonas. Within the territory of Acre, it comprises the areas of the Juruá river basins and its main tributaries, Tarauacá and Envira rivers, which corresponds to an area of 74.950 km², equivalent to approximately 49% of the state of Acre, 19.9% of the area of the Solimões/Juruá/Japurá Basin (in its entire course within the Legal Amazon) and only 1.9% of the Amazon basin in Brazilian territory. Among the eight municipalities that cover the basin, is the municipality of Tarauacá. The rivers that belong to this basin are classified in the category of “white water rivers” (SIOLI, 1984), because they have a yellowish color (muddy water), resulting from the high transport of suspended material. According to the classification of the drainage pattern of river networks, proposed by Ab'Saber (1985), the Juruá River Basin presents a dendritic drainage system, being composed of perennial and intermittent watercourses. The Tarauacá River is the main tributary of the Juruá River, being navigable from its mouth to the mouth of the Jordão River, almost border with Peru, with a minimum depth of 1.20 m; while the Envira River, main tributary of the Tarauacá River, is navigable from its mouth to the municipality of Feijó. According to vector data that make up the Continuous Cartographic Base of Brazil on the 1:250.000 scale, version 2021 of the IBGE, the property is composed of permanent and temporary watercourses.

Image 8. Water Map.



According to the classification proposed by the RADAMBRASIL Project (Brazil, 1977), two major Phytoecological Regions predominate in the state of Acre: the Dense Ombrophilous Forest, the Open Ombrophilous Forest, and the Campinarana, the latter being restricted to a small extent to the northwest of the state. Both in the domain of the Dense Ombrophilous Forest and in the domain of the Open Ombrophilous Forest, there is a great diversity of plant formations, which are differentiated mainly by the quality of the soils. The classification of these domains is usually based on physiognomic and structural aspects more than on floristic aspects (ACRE, 2010d).

In the Domain of the Dense Ombrophilous Forest, the vegetation is characterized by dense vegetation cover with uniform or emergent canopy and a sparse or absent understory. In the Domain of the Open Ombrophilous Forest, there may be a large concentration of palm trees, or bamboos and/or lianas, whether they are dominant or dominated (ACRE, 2010d). According to the vegetation map, there are the following typologies on the property:

- Alluvial Open Ombrophilous Forest with Palm Trees (Aap): Subformation characterized by presenting a physiognomy with an abundance of palm trees;

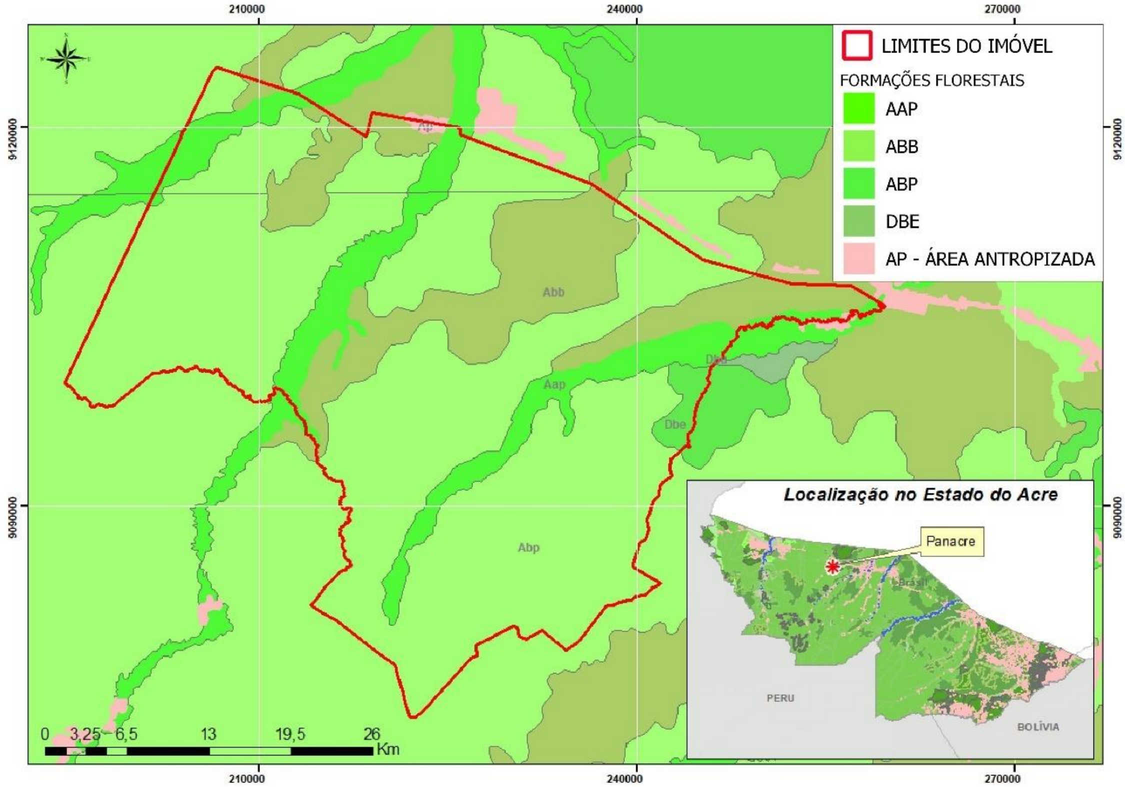
- Open Ombrophilous Forest of the lowlands with bamboos (Abb): Subformation characterized by presenting a physiognomy with abundance of sarmentosa bamboos, reaching to involve the crowns of the trees;

- Open Ombrophilous Forest of the Lowlands with palm trees (Abp): Subformation characterized by presenting a physiognomy with an abundance of palm trees.

- Dense Ombrophilous Forest of the Lowlands with emergent canopy: Subformation characterized by presenting a physiognomy of trees, in the upper stratum, with non-uniform heights.

- Dense Ombrophilous Forest of the Lowlands with uniform canopy: Subformation characterized by presenting a physiognomy of trees, in the upper stratum, with a fairly uniform or homogeneous height.

Image 9. Forest typologies on the property.



FAUNA

Brazilian biodiversity is considered the richest in the world. It is estimated that the country has 15 to 20% of the world's biota and the great biodiversity existing in Brazil makes it be interpreted as a natural reservoir of species, possessing numerous rare elements of fauna and flora. This enormous species richness has earned the country the title of "biologically healthy nation". However, Biological Diversity is often exploited in an unsustainable way, generating irreversible environmental damage (Ayres et al. 2005, Valente et al. 2006; Lewinsohn & Prado 2005, GARCIA & LOBO-FARIA, 2007).

The Amazon biome is home to the largest tropical forest and the largest hydrographic basin in the world and corresponds to approximately 49% of the Brazilian territory, distributed by seven states: Acre, Amapá, Maranhão, Mato Grosso, Pará, Rondônia, and Tocantins. The biome is of great importance for the maintenance and environmental balance of the planet and is formed by a set of different ecosystems: firm land Forests; Igapó Forests; and Várzea Forests (LEWINSOHN & PRADO 2005).

The project area is located in the municipality of Tarauacá-AC and presents approximately 149 thousand hectares within the Amazon biome characteristic of the state of Acre, this being the most biodiverse state in the Amazon. Reference geographic coordinate (UTM) for area location: 19M 224160/9115908.

The diagnosis of herpetofauna, mastofauna and avifauna was carried out between August 08 and 29, 2022 in the Paranacre Farm area, located in the municipality of Tarauacá, state of Acre. The survey of primary data included a single campaign, referring to the dry season, lasting 12 consecutive days. The fieldwork used non-invasive methodologies (no capture or collection). The animals registered in the field were identified at the lowest possible taxonomic level, with the use of field guides and the experience of the technical responsible.

Below is a sample of the photographic content collected at the site. The complete Fauna Study will be made available by the proponent to the project validator.












1.14 Compliance with Laws, Statutes, and Other Regulatory Frameworks

Article 225 of the Brazilian Constitution:

"art. 225. Everyone has the right to an ecologically balanced environment, a good for the common use of the people and essential to a healthy quality of life, and the public authorities and the community have the duty to defend and preserve it for present and future generations."

It is notorious that the largest Law in the country was thought not only of the Brazilian people, but of all the inhabitants of the planet Earth.

From the same article, from its § 1º, I, is extracted, in line with the other legislations set out below, the legal basis of this project. See:

§ 1º To ensure the effectiveness of this right, it is incumbent on the Public Power:

I - Preserve and restore essential ecological processes and provide for ecological management of species and ecosystems;

This project deals with the conservation of the forest, through the non-implementation of a sustainable management plan, which provides for the suppression of forests, for the commercialization of wood. Even if it is an activity provided for by law and approved by the competent environmental agencies of the Brazilian state, it is understood that the best sustainable economic project for the gleba in question is the total preservation of the forest, thus avoiding the release of millions of tons of greenhouse gases stored in the atmosphere.

Thus, let us analyze the Brazilian Forest Code (Law No. 12.651, of May 25, 2012), which, in its Article 3, brings the necessary definition for the matter under debate:

The Law is understood as:

I - Legal Amazon: the states of Acre, Pará, Amazonas, Roraima, Rondônia, Amapá, and Mato Grosso and the regions located north of the 13º S parallel, of the states of Tocantins and Goiás, and west of the 44º W Meridian, of the state of Maranhão;

II - Permanent Preservation Area - APP: protected area, covered or not by native vegetation, with the environmental function of preserving water resources, landscape, geological stability, and biodiversity, facilitating the gene flow of fauna and flora, protecting the soil, and ensuring the well-being of human populations;

III - Legal Reserve: area located within a rural property or possession, delimited in accordance with Article 12, with the function of ensuring the sustainable economic use of the natural resources of the rural property, assisting the conservation and rehabilitation of ecological processes, and promoting the conservation of biodiversity, as well as the shelter and protection of wildlife and native flora;

Also according to the Brazilian Forest Code, we have the following definitions:

Art. 17 - Legal Reserve must be conserved with native vegetation cover by the owner of the rural property, possessor or occupier in any capacity, natural or legal person, under public or private law.

§ **1º The economic exploitation of the Legal Reserve is admitted through sustainable management, previously approved by the competent body of Sisnama, in accordance with the modalities provided for in Article 20 (the emphasis is ours).**

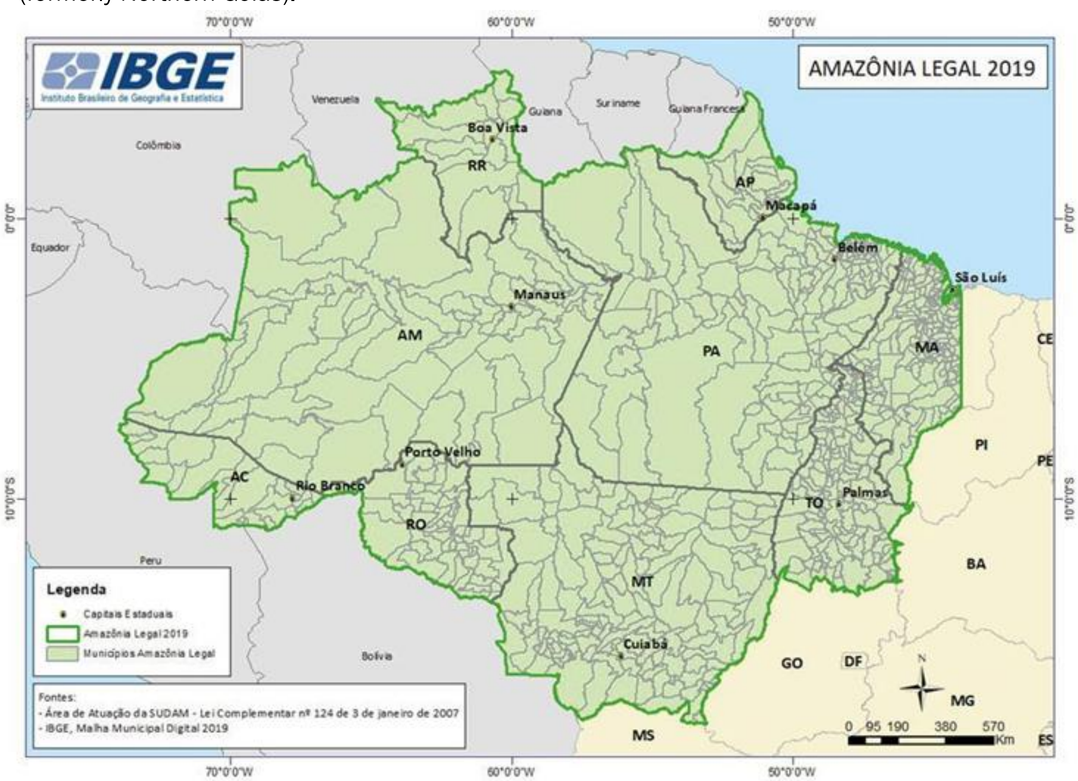
§ 2º For the purpose of managing Legal Reserve in small property or rural family possession, the Sisnama member bodies shall establish simplified procedures for the preparation, analysis, and approval of such management plans.

Art. 20 - In the sustainable management of forest vegetation of the Legal Reserve, selective exploitation practices will be adopted in sustainable management modalities without commercial purpose for consumption on the property **and sustainable management for commercial logging.**

Even with these definitions of the Brazilian Forest Code, there is a clear disregard for legal conservation requirements, especially in the Amazon region, since much of the deforestation occurs without proper permits, in areas that should be preserved.

One of the main ways to fight deforestation in Brazil are command and control mechanisms, such as effective monitoring, the requirement to comply with environmental legislation, and a greater presence of the state. However, this does not seem to be implemented in most regions of the country, due to the tendencies of some government spheres to disregard responsibilities to the detriment of other economic and social interests. This attitude has placed Brazil among the largest deforesters in the world. With the approval of the New Forest Code (2012) and its general pardon for those who deforested, a significant increase in annual deforestation rates has been observed over these years.

Image 10. The states of the Brazilian Legal Amazon: Acre (AC), Amapá (AP), Amazonas (AM), Maranhão (MA), Mato Grosso (MT), Pará (PA), Rondônia (RO), Roraima (RR), Tocantins (to) (formerly Northern Goiás).



After the peak of deforestation of 27.772 km2 per year in 2004, the rate fell by 84% in the eight consecutive years, reaching 4.571 km2 per year in 2012. This created a dangerous illusion in Brasília, Brazil's capital, that deforestation was under control and that the government could therefore build roads, dams, and other infrastructure without putting the forest at risk. Unfortunately, this has never been the case, deforestation rates have been on an upward trajectory since 2012, reaching 11.088 km2 per year in 2020, or 243% above the 2012 rate[2].

Despite legal provisions aimed at preserving in an economically-sustainable way at least 80% of the coverage of the Amazon rainforest, the lack of oversight by local authorities, coupled with public policies that seek to increase the production of *commodities* and encouraging the use of land for agricultural, bioenergy, and livestock purposes, have created a scenario of almost total disregard for the mandatory provisions of the Forest Code. High crime rates associated with land disputes often undermine law enforcement improvement efforts. In addition, covering large distances from forest areas with low population density makes it very difficult for the authorities to track illegal activities and monitor the land. Thus, policies implemented to combat illegal deforestation only through command and control approaches have proven ineffective so far.

Given the ongoing attempts against the project area, the project proponents send their best efforts to prevent trespassing and remain in compliance with the Brazilian Forest Code. Some of the farms carry out sustainable logging activities. These activities are carried out in accordance with the Sustainable Forest Management Plans previously approved by the Government of the state of Acre. These management plans were designed in accordance with the Brazilian Forest Code and local regulations.

Since the project activity involves the planned cutting, it is important to describe compliance with applicable law.

Sustainable Forest Management is defined in Article 3, VII, of Law No. 12.651 / 2012 (National Forest Code), as the administration of natural vegetation to obtain economic, social, and environmental benefits, respecting the mechanisms of support of the ecosystem, object of management, and considering, cumulatively or alternatively, the use of multiple species of

[2] https://g1.globo.com/ac/acre/amazonia-que-eu-quero/noticia/2022/05/06/peso-na-exportacao-manejo-florestal-sustentavel-equilibra-economia-e-preservacao.ghtml

wood or not, multiple products and by-products of the flora, as well as the use of other goods and services.

All legal reserve areas of the property, excluding permanent preservation areas, were authorized through the Rural Environmental License – LAR n.º 029/2009, to manage the forest and species defined as timber use, through the approved Sustainable Management Plan (annex). With this, 126,977.97 ha can be managed and legally suppressed, as approved by Brazilian environmental agencies.

The authorization was issued and renewed, following the constitutional provisions of the country and based on articles 17 and 20 of the Brazilian Forest Code, which ensure the economic forest exploitation of legal reserve areas for commercial purposes.

Such articles have the purpose of:

1. Ensure sustainable economic use of natural resources;
2. Assist in the conservation and rehabilitation of ecological processes;
3. Promote the conservation of biodiversity in conjunction with the appropriate use of forests.

It should be considered that Brazilian legislation, rightly, used the ecological sensitivity of the Amazon region and generated a higher percentage of protection for the establishment of legal forest reserve areas, but, in order not to empty the economic value of the properties, rightly guaranteed, through the law, the economic use of legal reserve areas.

The National Forest Code and Decree No. 5.975[3] also specify the technical and scientific foundations of PMFS (Article 3º):

I. Characterization of the physical and biological environment;

II. Determination of existing inventory;

[3] http://semapi.acre.gov.br/divisao-de-areas-naturais-protegidas-e-biodiversidade/

III. Intensity of exploitation compatible with the environmental bearing capacity of the forest;

IV. Cutting cycle compatible with the restoration time of the volume of product extracted from the forest;

V. Promotion of natural forest regeneration;

VI. Adoption of appropriate silvicultural system;

VII. Adoption of appropriate operating system;

VIII. Monitoring the development of forest remnants;

IX. Adoption of measures to mitigate socio-environmental impacts.

In addition, the law also requires compliance with obligations related to the control and monitoring of sustainable management. The company must submit an annual report to the environmental agency, with information on the entire sustainable management area and the description of the applicable activities, and must be submitted to technical inspections for approval of the operations and activities carried out in the management area.

The technical procedures for the elaboration, presentation, execution, and technical evaluation of sustainable forest management plans are regulated by Ibama Normative Instructions: 1, of 04/24/2007[4]; 5, of 12/11/2006[5]; and 2 of 27/06/2007[6]; in addition to CONAMA resolution 406 of 02/02/2009[7].

The approval of the PMFS and issuance of environmental licenses and permits are the responsibility of the state government. After the approval of the PMFS, the company must apply for the Applicable Forest Management licenses, according to the implementation of the phases and UPAs (AUTEX, at the national level, and PEF, in Acre).

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[4] The minimum circumference value considered was 15 cm.

[5] https://www.scielo.br/j/aa/a/FSh4LVRYsWhwsYWBqcRYxMr/?lang=pt

[6] https://www.ibama.gov.br/component/legislacao/?view=legislacao&force=1&legislacao=113306

[7] https://www.ibama.gov.br/component/legislacao/?view=legislacao&legislacao=114762

Brazil, in 2019, established the National Commission for the reduction of greenhouse gas emissions from deforestation and forest degradation, conservation of forest carbon stocks, sustainable management of forests, and increase of forest carbon stocks – REDD+, through Decree No. 10.144/2019.

Regarding the jurisdictional object and scope of Decree No. 10.144/2019, it is understood that its application is merely administrative, that is, it merely organizes the operation of the Federal Government on the REDD+agenda. Its application is restricted to the Federated entities of the Public Administration and, because it is a decree, of the normative type, which only confers regulation to the matter of law, it does not establish duties or obligations towards society.

Thus, Decree No. 10.144/2019[8] only limits the Federal Government's understanding of what should be accounted for to meet other countries' mitigation commitments to the United Nations Framework Convention on Climate Change. It does not impose barriers or obstacles to the implementation of REDD projects and the commercialization of the carbon assets generated from those projects. This consideration in the decree does not affect or interfere with the voluntary or regulated carbon market, national or international.

There is no law in Brazil that does not allow or restrict the execution of REDD projects or that does not allow or restrict any commercial transaction of assets resulting from REDD projects. On the contrary, such transactions are valid and legally permissible. Thus, there is no contradiction or irregularity between the REDD+ Tauari Forest Conservation Project and such a decree.

[8] Available in <http://www.planalto.gov.br/ccivil_03/_ato2019-2022/2019/decreto/D10144.htm>

1.15 Participation under other GHG Programs

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

The project also seeks CCB registration, thus aligning its activities with the development and support of local communities.

1.15.2 Projects Rejected by Other GHG Programs

The project was not rejected by any other GHG program.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

This project will only generate net GHG emissions reductions in an additional and voluntary way, there are no ongoing emissions trading programs in Brazil. Thus, the GHG removals generated by this project will not be used to meet the mandatory limits for GHG emissions.

1.16.2 Other Forms of Environmental Credit

The project has not sought or received any other form of GHG-related credit.

1.17 Sustainable Development Contributions

The Sustainable Development Goals are a global call to action to end poverty, protect the environment and climate, and ensure that people everywhere can enjoy peace and prosperity. In line with this, the REDD+ Tauari Forest Conservation Project considered each of these activities in such a way that they were aligned with the ideal of sustainable development, contributing to the climate, the community, and forest areas.

Goal 2. End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.

The consultations carried out in the communities will serve as a basis for understanding the real needs of the families who live there. Thus, it seeks to ensure production, aligned with sustainable systems, providing agricultural productivity, income of small food producers, and access to safe, nutritious, and sufficient food throughout the year.

Goal 13. Take urgent action to fight climate change and its impacts.

The activity of voluntary abandonment of any initiative that results in degradation and deforestation is directly related to taking measures to combat climate change, since the stock of carbon dioxide present in this area is maintained and does not contribute to global warming and its consequences. In addition, the maintenance of forest health helps in the continuity of photosynthetic activities that contribute to the storage of carbon dioxide still present in the atmosphere.

Another important point related to this topic is the work carried out with the community based on awareness, adaptation, reduction, and mitigation of impacts. Once aligned with the community, the project gains much greater power in its goal of reducing greenhouse gas emissions.

Goal 15. Protect, recover, and promote the sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss.

Still in line with the main objective of this project, the area in question will be preserved, thus stopping the desertification caused by deforestation and the loss of biodiversity. Protect, recover, and promote sustainable use are the main conducts of the entire project elaboration process. In this way, preserved areas will continue to be monitored and protected, degraded areas close to the project area will be recovered in initiatives aligned with the community. Enable sustainable forest use will be the main theme of the CCB project, which focuses on the sustainable economic development of local communities.

1.18 Additional Information Relevant to the Project

Leakage Management

In the delimitation of the project area, all areas understood as deforested were removed, in addition to the inclusion of a 50m border around all suppression points for safety. Nevertheless, the project considered the leakage of nearby regions connected to the project area by water bodies. As these regions are directly linked to subsistence deforestation carried out by local communities, the project intends the realization of reforestation initiatives to promote sustainable agriculture.

Commercially Sensitive Information

There is no sensitive information.

Further Information

It was not necessary to include any information, all the necessary requirements were described and distributed throughout the project.

2 SAFEGUARDS

2.1 No Net Harm

The activities of the project do not negatively impact the natural environment or local communities; on the contrary, the initiative to abandon degradation and deforestation activities preserves the ecosystems and biodiversity of the area, preventing a scenario harmful to the natural area from happening. The project also seeks CCB registration, thus aligning its activities with the development and support of local communities.

2.2 Local Stakeholder Consultation

The involvement with the community that inhabits the regions close to the project area was an important part of its elaboration. Consultations were held with residents of existing communities around the Gregório, Tauari, and Acurauá rivers.

The objective of the consultations was to better understand the daily lives of families, their means of survival, and the existing needs in the area. The consultations also allowed residents to learn about the project and assess how the project would impact their lives.

Through this contact, it was possible to establish continuous communications with some residents to allow incoming contributions to happen constantly, enriching the project.

Understanding the demands of the communities was extremely important to align the objectives of the project with socio-environmental initiatives and the elaboration of a CCB project that contemplates the community and sustainable economic development.

2.3 Environmental Impact

The project is not an exploratory initiative and its activities do not have deployments that could cause damage to the environment; on the contrary, all project activities and monitoring were designed to ensure the integrity of forest areas and all resources related to them.

2.4 Public Comments

The draft has not yet been subject to the 30-day public comment period.

2.5 AFOLU-Specific Safeguards

In order to carry out conscious and committed work with the local communities, a responsible team went to the area and carried out a socioeconomic diagnosis with the families living around the project area.

With the use of semi-structured interviews, 109 questionnaires were applied in 4 (four) regions of the area: Acurauá river, Gregório river, Tauari river (areas located on BR 364, Cruzeiro do Sul direction), and surrounding areas located in the state forests of Mogno and Gregório.

Data collection was performed using a questionnaire with semi-structured, open, and closed questions. The interviews were applied with the main representatives of the family group, the father or mother, and/or one of the oldest children if the parents were not in the residence. In addition, we sought to integrate the whole family into the dialogue process during the interview, in order to ensure quality in the collection of reliable information.

This report aimed to characterize the reality of the life of producers living in the region regarding social, economic, cultural, and environmental aspects: Way of Life; Infrastructure; Education; Health; Public Safety; Environment; Land Use; Use of Natural Resources; Production Runoff; Commercialization of agro-extractive production; Credit and financing of production, Technical Assistance, and Rural Extension.

The elaboration of a Climate, Community, and Biodiversity (CCB) project is happening in parallel with the development of the project described here; this way, it is ensured that local communities will not be harmed in any way during the implementation process of the project. REDD+ Tauari Forest Conservation Project on the contrary, the CCB project aims to ensure that these people have an improvement in their quality of life and can actively participate in the process of forest regeneration through continuous communication and exchange of ideas.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The REDD+ Tauari Forest Conservation Project is using the VCS REDD methodology, titled VM0007 – REDD+ Methodology Framework (REDD+MF), v1.6. The only eligible activity as part of this project is to prevent degradation and planned deforestation, and therefore only modules related to planned deforestation are required. This project is eligible as an initiative to logging in forest areas and the possible conversion to pasture allowed by law. The specific modules applied to the REDD+ Tauari Forest Conservation Project are listed below.

CO_2 pools module:

VMD0001 - Estimate of carbon stocks in above and below-ground biomass in living and non-tree pools (CP-AB), v1.1.

VMD0005 - Estimate of carbon stocks in the pool of long-term wood products (CP-W), v1.1.

Baseline module:

VMD0006 - Estimate of changes in baseline carbon stock and greenhouse gas emissions from planned deforestation/forest degradation and planned wetland degradation (BL-PL), v1.3.

Monitoring module:

VMD0015 - Methods for monitoring greenhouse gas emissions and removals (M-REDD), v2.2.

VMD0009 - Estimated emissions from activity change to prevent planned deforestation/forest degradation and prevent planned wetland degradation (LK-ASP), v1.3.

Leakage module:

VMD0012 - Estimate displacement emissions from firewood extraction (LK-DFW), v1.0.

VMD0044 - Estimate emissions from ecological leakage (LK-ECO), v1.1.

VMD0011 - Estimate market effects emissions (LK-ME), v1.1.

Miscellaneous modules:

VMD0016 - Methods for stratification of the project area (X-STR), v1.2.

VMD0017 - Uncertainty estimate for REDD project activities (X-UNC), v2.2.

Tools:

VT0001 Tool for Demonstration and Evaluation of Additionality in VCs Agriculture, Forestry, and Other Land Use (AFOLU) project activities, v3.0 (T-ADD).

AFOLU Non-Permanence Risk Tool v4.0. (T-BAR).

The use of the modules M-REDD, T-ADD, T-BAR, X-UNC, and X–STR is always mandatory when using the VM0007 - REDD+ Methodology Framework (REDD+MF), v1.6 methodology.

The additional use of the BL-PL and LK-ASP modules is mandatory in the case of projects focusing on planned deforestation. LK-ME and CP-W are mandatory where the deforestation process involves logging for commercial markets. The use of the T-SIG module determines whether GHG emissions by sources and/or reductions in carbon reservoirs are negligible. Finally, CP-AB is mandatory in all cases.

3.2 Applicability of Methodology

Table 11. Applicability and justification of theVM0007 - REDD+ Methodology Framework (REDD+MF), v1.6 methodology.

VM0007 - REDD+ Methodology Framework (REDD+MF), v1.6	
Conditions of Applicability	**Justification**
The land in the project area was qualified as forest at least 10 years before the project start date.	The project area meets this condition as mentioned in Section 1.3.
The project area may include forest wetlands (such as solid-ground forests, floodplain forests, mangrove forests), provided they do not grow on peat. Peat should be defined as organic soil with at least 65% organic matter and a minimum thickness of 50 cm. If the project area includes forest wetlands that grow on peat (e.g. peat swamp forests), this methodology is not applicable.	As demonstrated, no organic soils (or peat bogs) exist within the project area. Therefore, the project is not subject to VCs WRC requirements.

Project proponents must be able to demonstrate control over the project area and ownership of carbon rights to the project area at the time of verification.	As demonstrated, project proponents have control of the project area and ownership of the carbon credits.
Baseline deforestation and baseline forest degradation in the project area fall into one or more of the following categories: Unplanned deforestation (VCs AUDD category); Planned deforestation (VCs APD category); Degradation by logging for fuel (firewood and coal production) (VCs AUDD category).	The planned baseline degradation in the project area falls into the APD category, as the project proponent has Exploration Authorization - PMFS (Amazônia Legal) Nº 2012.2.2022.73574 and Exploration Authorization - POA (Amazônia Legal) Pleno Nº 2012.2.2022.74141, by Instituto de Meio Ambiente do Acre – IMAC in favor of RADAN ADMINISTRAÇÃO E PARTICIPAÇÕES LTDA.
Baselines must be renewed every 10 years from the project start date.	The baseline will be renewed in August 2032, 2042 and 2052.
All land areas registered under the CDM or under any other carbon trading scheme (both voluntary and compliance-oriented) must be transparently reported and excluded from the project area. The exclusion of land in the project area from any other carbon trading scheme should be monitored over time and reported in monitoring reports.	The REDD+ Tauari Forest Conservation Project is not registered in any carbon trading scheme or program.
If the land is not being converted to alternative use, but natural regeneration is allowed (i.e. temporarily not stocked), this structure should not be used.	Forest degradation interferes with natural processes and the ecological balance, opening spaces for invasive plant species that would compete with native species, harming the recovery of the area. In the context of the baseline of this project, the area will be hosted

	by a Management Plan with fallow spaces that do not configure natural regeneration since after the determined time the fallow area becomes degraded again.
Spill prevention activities should not include: Agricultural land that is flooded to increase production (e.g. paddy rice); Intensification of livestock production through the use of “feedlots”, and/or manure ponds.	Spill prevention activities do not include flooding agricultural land or creating feedlots or manure ponds.

Table 12. Applicability and justification of module VMD0001- Estimate of carbon stock in above-and below-ground biomass in living and non-tree pools (CP-AB), v1.1.

VMD0001 - Estimate of carbon stocks in above and below-ground biomass in living and non-tree pools (CP-AB), v1.1.	
Conditions of Applicability	**Justification**
This module is applicable to all forest types and age classes. The inclusion of the aboveground tree biomass reservoir as part of the project boundary is mandatory according to the REDD-MF structure module. Non-tree aboveground biomass should be included as part of the project boundary if the following applicability criteria are met (per REDD-MF structure module): • Stocks of non-tree aboveground biomass are higher at baseline than at design. Stocks of non-tree aboveground biomass are higher at baseline than at design. • Non-arboreal aboveground biomass is considered significant (using the T-SIG module).	This module was used to estimate carbon stocks in woody biomass above, below ground, and non-arboreal, in the case of baseline. The project considered biomass reservoirs of trees above and below ground. After the use of *"Tool for testing significance of GHG emissions in A/R CDM project activities",* the use of above-ground non-tree biomass was disregarded since the results presented were lower than the percentage of 5% of the total reductions in carbon reservoirs and increases in emissions.

Table 13. Applicability and justification of module VMD0005 - Estimate of carbon stocks in reservoirs of long-term wood products (CP-W), v1.1.

VMD0005 - Estimate of carbon stocks in reservoirs of long-term wood products (CP-W), v1. 1	
Conditions of Applicability	**Justification**
This module is applicable to all cases where wood is harvested for conversion into wood products for commercial markets, for all forest types and age classes. This module is applicable at baseline if the wood products reservoir is included as part of the project boundary according to the applicability criteria in the REDD-MF structure module, specifically: • Timber harvesting occurs before or in the process of deforestation, and where timber is destined for commercial markets. • The reservoir of wood products is considered significant (using T-SIG).	This module was used to estimate carbon stocks in reservoirs of long-term wood products in the case of the baseline. Reservoirs of wood products in the baseline were not considered, as the *"Tool for testing significance of GHG emissions in A/R CDM project activities",* demonstrated a negligible percentage of 0.4% of total reductions in carbon pools and increases in emissions.

Table 14. Applicability and justification of module VMD0006 - Estimate of changes in baseline carbon stock and greenhouse gas emissions from planned deforestation/forest degradation and planned wetland degradation(BL-PL), v1. 3.

VMD0006 - Estimate of changes in baseline carbon stock and greenhouse gas emissions from planned deforestation/forest degradation and planned wetland degradation (BL-PL), v1.3.	
Conditions of Applicability	**Justification**
The module is applicable to estimate baseline emissions on forest land (usually privately or government owned) that is legally authorized and documented to be converted to non-	This module was used to estimate GHG emissions related to Planned degradation. The module was originally developed for the

forest land. • When pre-project unsustainable firewood collection is occurring within project boundaries, the BL-DFW and LK-DFW modules should be used to determine leakage potential.	activities of the APD project. The project area has authorizations for logging in the area, Exploration Authorization - PMFS (Legal Amazon) No. 2012.2.2022.73574 and Exploration Authorization-POA (legal Amazon) Pleno No. 2012.2.2022.74141, by Instituto de Meio Ambiente do Acre – IMAC in favor of RADAN ADMINISTRAÇÃO E PARTICIPAÇÕES LTDA. In this way, the baseline carbon stock estimate following the management plan that would be implemented in the absence of the project is being considered.

Table 15. Applicability and justification of module VMD0015 Methods for monitoring greenhouse gas emissions and removals (M-REDD), v2.2.

VMD0015 - Methods for monitoring greenhouse gas emissions and removals (M-REDD), v2.2.	
Conditions of Applicability	**Justification**
The module is mandatory for REDD project activities, CIW-REDD, RWE-REDD and independent CIW projects. Where selective registration is taking place in the case of the project: • Emissions from logging may be omitted if it can be demonstrated that emissions are minimal using the T-SIG tool. • If emissions from logging are not omitted, logging may only occur in	This module will be used to monitor *ex-post* emissions and GHG removals due to prevent deforestation and forest degradation, and increased carbon stock that has been induced as a result of the implementation of the REDD project. The REDD+APD project developed here has as its main project activity the abandonment of any logging action, in addition to forest surveillance to monitor any possible degradation will be constant. Thus, all monitoring carried out by the

forest management areas that have and maintain a forest management certificate. *Forest Stewardship Council* (FSC) for the years in which selective extraction occurs. • Logging operations may only carry out selective logging that maintains a land cover that meets the definition of forest within the project boundary. • All trees cut for logging during felling operations must have a DAP greater than 30 cm. • During cutting operations, only the trunk/log of the felled tree can be removed. The crown of the tree must remain within the forest area. • Logging practices may not include stacking and/or burning the logging bar. The volume of harvested wood must be measured and monitored.	project will be based on such activities and the maintenance of the integrity of all forest areas within the project boundaries.

Table 16. Applicability and justification of module VMD0009 Estimate emissions from activity change to prevent planned deforestation/forest degradation and prevent planned wetland degradation (LK-ASP), v1.3.

VMD0009 - Estimated emissions from activity change to prevent planned deforestation/forest degradation and prevent planned wetland degradation (LK-ASP), v1.3.	
Conditions of Applicability	**Justification**
The module is applicable for estimating fugitive emissions due to activity change from legally authorized and documented	This module was used to estimate the GHG emissions caused by the activity displacement leak.

forest areas to be converted to non-forest land, including activity change to forested wetlands that are drained or degraded as a consequence of project implementation. The module is also applicable to estimate leakage emissions due to the displacement of activities from non-forested wetlands that are legally authorized and documented to be converted and degraded. In these situations, the displacement of baseline activities can be controlled and measured directly by monitoring baseline deforestation or wetland degradation agents or class of agents. This tool should be used for projects in areas where planned deforestation occurs in forest wetlands, regardless of the absence of wetlands within the project boundaries. The module is mandatory if the BL-PL Module has been used to define the baseline, and the conditions of applicability of the BL-PL Module must be fully met.	The estimated total area where there would be logging at baseline is 85% of the property managed by the agents of this project. Thus, there are areas of permanent preservation, zone of silence and leakage belts. In addition, the area manager has no other areas under his administration. As already evidenced in the description of the *module VMD0006 - Estimate of changes in baseline carbon stock and greenhouse gas emissions from planned deforestation/forest degradation and planned wetland degradation (BL-PL)*, v1.3, there is no extraction of unsustainable firewood in the pre-project scenario but rather authorizations that enable such action in the absence of the project. Therefore, the project does not represent a risk of displacement of forest degradation.

Table 17. Applicability and justification of module VMD0009 Estimate emissions from activity change to prevent planned deforestation/forest degradation and prevent planned wetland degradation (LK-ASP), v1.3.

VMD0012 - Estimate displacement emissions from firewood extraction (LK-DFW), v1.0.	
Conditions of Applicability	**Justification**
The module is applicable to estimate leakage emissions due to activity change for projects that prevent degradation of firewood collection and charcoal production.	The module was used to estimate GHG emissions caused by activity displacement leakage for projects that prevent degradation of firewood collection. The action taking place on the property

When firewood is collected or coal is produced for sale in the regional or national market, the leakage of market effects should be considered using the LK-ME module.	today, from a pre-project perspective, is a limited collection of firewood and is not part of the project area. Acre communities generally collect firewood from dead wood, usually in areas open to family farming in the region. The habit of removing live trees for firewood is practically non-existent, thus decreasing the demand for removal displacement in other places. Thus, the percentage of displacement of firewood extraction is only 4% and the value has already been reduced from the final figures. Conservatively, the LK-ME module was considered to ensure that all points would be considered.

Table 18. Applicability and justification of VMD0044 - Ecological leak emissions estimation (LK-ECO), v1.1.

VMD0044 - Estimate emissions from ecological leakage (LK-ECO), v1.1.	
Conditions of Applicability	**Justification**
This module is applicable under the following condition: Leakage caused by hydrological connectivity is prevented by project design and site selection.	This module was used to estimate ecological leaks in the project. The project in question has hydrological connectivity with adjacent areas, in any case, it was also designed to provide a minimum distance of 30 m from any watercourses and a 50 m radius around Springs. From the main courses, Gregório and Tauari rivers, the distance is 100 and 50 m respectively.

	There are no hydrological changes expected to affect GHG emissions in areas within and outside the project area at no project stage. In addition, the elaboration of a CCB project is being carried out together with the riverside communities that live near the water bodies to ensure that all actions, both in the project area and connected through rivers to the project area, are aligned to avoid ecological leaks.

Table 19. Applicability and justification of VMD0011- Estimate of market effect emissions (LK-ME), v1.1.

VMD0011 - Estimate market effects emissions (LK-ME), v1.1.	
Conditions of Applicability	**Justification**
This module is applicable to calculate the leakage market effects of REDD projects that are planned to reduce levels of logging substantially and permanently. When REDD project activities result in reductions in timber harvest, it is likely that production can be transferred to other areas of the country to compensate for the reduction. This tool should be used in countries where wood harvesting takes place on forested peat bogs, regardless of the absence of peat bogs within the project boundary. As referenced in REDD-MF, this module is mandatory (in the context of this methodology) where: • The deforestation process involves harvesting timber for commercial	The module was used to estimate the GHG emissions caused by leaking market effects related to logging. The project activity results in the abandonment of logging and harvesting activities. The state of Acre has a 5,9% share of the timber market in relation to the Legal Amazon, and in this context, the project area has a 0,37% share of the Amazon timber market. All figures were considered and culled from the final figures.

markets. • The baseline is calculated using the BL-DFW module and the firewood or charcoal is harvested for commercial markets.	

Table 20. Applicability and justification of VMD0016 - Methods for stratification of the project area (X-STR), v1.2.

VMD0016 - Methods for stratification of the project area (X-STR), v1.2.	
Conditions of Applicability	**Justification**
Any module that references strata should be used in combination with this module. Different stratifications may be required for baseline and design scenarios to achieve optimal accuracy of estimates of net GHG emissions or removals. In the case of REDD, the stratification of above-ground biomass is only used for forest classes, pre-deforestation, and the strata are the same at baseline and in the project scenario. Post-deforestation land uses are not stratified. Instead, average post-deforestation stock values (for example, simple or historical area-weighted approaches are used, as per the BL-UP module).	The module was used to obtain guidance on the stratification of the project area into discrete and relatively homogeneous units to improve the accuracy and precision of carbon stock, carbon stock change, and GHG emission. For the study under analysis, the stratification was based on the *in loco* sampling plots of 50mX50 m, where the dendrometric data of each tree/shrub element were recorded. Carbon was measured according to the indications of the vm0007 modules. The carbon contents of each reservoir were organized into nine storage classes that were distributed proportionally to the project area. Thus, the basis of stratification was the carbon storage classes of different sectors of the forest area.

Table 21. Applicability and justification of VMD0017 - Uncertainty estimate for REDD project activities (X-UNC), v2.2.

VMD0017 - Uncertainty estimate for REDD project activities (X-UNC), v2.2.	
Conditions of Applicability	**Justification**
This module is mandatory when using the REDD+ MF methodology. It is applicable to estimate the uncertainty of CO_2 emissions and removals estimates - and generated by REDD and WRC project activities. The module focuses on the following sources of uncertainty: Determination of deforestation and degradation rates. Uncertainty associated with the estimation of stocks in carbon reservoirs and changes in carbon stocks. Uncertainty associated with estimating peat emissions. Uncertainty in the assessment of project emissions. When an uncertainty value is not known or cannot simply be calculated, a project must justify that it is using an arguably conservative number and an uncertainty of 0% can be used for that component. Guidance on uncertainty – a precision target of a 95% confidence interval with a half-width equal to or less than 15% of the recorded value should be targeted. This is especially important in terms of planning projects for measuring carbon stocks; sufficient measurement plots must be included to achieve this accurate level	The module was used to estimate uncertainty in the estimation of emissions and removals in REDD project activities. The project has its baseline emission values based on a forest management plan written to contemplate the situation of the area. Therefore, it is possible to work with specific numbers regarding the CO_2 reservoirs present in the area.

across all measured stocks.	

Table 22. Applicability and justification of the VT0001 Tool for Demonstration and Evaluation of Additionality in VCs Agriculture, Forestry, and other Land Uses (AFOLU) project activities, v3.0 (T-ADD).

VT0001 Tool for Demonstration and Evaluation of Additionality in VCs Agriculture, Forestry, and Other Land Use (AFOLU) project activities, v3.0 (T-ADD).	
Conditions of Applicability	**Justification**
The tool is applicable under the following conditions: • AFOLU activities equal to or similar to the proposed project activity on the land within the project boundary carried out with or without registration as a VCS AFOLU project shall not lead to the violation of any applicable law, even if the law is not applied; • Using this tool to determine additionality requires the baseline methodology to provide a stepwise approach that justifies determining the most plausible baseline scenario.	The module was used to define project additionality and determine more plausible baseline scenarios. The results can be found in topics 3.4 and 3.5. No activity proposed in this project violates any applicable law.

Table 23. AFOLU Non-Permanence Risk Tool v4.0. (T-BAR).

AFOLU Non-Permanence Risk Tool v4.0. (T-BAR).	
Conditions of Applicability	**Justification**
This tool provides the procedures to perform the non-permanence risk analysis and buffer determination required for Agriculture, Forestry, and Other Land Uses (AFOLU) projects. The tool establishes the requirements for project proponents, implementation partners, and validation/verification bodies to assess risk and determine the appropriate risk classification.	The tool was used and all the necessary aspects were contemplated and evaluated. The project is designed and developed to comply with the pre-defined period of time and maintain its continuity.

3.3 Project Boundary

Table 24. GHG sources, sinks, and reservoirs relevant to the project and baseline scenarios (including leaks, if applicable).

Source		Gas	Included?	Justification/Explanation
Baseline	Biomass above	CO_2	YES	The design adopted for baseline includes the suppression of tree elements.
		CH_4	NO	The project does not foresee environmental changes that interfere with N_2O emissions since changes in groundwater levels are expected.
		N_2O	NO	The project does not foresee environmental changes that interfere with N_2O emissions since changes in groundwater levels are expected.
	Low soil biomass	CO_2	YES	The reduction of tree biomass below ground is pertinent to the project activities.
		CH_4	NO	The project does not foresee environmental changes that interfere with CH_4 emissions since changes in groundwater levels are expected.
		N_2O	NO	The project does not foresee environmental changes that interfere with N2O emissions since to changes in groundwater levels are expected.
	Fuel-burning	CO_2	YES	Activities include surveillance and monitoring activities that generate CO_2 emissions.
		CH_4	NO	Does not apply.
		N_2O	NO	Does not apply.
PROJECT	Fuel-burning	CO_2	YES	Activities include surveillance and monitoring activities that generate CO_2 emissions.
		CH_4	NO	Does not apply.

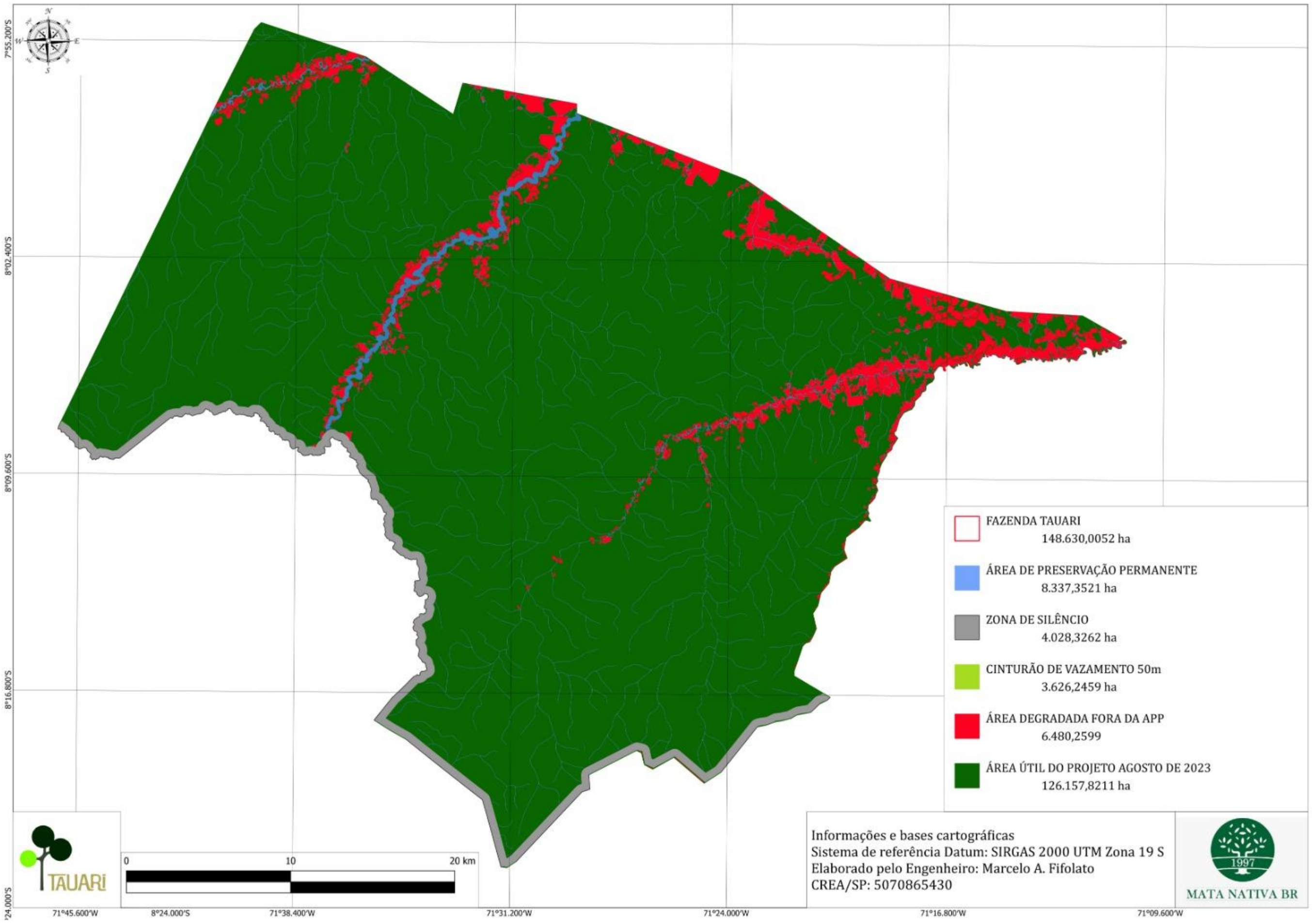
		N_2O	NO	Does not apply.
	Aboveground biomass	CO_2	NO	The project does not consider the above-ground biomass increment.
		CH_4	NO	Does not apply.
		CH_4	NO	Does not apply.
	Low soil biomass	CO_2	NO	The project does not consider the below-ground biomass increment.
		CH_4	NO	The project does not foresee environmental changes that interfere with CH_4 emissions since changes in groundwater levels are expected.
		CH_4	NO	The project does not foresee environmental changes that interfere with N_2O emissions since changes in groundwater levels are expected.

The spatial extent of the project, from 126,157.8211 ha, has been clearly specified for ease of monitoring and to exclude any possible areas that do not conform to the project molds. In this way, water bodies (areas that are not configured as forests and leakage belts) were disregarded from the project area.

In addition to these sectors, the project also disregarded a delimitation of forest land called the "zone of silence", of 4,028.3262 ha of forests that are within the property, where the project area is located and border the indigenous community of the Katukina, Yawanawá, and Huni Kuĩ (Kaxinawá). The forest corridor remains untouched and is open to community subsistence practices such as fishing and hunting activities for food.

The project activities, abandonment of logging and monitoring of deforestation, take place on all 126,157.8211 ha.

Image. Map indicating specific areas of the project (in green).



3.4 Baseline Scenario

To determine the most plausible baseline scenario, aligned with the methodology developed in the project, the VT0001 tool was used. Tool for Demonstration and Evaluation of Additionality in VCs Agriculture, Forestry, and Other Land Uses (AFOLU) project activities, v3.0 (T-ADD).

According to this VT0001 tool, the project proponent should apply the following steps:

STEP 1. Identification of alternative land use scenarios for AFOLU project activity;

As a result of STEP 1:

Sub-step 1a. Identification of credible alternative land use scenarios for the proposed CCB-VCS AFOLU project activity):

I. Continuation of pre-project land use/project activity on land within the project boundary carried out without being registered as a VCS AFOLU project.

II. Commercial logging through a Forest Management Plan.

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

All land use scenarios identified above comply with applicable legal and regulatory requirements. These scenarios are discussed and justified below. There is no legal requirement to carry out activities similar to the project activity. Similarly, there are no similar project activities observed in the geographic region on private land.

3.4.1 Continuation of the Land Use Pre-Project/Activity on Land within the Boundary Project executed without being registered as VCS AFOLU Project

The owner maintains the property as a preserved rainforest.

Forest preservation in the project area, as a decision of the for-profit landowner company, would be unlikely in any non-carbon and market-related scenario. The owner Sumaúma Empreendimentos Imobiliários S/A, acquired the Paranacre Farm, with the aim of commercially exploiting the existing forest potential, continuously supplying through the export of raw materials to international forest-based industries.

3.4.2 Commercial logging

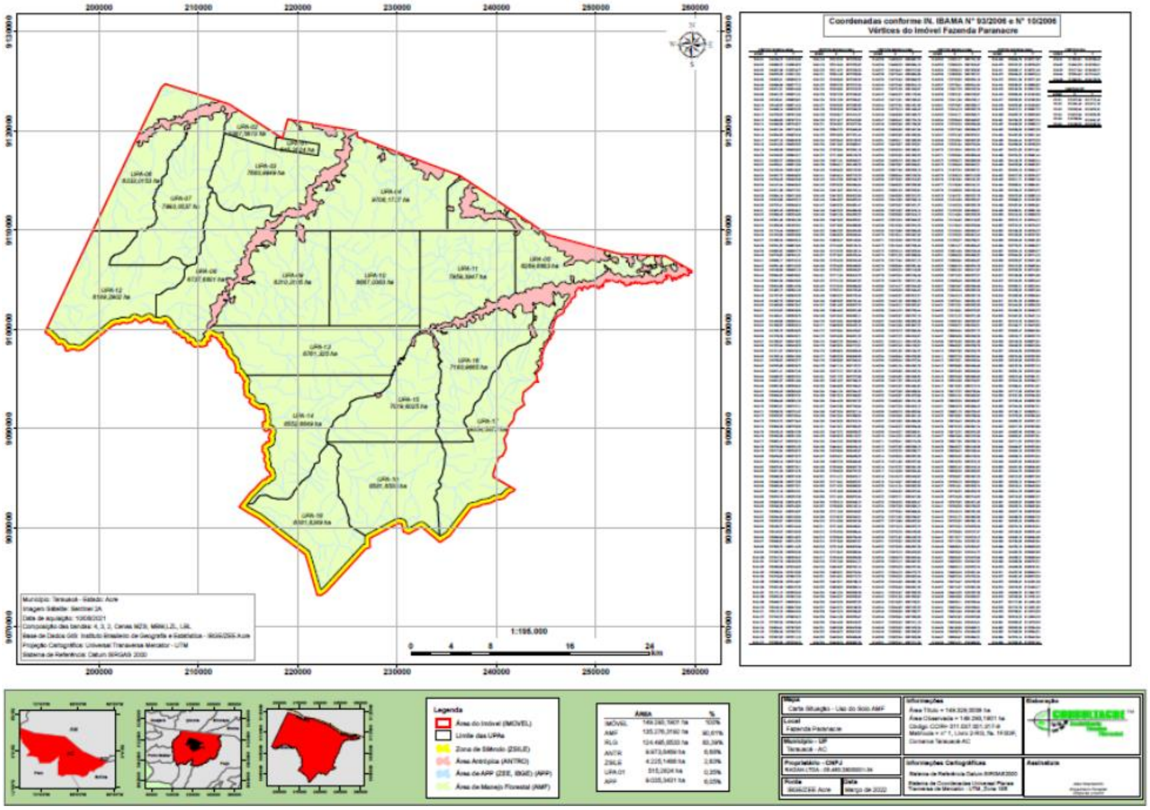
Sub-step 1c. Baseline scenario selection:

The most likely baseline scenario is the commercial exploitation of existing timber on Paranacre Farm according to the Forest Management Plan approved by Instituto de Meio Ambiente do Acre – IMAC.

Logging

Productive area for forest management purposes (19 UPAS)

The property has a total area of 148,630.0052 ha with the establishment of a management plan that occupies 91.01% of the property in a total of 135,276.3192 ha, with planning for 19 UPAS (image below and annex).



The cutting cycle is 25 years. For this PMFS, the expected period of exploration is two years of exploration; after this period, the area already explored (UPA) will remain fallow (recomposition and growth) for 25 years until the start of the second phase of exploration.

The immediate consequence of the initialization of the Forest Management Plan in every legally permitted area would be the emission of large amounts of greenhouse gases into the atmosphere, aggravating the effects of global climate change. The purpose of this project is to prevent such emissions.

3.5 Additionality

To demonstrate the additionality of the project, the VT0001 tool was used. Tool for Demonstration and Evaluation of Additionality in VCs Agriculture, Forestry, and Other Land Uses (AFOLU) project activities, v3.0 (T-ADD).

STEP 2. Investment analysis to determine whether the proposed project activity is not the most economically or financially attractive of the identified land use scenarios; or

The project activity does not generate revenue, since the project area will be managed for conservation purposes, rather than extraction of timber of extreme value, especially in the international market. On the other hand, the REDD project will incur ongoing costs related to documentation (feasibility analyses, PD elaboration, validation, verification, etc.) implementation, and management of project activities that need to be covered by some source of income. Project proponents hope to generate VCUs from this REDD project to make forest conservation possible and feasible.

Sub-step 2a. Determine the appropriate analysis method:

Since the project activity generates no financial or economic benefits for the project proponents beyond CCB-VCS-related revenue through VCUs, a simple cost approach is warranted.

Sub-step 2b. Option I. Apply simple (chosen) cost analysis.

3.5.1 Simple Cost Analysis

Logging is one of the most abundant products in Acre. The Forest Management Plan is one of the alternatives used by many companies that work with the exploitation of wood.

Taking into account the volumetric productivity of all 19 UPAs, based on the values practiced for export[9] of the species that are available in the project area, we have approximately:

Expected productivity (m^3)	Value (R$/$m^3$)	Total value
1,416,456.90 m^3	R$ 5,000.00/m^3	R$ 7,082,284,500.00

[9] https://g1.globo.com/ac/acre/amazonia-que-eu-quero/noticia/2022/05/06/peso-na-exportacao-manejo-florestal-sustentavel-equilibra-economia-e-preservacao.ghtml

As a consequence, the execution of the forest management plan is more economically and financially attractive than the project activity.

The proposed project activity will not generate a profit except for the revenue related to the CCB-VCS, and the associated costs will be covered by the landowner.

Once it is concluded that the proposed VCS AFOLU project produces no financial benefits beyond the income related to the VCS, the VT0001 Tool recommends proceeding to step 4 (Common practice analysis).

3.5.2 Common Practice

Logging is a common practice in the vast majority of areas of the state of ACRE. This REDD project sets out to change that paradigm.

Conservation of privately owned forest lands in the state of Acre, including the project area and other substitute areas, is generally limited to legal reserves and designated areas of permanent protection (Permanent Preservation Areas – PPA). The legal reserve is a requirement of the Brazilian Forest Code for landowners in the Legal Amazon to maintain 80% of the property as Forest. However, logging is allowed in such areas once authorized by a control officer, as is the case.

Conservation efforts undertaken in the state of Acre include several national, state, and municipal conservation units, as well as indigenous reserves[10]. Although conservation areas and indigenous reserves have had some successes in maintaining forest cover, the essential distinction between these lands and the project area is that the project area is privately owned and does not have access to government resources to encourage non-extractive uses of the land. While some public initiatives have provided financial support to avoided deforestation projects, as far as we know, there are no privately funded projects on private land with the goal of halting deforestation in Acre without the help of carbon finance.

There is no incentive at the Federal, State, or Municipal level to allocate any support to carbon projects in the voluntary market. As a consequence, forest conservation is not common

[10] https://g1.globo.com/ac/acre/amazonia-que-eu-quero/noticia/2022/05/06/peso-na-exportacao-manejo-florestal-sustentavel-equilibra-economia-e-preservacao.ghtml

practice on private land. Landowners are not used to carrying out similar activities within the scope of the proposed VCS AFOLU project.

Thus, such forest conservation activities were not sufficiently widespread in the activity of the geographical area. The associated costs and the absence of concrete subsidies and other financial flows for forest conservation on private lands prevent the development of other project modalities similar to the proposed VCS AFOLU project.

The owners would be degrading the entire project area authorized by Instituto do Meio Ambiente do Acre, in addition to possibly deforesting the non-legal reservation of the property in the case of the baseline.

3.5.3 Results of Additionality Analysis

As demonstrated above, the project activity, without revenue from carbon credits, is unlikely to occur and is not a common practice in the region. The project is therefore additional to VCS REDD.

3.6 Methodology Deviations

There are no methodological deviations in the preparation of this project.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

For the calculation of the project baseline, the guidelines, criteria, and assumptions contained in Section 8 – Quantification of GHG Emission Reductions and Removals - of the VCS VM0007, v1.6 methodology, were used. The baseline of the following project presents a logging scenario; for this, the module related to forest degradation was used: *VMD0006 - Estimate of changes in baseline carbon stock and greenhouse gas emissions from planned deforestation/forest degradation and planned wetland degradation*, and the carbon reservoirs considered were biomass above and below ground, thus using the modulus

VMD0001-Estimate of carbon stocks in above and below ground biomass in living and non-tree pools (CP-AB), v1.1.

In addition to the modules described above, the *VMD0005 - Estimate of carbon stocks in the long-term wood products reservoir (CP-W) module* was also used for accounting purposes, referring to carbon storage.

All the calculations presented in this section were made considering the surveys carried out in the field in the project area during the month of August 2022 and the Sustainable Forest Management Plan – PMFS RADAN ADMINISTRAÇÃO E PARTICIPAÇÃO LTDA.

The following are the equations contained in this section which were used in calculating the emissions of this study with their respective purposes and justifications.

4.1.1 Field Data — Project Area

All calculations presented in this section were made considering the surveys carried out in the field in the project area during the month of August 2022. 109 plots of 50mx50m (2.500 m2) were generated, which were duly georeferenced; for each plot, the Diameter at Breast Height (DAP) of all species that had a circumference greater than 13 cm was surveyed.

4.1.1.1 Procedures

To identify the biomass (below and above ground), the *VMD0001 - Estimate of carbon stocks in above-and below-ground biomass in living and non-tree pools (CP-AB), v1.1 module was used.*

Aboveground tree biomass: Estimate of carbon stocks in aboveground tree biomass (CAB_{tree}, i)

The average carbon stock in above-ground tree biomass per unit area was estimated based on field measurements in sample fixed-area plots employing random sampling.

Step 1) For each portion raised, a table containing the value of Circumference at Breast Height (CBH) was prepared.[11] which is later divided by the number Pi (π), a digit that represents the

[11] http://semapi.acre.gov.br/divisao-de-areas-naturais-protegidas-e-biodiversidade/

relationship between the perimeter of a circumference and its diameter. The result of the equation is the DAP value of each tree specimen raised.

- **Equation for: Diameter at Breast Height (DAP)**

$$\boldsymbol{DAP = \frac{CAP}{\pi}}$$

DAP= Diameter at Breast height

CAP= Circumference at Breast Height

π= 3.14159…

- **Demonstration (Installment 1 — Individual 1):**

The following example shows the application of the equation in a parcel (Installment 1) with data collected in the project area, the material with the description of all 109 parcels will be forwarded attached.

Each CBH value shown in the table corresponds to an arboreal specimen, the equation (shown below) was performed for all individuals raised.

$$DAP = \frac{114.00}{3.14159}$$

$$DAP = 36.2873$$

DAP = Diameter at Breast Height

CAP = 114.00

π = 3.14159…

INSTALLMENT 1				
INDIVIDUALS	HEIGHT	PAP	CONVERSION (cm)	DAP (cm)
Ind. 1	6.5000	1.1400	114.0000	36.4898
Ind. 2	12.0000	1.6500	165.0000	52.8142
Ind. 3	8.5000	0.3400	34.0000	10.8829
Ind. 4	15.0000	1.1800	118.0000	37.7702
Ind. 5	7.0000	0.1600	16.0000	5.1214
Ind. 6	14.0000	0.4900	49.0000	15.6842
Ind. 7	12.0000	1.1200	112.0000	35.8496
Ind. 8	23.5000	0.9500	95.0000	30.4082
Ind. 9	8.0000	0.2200	22.0000	7.0419
Ind. 10	3.6000	1.2300	123.0000	39.3706
Ind. 11	15.0000	0.5200	52.0000	16.6445
Ind. 12	8.4000	0.4700	47.0000	15.0440
Ind. 13	8.0000	0.1900	19.0000	6.0479
Ind.14	22.0000	0.3100	31.0000	9.8676
Ind. 15	5.0000	0.1200	12.0000	3.8197
Ind. 16	20.0000	0.3600	36.0000	11.4592
Ind. 17	19.0000	0.3900	39.0000	12.4141
Ind. 18	11.0000	0.1900	19.0000	6.0479
Ind. 19	8.0000	0.1600	16.0000	5.0930
Ind. 20	12.0000	0.2500	25.0000	7.9577
Ind. 21	18.5000	0.5000	50.0000	15.9155
Ind. 22	5.5000	0.4300	43.0000	13.6873
Ind. 23	12.0000	0.9300	93.0000	29.6028
Ind. 24	30.0000	0.4300	43.0000	13.6873
Ind. 25	20.5000	0.8100	81.0000	25.7831
Ind. 26	12.0000	0.8800	88.0000	28.0113
Ind. 27	8.0000	0.5500	55.0000	17.5070
Ind. 28	8.5000	0.4200	42.0000	13.3690
Ind. 29	12.0000	0.6700	67.0000	21.3268
Ind. 30	20.5000	1.0200	102.0000	32.4676
Ind. 31	12.0000	0.8700	87.0000	27.6930
Ind. 32	32.0000	2.0600	206.0000	65.5719
Ind. 33	15.0000	0.5200	52.0000	16.5521
Ind. 34	5.5000	0.4200	42.0000	13.3690
Ind. 35	7.0000	0.2900	29.0000	9.2310
Ind. 36	5.0000	0.4500	45.0000	14.3239
Ind. 37	9.0000	0.7300	73.0000	23.2366
Ind. 38	28.0000	1.4600	146.0000	46.4733

Ind. 39	6.5000	1.1400	114.0000	36.2873
Ind. 40	7.0000	0.4100	41.0000	13.0507
Ind. 41	40.0000	1.4900	149.0000	47.4282
Ind. 42	25.0000	0.5500	55.0000	17.5070
Ind. 43	30.0000	0.4900	49.0000	15.5972
Ind. 44	20.0000	0.9800	98.0000	31.1944
Ind. 45	25.0000	0.3800	38.0000	12.0958
Ind. 46	30.0000	1.1000	110.0000	35.0141
Ind. 47	15.0000	0.4500	45.0000	14.3239
Ind. 48	15.0000	0.7800	78.0000	24.8282
Ind. 49	25.0000	0.8800	88.0000	28.0113
Ind. 50	10.0000	0.4900	49.0000	15.5972
Ind. 51	15.0000	0.5700	57.0000	18.1437
Ind. 52	11.0000	0.4400	44.0000	14.0056
Ind. 53	12.0000	0.8700	87.0000	27.6930
Ind. 54	7.5000	0.3100	31.0000	9.8676
Ind. 55	6.5000	1.1400	114.0000	36.2873
Ind. 56	20.0000	0.8500	85.0000	27.0563
Ind. 57	15.0000	0.7200	72.0000	22.9183

Step 2) To define the tree biomass above ground, the allometric equation developed by Higuchi, N. *et al.* (2004)[12] was selected. This equation is appropriate for use in the Amazon biome. The equation dispenses with height data to reduce possible errors associated with height variation between the same specimens and different species. The proof of validity will be demonstrated below:

- **Allometric Equation**

$$\boldsymbol{fj(X,Y..) = 0.20158 * DAP^{2.55224}}$$

$fj(X,Y..)$ =Aerial biomass of trees

$0{,}20158$ **=** Correction factor for absence of height data

$DAP^{2.55224}$ $=$ Correction factor for absence of height data

[12] The minimum circumference value considered was 15 cm.

- **Demonstration (Installment 1 — Individual 1):**

$fj(X,Y..) = 0.20158 * 36.2873^{2.55224}$

$fj(X,Y..) = 1{,}956.5211$

$fj(X,Y..) = 1{,}956.5211$

$\mathbf{0,20158}$ **=** Correction factor for absence of height data

$\boldsymbol{DAP}^{\mathbf{2,55224}} = 36.4898^{2,55224}$

PARCELA 1			
INDIVIDUALS	CAP (cm)	DAP (cm)	Estoque de Biomassa (Kg) $= \mathbf{0,20158} * \boldsymbol{DAP}^{\,2,55224}$
Ind. 1	1.1400	36.4898	1,956.5211
Ind. 2	1.6500	52.8142	5,027.1392
Ind. 3	0.3400	10.8829	89.2219
Ind. 4	1.1800	37.7702	2,136.5341
Ind. 5	0.1600	5.1214	13.0309
Ind. 6	0.4900	15.6842	226.7544
Ind. 7	1.1200	35.8496	1,870.1046
Ind. 8	0.9500	30.4082	1,228.5561
Ind. 9	0.2200	7.0419	29.3734
Ind. 10	1.2300	39.3706	2,375.2488
Ind. 11	0.5200	16.6445	263.8895
Ind. 12	0.4700	15.0440	203.8754
Ind. 13	0.1900	6.0479	19.9199
Ind.14	0.3100	9.8676	69.4888
Ind. 15	0.1200	3.8197	6.1650
Ind. 16	0.3600	11.4592	101.7793
Ind. 17	0.3900	12.4141	124.8477
Ind. 18	0.1900	6.0479	19.9199
Ind. 19	0.1600	5.0930	12.8471
Ind. 20	0.2500	7.9577	40.1310
Ind. 21	0.5000	15.9155	235.3862
Ind. 22	0.4300	13.6873	160.1789
Ind. 23	0.9300	29.6028	1,147.2097
Ind. 24	0.4300	13.6873	160.1789

Ind. 25	0.8100	25.7831	806.3316
Ind. 26	0.8800	28.0113	996.2959
Ind. 27	0.5500	17.5070	300.2100
Ind. 28	0.4200	13.3690	150.8425
Ind. 29	0.6700	21.3268	496.8017
Ind. 30	1.0200	32.4676	1,452.2172
Ind. 31	0.8700	27.6930	967.6549
Ind. 32	2.0600	65.5719	8,732.6560
Ind. 33	0.5200	16.5521	260.1682
Ind. 34	0.4200	13.3690	150.8425
Ind. 35	0.2900	9.2310	58.6128
Ind. 36	0.4500	14.3239	179.8858
Ind. 37	0.7300	23.2366	618.3709
Ind. 38	1.4600	46.4733	3,627.0189
Ind. 39	1.1400	36.2873	1.928.9311
Ind. 40	0.4100	13.0507	141.8448
Ind. 41	1.4900	47.4282	3,820.2765
Ind. 42	0.5500	17.5070	300.2100
Ind. 43	0.4900	15.5972	223.5568
Ind. 44	0.9800	31.1944	1,311.2597
Ind. 45	0.3800	12.0958	116.8393
Ind. 46	1.1000	35.0141	1,760.8645
Ind. 47	0.4500	14.3239	179.8858
Ind. 48	0.7800	24.8282	732.2871
Ind. 49	0.8800	28.0113	996.2959
Ind. 50	0.4900	15.5972	223.5568
Ind. 51	0.5700	18.1437	328.8637
Ind. 52	0.4400	14.0056	169.8586
Ind. 53	0.8700	27.6930	967.6549
Ind. 54	0.3100	9.8676	69.4888
Ind. 55	1.1400	36.2873	1,928.9311
Ind. 56	0.8500	27.0563	911.8891
Ind. 57	0.7200	22.9183	596.9805

Step 3) The carbon stock in the above-ground tree biomass was estimated for each individual in the sample plot, located in stratum i, using the selected allometric equation, applying the dimensions of the tree specimens resulting from Step 1, and adding the carbon stocks in the sample plot.

- **Equation for Above-Ground Tree Biomass**

$$C_{AB\_tree,sp,i} = \sum_{j}^{S} \sum_{l=1}^{N_{j,sp,i}} f_j(X,Y\ldots) * CF_j$$

$\boldsymbol{CAB_{tree}, sp, i}$ **=** Carbon stock in aboveground biomass of *sp* plot trees in stratum *i*.

$\boldsymbol{CFj}$ **=** Biomass carbon fraction for group *j* species.

$\boldsymbol{fj(X, Y..)}$**=** Aerial biomass of trees based on the allometric equation for the group *j* species based on the measured tree variable(s).

i = 1, 2, 3, … M layer.

j = 1, 2, 3 … S species of trees.

l = 1, 2, 3, … *Nj, sp, i* sequence number of individual trees in the group *j* species in the *sp* sampling plot in stratum *i*.

- **Demonstration (Installment 1 — Individual 1):**

$CAB_{tree}, sp, i = 1{,}956.5211 * 0.47$

$CAB_{tree}, sp, i = 919.5649$

$fj(X, Y..) = 919.5649$

$CFj = 0.47$[13]

[13] https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_04_Ch4_Forest_Land.pdf

INDIVUDUAL	CAP (cm)	DAP (cm)	Estoque de Biomassa (Kg) $= 0,20158 * DAP^{2,55224}$	Estoque de Carbono (Kg) X 0,47
Ind. 1	1.1400	36.4898	1,956.5211	919.5649
Ind. 2	1.6500	52.8142	5,027.1392	2,362.7554
Ind. 3	0.3400	10.8829	89.2219	41.9343
Ind. 4	1.1800	37.7702	2,136.5341	1,004.1710
Ind. 5	0.1600	5.1214	13.0309	6.1245
Ind. 6	0.4900	15.6842	226.7544	106.5746
Ind. 7	1.1200	35.8496	1,870.1046	878.9492
Ind. 8	0.9500	30.4082	1,228.5561	577.4214
Ind. 9	0.2200	7.0419	29.3734	13.8055
Ind. 10	1.2300	39.3706	2,375.2488	1,116.3669
Ind. 11	0.5200	16.6445	263.8895	124.0281
Ind. 12	0.4700	15.0440	203.8754	95.8214
Ind. 13	0.1900	6.0479	19.9199	9.3624
Ind.14	0.3100	9.8676	69.4888	32.6597
Ind. 15	0.1200	3.8197	6.1650	2.8975
Ind. 16	0.3600	11.4592	101.7793	47.8363
Ind. 17	0.3900	12.4141	124.8477	58.6784
Ind. 18	0.1900	6.0479	19.9199	9.3624
Ind. 19	0.1600	5.0930	12.8471	6.0381
Ind. 20	0.2500	7.9577	40.1310	18.8616
Ind. 21	0.5000	15.9155	235.3862	110.6315
Ind. 22	0.4300	13.6873	160.1789	75.2841
Ind. 23	0.9300	29.6028	1,147.2097	539.1885
Ind. 24	0.4300	13.6873	160.1789	75.2841
Ind. 25	0.8100	25.7831	806.3316	378.9759
Ind. 26	0.8800	28.0113	996.2959	468.2591
Ind. 27	0.5500	17.5070	300.2100	141.0987
Ind. 28	0.4200	13.3690	150.8425	70.8960
Ind. 29	0.6700	21.3268	496.8017	233.4968
Ind. 30	1.0200	32.4676	1,452.2172	682.5421
Ind. 31	0.8700	27.6930	967.6549	454.7978
Ind. 32	2.0600	65.5719	8,732.6560	4,104.3483
Ind. 33	0.5200	16.5521	260.1682	122.2791
Ind. 34	0.4200	13.3690	150.8425	70.8960
Ind. 35	0.2900	9.2310	58.6128	27.5480
Ind. 36	0.4500	14.3239	179.8858	84.5463
Ind. 37	0.7300	23.2366	618.3709	290.6343
Ind. 38	1.4600	46.4733	3,627.0189	1,704.6989

Ind. 39	1.1400	36.2873	1,928.9311	906.5976
Ind. 40	0.4100	13.0507	141.8448	66.6670
Ind. 41	1.4900	47.4282	3,820.2765	1,795.5300
Ind. 42	0.5500	17.5070	300.2100	141.0987
Ind. 43	0.4900	15.5972	223.5568	105.0717
Ind. 44	0.9800	31.1944	1,311.2597	616.2921
Ind. 45	0.3800	12.0958	116.8393	54.9144
Ind. 46	1.1000	35.0141	1,760.8645	827.6063
Ind. 47	0.4500	14.3239	179.8858	84.5463
Ind. 48	0.7800	24.8282	732.2871	344.1750
Ind. 49	0.8800	28.0113	996.2959	468.2591
Ind. 50	0.4900	15.5972	223.5568	105.0717
Ind. 51	0.5700	18.1437	328.8637	154.5659
Ind. 52	0.4400	14.0056	169.8586	79.8335
Ind. 53	0.8700	27.6930	967.6549	454.7978
Ind. 54	0.3100	9.8676	69.4888	32.6597
Ind. 55	1.1400	36.2873	1,928.9311	906.5976
Ind. 56	0.8500	27.0563	911.8891	428.5879
Ind. 57	0.7200	22.9183	596.9805	280.5809

Step 4) Conversion of the average carbon stock in aboveground biomass for each stratum to carbon dioxide equivalents:

- **Equation for Molecular Weight Ratio of Carbon Dioxide (CO_2) For Carbon (C)**

$$C_{AB\_tree,i} = \sum_{sp=1}^{P_i} \frac{C_{AB\_tree,sp,i}}{A_{sp,i}} * \frac{44}{12}$$

$\boldsymbol{CAB_{tree}, i}$ =Average carbon stock of aboveground biomass in the stratum *i.*

$\boldsymbol{CAB_{tree}, sp, i, t}$ = Aboveground biomass carbon stock of trees in the sample plot *sp* of the stratum *i.*

sp = 1, 2, 3 … sample plots *Pi* in stratum *i.*

i = 1, 2, 3 … M layer.

44/12 = Molecular Weight Ratio of CO_2 for carbon.

- **Demonstration (Installment 1 — Individual 1):**
- $\mathbf{CAB_{tree}, i} = 919.5649 * \frac{44}{12}$

  $\mathbf{CAB_{tree}, i} = 3{,}324.1912$

  $\mathbf{CAB_{tree}, sp, i, t} = 3{,}371.7380$

  sp = 1, 2, 3 … sample plots *Pi* in stratum *i.*

  i = 1, 2, 3 … M layer.

  44/12 = Molecular Weight Ratio of CO_2 for carbon.

INSTALLMENT 1			
INDIVIDUAL	CARBON STOCK (Kg)	CABtree $KgCO_2e$ (X44/12)	CABtree tCO_2e (/1000)
Ind. 1	919.5649	3371.7380	3.3717
Ind. 2	2,362.7554	8,663.4365	8.6634
Ind. 3	41.9343	153.7591	0.1538
Ind. 4	1,004.1710	3,681.9603	3.6820
Ind. 5	6.1245	22.4565	0.0225
Ind. 6	106.5746	390.7735	0.3908
Ind. 7	878.9492	3,222.8137	3.2228
Ind. 8	577.4214	2,117.2118	2.1172
Ind. 9	13.8055	50.6202	0.0506
Ind. 10	1,116.3669	4,093.3453	4.0933
Ind. 11	124.0281	454.7697	0.4548
Ind. 12	95.8214	351.3451	0.3513
Ind. 13	9.3624	34.3288	0.0343
Ind.14	32.6597	119.7522	0.1198
Ind. 15	2.8975	10.6242	0.0106
Ind. 16	47.8363	175.3998	0.1754
Ind. 17	58.6784	215.1541	0.2152
Ind. 18	9.3624	34.3288	0.0343
Ind. 19	6.0381	22.1397	0.0221
Ind. 20	18.8616	69.1592	0.0692
Ind. 21	110.6315	405.6488	0.4056

Ind. 22	75.2841	276.0417	0.2760
Ind. 23	539.1885	1,977.0245	1.9770
Ind. 24	75.2841	276.0417	0.2760
Ind. 25	378.9759	1,389.5783	1.3896
Ind. 26	468.2591	1,716.9500	1.7170
Ind. 27	141.0987	517.3619	0.5174
Ind. 28	70.8960	259.9520	0.2600
Ind. 29	233.4968	856.1549	0.8562
Ind. 30	682.5421	2502.6544	2.5027
Ind. 31	454.7978	1,667.5919	1.6676
Ind. 32	4,104.3483	1,5049.2771	15.0493
Ind. 33	122.2791	448.3567	0.4484
Ind. 34	70.8960	259.9520	0.2600
Ind. 35	27.5480	101.0093	0.1010
Ind. 36	84.5463	310.0031	0.3100
Ind. 37	290.6343	1,065.6591	1.0657
Ind. 38	1,704.6989	6,250.5626	6.2506
Ind. 39	906.5976	3,324.1912	3.3242
Ind. 40	66.6670	244.4457	0.2444
Ind. 41	1,795.5300	6,583.6100	6.5836
Ind. 42	141.0987	517.3619	0.5174
Ind. 43	105.0717	385.2629	0.3853
Ind. 44	616.2921	2,259.7377	2.2597
Ind. 45	54.9144	201.3528	0.2014
Ind. 46	827.6063	3,034.5564	3.0346
Ind. 47	84.5463	310.0031	0.3100
Ind. 48	344.1750	1,261.9750	1.2620
Ind. 49	468.2591	1,716.9500	1.7170
Ind. 50	105.0717	385.2629	0.3853
Ind. 51	154.5659	566.7416	0.5667
Ind. 52	79.8335	292.7228	0.2927
Ind. 53	454.7978	1,667.5919	1.6676
Ind. 54	32.6597	119.7522	0.1198
Ind. 55	906.5976	3,324.1912	3.3242
Ind. 56	428.5879	1,571.4890	1.5715
Ind. 57	280.5809	1,028.7966	1.0288

Biomass of below ground trees: estimation of carbon stocks in biomass of below ground trees (CBB_{tree}, i)

Step 1) The carbon stock of the biomass of the trees below the ground was calculated for each plot:

- **Equation - Carbon Stock Of Tree Biomass Below Ground**

$$C_{BB\_tree,sp,i} = R * C_{AB\_tree,sp,i}$$

$\boldsymbol{CBB_{tree}, sp, i}$ =Carbon stock of tree biomass below ground of plot trees *sp*, in stratum.

$\boldsymbol{CAB_{tree}, sp, i}$ =Carbon stock of aerial arboreal biomass of the trees of plot sp, in the stratum *i*.

R **=** Root-shoot relationship.

i **=** 1, 2, 3, ...M layer.

- **Demonstration (Installment 1 — Individual 1):**

$CBB_{tree}, sp, i = 0.37 * \ 3{,}371.7380$

$CBB_{tree}, sp, i = 1{,}247.5431$

R **=** 0.37[14]

i **=** 1, 2, 3, ...M layer

[14] (Referência- Fittkau and Klinge, 1973 TABLE 4.4 RATIO OF BELOW-GROUND BIOMASS TO ABOVE GROUND BIOMASS (R) Chapter 4: Forest Land Volume 4. Agriculture, Forestry and Other Land Use IPCC 2006

INSTALLMENT 1			
INDIVIDUAL	CABtree ($KgCO_2e$)	CBBtree ($KgCO_2e$) (x 0,37)	CBBtree (tCO_2e) (/1000)
Ind. 1	3,371.7380	1,247.5431	1.2475
Ind. 2	8,663.4365	3,205.4715	3.2055
Ind. 3	153.7591	56.8909	0.0569
Ind. 4	3,681.9603	1,362.3253	1.3623
Ind. 5	22.4565	8.3089	0.0083
Ind. 6	390.7735	144.5862	0.1446
Ind. 7	3,222.8137	1,192.4411	1.1924
Ind. 8	2,117.2118	783.3684	0.7834
Ind. 9	50.6202	18.7295	0.0187
Ind. 10	4,093.3453	1,514.5378	1.5145
Ind. 11	454.7697	168.2648	0.1683
Ind. 12	351.3451	129.9977	0.1300
Ind. 13	34.3288	12.7017	0.0127
Ind.14	119.7522	44.3083	0.0443
Ind. 15	10.6242	3.9310	0.0039
Ind. 16	175.3998	64.8979	0.0649
Ind. 17	215.1541	79.6070	0.0796
Ind. 18	34.3288	12.7017	0.0127
Ind. 19	22.1397	8.1917	0.0082
Ind. 20	69.1592	25.5889	0.0256
Ind. 21	405.6488	150.0901	0.1501
Ind. 22	276.0417	102.1354	0.1021
Ind. 23	1,977.0245	731.4991	0.7315
Ind. 24	276.0417	102.1354	0.1021
Ind. 25	1,389.5783	514.1440	0.5141
Ind. 26	1,716.9500	635.2715	0.6353
Ind. 27	517.3619	191.4239	0.1914
Ind. 28	259.9520	96.1822	0.0962
Ind. 29	856.1549	316.7773	0.3168
Ind. 30	2,502.6544	925.9821	0.9260
Ind. 31	1667.5919	617.0090	0.6170
Ind. 32	15,049.2771	5,568.2325	5.5682

Ind. 33	448.3567	165.8920	0.1659
Ind. 34	259.9520	96.1822	0.0962
Ind. 35	101.0093	37.3734	0.0374
Ind. 36	310.0031	114.7011	0.1147
Ind. 37	1,065.6591	394.2939	0.3943
Ind. 38	6,250.5626	2,312.7082	2.3127
Ind. 39	3,324.1912	1,229.9507	1.2300
Ind. 40	244.4457	90.4449	0.0904
Ind. 41	6,583.6100	2,435.9357	2.4359
Ind. 42	517.3619	191.4239	0.1914
Ind. 43	385.2629	142.5473	0.1425
Ind. 44	2,259.7377	836.1029	0.8361
Ind. 45	201.3528	74.5005	0.0745
Ind. 46	3,034.5564	1,122.7859	1.1228
Ind. 47	310.0031	114.7011	0.1147
Ind. 48	1,261.9750	466.9308	0.4669
Ind. 49	1,716.9500	635.2715	0.6353
Ind. 50	385.2629	142.5473	0.1425
Ind. 51	566.7416	209.6944	0.2097
Ind. 52	292.7228	108.3074	0.1083
Ind. 53	1,667.5919	617.0090	0.6170
Ind. 54	119.7522	44.3083	0.0443
Ind. 55	3,324.1912	1,229.9507	1.2300
Ind. 56	1,571.4890	581.4509	0.5815
Ind. 57	1,028.7966	380.6547	0.3807
TOTAL	**91,380.9314**	**33,810.9446**	**33.8109**

Module *VMD0001 - Estimate of carbon stocks in above and below-ground biomass in living and non-tree pools (CP-AB), v1.1* It also contemplates the biomass of non-arboreal individuals below and above ground. After the use of the *"Tool to test the significance of GHG emissions in F/R CDM project activities",* the use of above-ground non-tree biomass was disregarded since the results presented were less than the percentage of 5% of the total reductions in carbon reservoirs and increases in emissions.

Carbon Stock Throughout The Area

To begin to define the carbon stock in biomass above and below, the project area was stratified following the following criterion:

Step 1) It was established that the area would be stratified according to the carbon stock per plot. For this, the carbon stock values determined in the plots were authorized by the Sturges formula/equation. This empirical method is widely used in descriptive statistics to determine the number of classes that must exist in a frequency histogram in order to classify a dataset representing a sample or population. Thus, it was considered the most assertive method for post-field stratification. Despite having a single locomotion, which is to generate many classes with few elements, this is not a problem for simplifying the study area, as many sample plots were raised. And all the elements for its employment were present, especially the sample number. This option was the most indicated because it is the basis for establishing the post-field stratification.

Step 2) The sample plots were categorized into 8 storage classes, each class has a range of values that represents the carbon stock collected in the 109 plots. Soon after, the number of parcels within the storage intervals was defined.

Table relating carbon storage class and number of plots.

Class	Stock Classes (tC/ha)		Number of plots
1	0.00	101.00	3
2	101.00	202.00	6
3	202.00	303.00	16
4	303.00	404.00	20
5	404.00	505.00	23
6	505.00	606.00	14
7	606.00	707.00	19
8	707.00	808.00	8

Step 3) The plots were transformed as a percentage in relation to the total number of plots (109) and were multiplied by the project area.

- **Simulation — Interval 1**

4/110x100 **=** Percentage by Stock Class

4/110x100 **= 2.75%**

Table relating carbon storage class and the percentage of representation of each class in the property area.

Class	Stock Classes (tC/ha)		Number of plots	%
1	0,00	101,00	3	2,75%
2	101,00	202,00	6	5,50%
3	202,00	303,00	16	14,68%
4	303,00	404,00	20	18,35%
5	404,00	505,00	23	21,10%
6	505,00	606,00	14	12,84%
7	606,00	707,00	19	17,43%
8	707,00	808,00	8	7,34%

Step 4) To obtain the percentage representation of the stock classes in the total project area, the percentage of the stochastic classes was multiplied by the total project area.

- **Simulation — Interval 1**

$$2{,}75\% * 126{,}157.82 = Area\ inserted\ in\ the\ storage\ class$$

$$2.75\% * \ 126{,}157.82 = \ 3{,}472.23\ \text{ha}$$

Class	Stock Classes		Number of plots	%	Area - stock
1	0.00	101.00	3	2.75%	3,472.23
2	101.00	202.00	6	5.50%	6,944.47
3	202.00	303.00	16	14.68%	18,518.58
4	303.00	404.00	20	18.35%	23,148.22

5	404.00	505.00	23	21.10%	26,620.46
6	505.00	606.00	14	12.84%	16,203.76
7	606.00	707.00	19	17.43%	21,990.81
8	707.00	808.00	8	7.34%	9,259.29
			109	**100.00%**	**126,157.82**

Step 5) After defining the value of the areas inserted in the storage intervals, the values will be multiplied by the average of the storage class.

- **Simulation — Interval 1**

$$50{,}50 * 3{,}472.23 = carbon\ stock\ in\ storage\ class$$

$50{,}50 * 3{,}472.23 =$ **175,347.80tC**

Table indicating the total amount of carbon stored on the property

Class	Stock Classes		Number of plots	%	Area - stock	Average	CABBSL
1	0.00	101.00	3	2.75%	3,472.23	50.50	175,347.80
2	101.00	202.00	6	5.50%	6,944.47	151.50	1,052,086.78
3	202.00	303.00	16	14.68%	18,518.58	252.50	4,675,941.26
4	303.00	404.00	20	18.35%	23,148.22	353.50	8,182,897.20
5	404.00	505.00	23	21.10%	26,620.46	454.50	12,098,998.01
6	505.00	606.00	14	12.84%	16,203.76	555.50	9,001,186.92
7	606.00	707.00	19	17.43%	21,990.81	656.50	14,436,968.64
8	707.00	808.00	8	7.34%	9,259.29	757.50	7,013,911.89
			109	**100.00%**	**26,157.82**		**56,637,338.50**

56,637,338.50 tonC = Total amount of carbon stored in the project area.

- **Carbon stock in below-ground biomass**

  CBB = CABBSL * R

  CBB = CABBSL * 0.37

  CBB = 56,637,338.50 * 0.37

  CBBBSL = 20.955.815,25 tC

- **Existing carbon stock in the project area**

  EBSL = CAB_{BSL} + CBB_{BSL}

  E_{BSL} = 56,637,338.50 + 20,955,815.25

  $E_{BSLtotal}$ = 77,593,153.75tC

  tC02e = 77,593,153.75tC *(44/12)

  = 284,508,230.40 tC02e

Forest Management Plan — Degradation activities

To estimate GHG emissions related to degradation activities of the approved Forest Management Plan (APD) for logging throughout the project area for the baseline period, module VMD0006 - Estimate of changes in baseline carbon stock and greenhouse gas emissions from planned deforestation/forest degradation and planned wetland degradation (BL-PL), v. 1.3, was used.

The Net greenhouse gas emissions at baseline from planned deforestation (ODA) shall be determined as:

For REDD project activities (non-wet):

$$\Delta C_{BSL,planned} = \sum_{t=1}^{t^*} \sum_{i=1}^{M} \left(\Delta C_{BSL,i,t} + GHG_{BSL-E,i,t} \right)$$

Where:

$\Delta C_{BSL,planned}$ = Net greenhouse gas emissions at baseline from planned deforestation through year t*; tCO_2-e

$\Delta C_{BSL,i,t}$ = Changes in net carbon stock in all reservoirs in baseline stratum i in year t; t CO_2e

$GHG_{BSL\text{-}E,i,t}$ = Greenhouse gas emissions as a result of deforestation activities within the project boundary in the baseline stratum i in year t; t CO_2-e year-1

i = 1, 2, 3, ... M layer.

t = 1, 2, 3, ... *t* years elapsed since the projected start of the project activity.

Part 1.

1.1 Calculation of the annual area of deforested land

$$D\%_{planned,i,t} = \left(\sum_{pn=1}^{n^*} \left(D\%_{pn} \Big/ Yrs_{pn} \right) \right) \Big/ n$$

Where:

$\boldsymbol{D\%planned, i, t,}$ projected annual proportion of land that will be deforested in stratum i during year t. If the actual annual ratio is known and documented (e.g. 25% per annum for 4 years), defined as ratio;%.

$\boldsymbol{D\%pn,}$ percentage of deforestation in plot of land pn etc. of a project area as a result of planned deforestation as defined in this module; %.

$\boldsymbol{Yrspn,}$ number of years in which deforestation occurred on plot of land pn in proxy area; years.

n, total number of plots examined.

pn, 1, 2, 3, ... n * plots of land examined in project area.

i, 1, 2, 3, … M strata.

UPA	UPA Area (ha)	Degraded Area (ha)	Years	*D*%
UPA 1	483.27	164.31	1	0.13%
UPA 2	1,019.99	346.80	1	0.27%
UPA 3	7,203.75	2,449.27	1	1.93%
UPA 4	9,103.09	3,095.05	2	2.44%
UPA 5	5,899.08	2,005.69	1	1.58%
UPA 6	5,939.52	2,019.44	1	1.59%
UPA 7	7,496.42	2,548.78	1	2.01%
UPA 8	6,319.04	2,148.48	1	1.69%
UPA 9	7,793.97	2,649.95	1	2.09%
UPA 10	8,147.28	2,770.08	2	2.18%
UPA 11	7,464.85	2,538.05	1	2.00%
UPA 12	7,642.95	2,598.60	2	2.05%
UPA 13	8,216.95	2,793.76	2	2.20%
UPA 14	8,021.45	2.727.29	1	2.15%
UPA 15	6,583.64	2,238.44	1	1.76%
UPA 16	6,734.79	2,289.83	1	1.80%
UPA 17	8,491.99	2,887.28	2	2.28%
UPA 18	6,266.67	2,130.67	1	1.68%
UPA 19	8,048.63	2,736.53	2	2.16%
	126,877.32	**43,138.29**	25	**34.00%**

For the total area to be degraded, 43,138.29, the percentage of total degradation will be 34.00%, a value that approached the percentage of biomass loss and other dendrometric parameters observed by D'arace 2019 et al, who obtained in a study the following reductions in the target area of the sustainable management plan:

- reduction in the abundance of 33.33%
- (15 árv.ha^{-1} para 10 árv.ha^{-1});
- volume of 36.64% (59.5 m^3. ha-1 para 37.7 m^3. ha-1);
- and basal area of 36.21% (5, 8m^2.ha-1 para 3.7 m^2. ha-1).

Thus, the degraded percentage value of 34% of the area is consistent with studies in areas of the same biome.

- **Annual area of deforestation**

The exploration time was defined by the forest management plan as 25 years. According to the defined time, we have that the total area that will be impacted will be 4.00% per year. Converted into an area, 1753.24ha will be degraded annually.

$$AA_{planned,i,t} = \left(A_{planned,i} * D\%_{planned,i,t}\right) * L - D_i$$

Where:

$\boldsymbol{AAplanned, i, t}$, annual baseline planned deforestation area for stratum i at time t; ha.

$\boldsymbol{D\%planned, i, t}$, projected annual proportion of land that will be deforested in stratum i during year t. If the actual annual ratio is known and documented (for example, 25% per year for 4 years), set the ratio; %.

$\boldsymbol{Aplanned, i}$**,** total area of planned deforestation during the reference period for stratum i; ha.

$\boldsymbol{L - Di}$, probability of deforestation for stratum i; %.

Project area (ha)	Aplanned (ha)	time (anos)	D%	D% planned	AAPLANNED (ha)
126,877.32	43,138.2897	25	100.00%	4.00%	1,725.5316

Carbon variation in aboveground biomass

Table indicating the estimated expansion of the carbon stock by regeneration during the operation period using an average increment rate.

UPA	Degraded Area (ha)	CABtreebsl (tCO2e)	ΔCABtree (tCO2e)	CABtree - Pós (tCO2e)
UPA 01	164.31	791,000.18	268,940.06	522,060.12
UPA 02	346.80	1,669,503.81	567,631.30	1,101,872.51
UPA 03	2,449.27	11,790,948.70	4,008,922.56	7,782,026.14
UPA 04	3,095.05	14,899,762.04	5,065,919.09	9,833,842.94
UPA 05	2,005.69	9,655,487.51	3,282,865.75	6,372,621.75
UPA 06	2,019.44	9,721,690.94	3,305,374.92	6,416,316.02
UPA 07	2,548.78	12,269,984.21	4,171,794.63	8,098,189.58
UPA 08	2,148.48	10,342,884.15	3,516,580.61	6,826,303.54
UPA 09	2,649.95	12,757,012.89	4,337,384.38	8,419,628.51
UPA 10	2,770.08	13,335,303.66	4,534,003.24	8,801,300.42
UPA 11	2,538.05	12,218,314.92	4,154,227.07	8,064,087.85
UPA 12	2,598.60	12,509,819.88	4,253,338.76	8,256,481.12
UPA 13	2,793.76	13,449,342.83	4,572,776.56	8,876,566.26
UPA 14	2,727.29	13,129,339.70	4,463,975.50	8,665,364.20
UPA 15	2,238.44	10,775,964.87	3,663,828.05	7,112,136.81
UPA 16	2,289.83	11,023,364.65	3,747,943.98	7,275,420.67
UPA 17	2,887.28	13,899,524.03	4,725,838,17	9,173,685.86
UPA 18	2,130.67	10,257,157.25	3,487,433.47	6,769,723.79
UPA 19	2,736.53	13,173,834.94	4,479,103.88	8,694,731.06
TOTAL	**43,138.29**	**207,670,241.17**	**70,607,882.00**	**137,062,359.17**

$$\Delta CABtree, i = CABtreebsl, i - CABtreepost, i$$

Onde:

$\Delta CAB\_tree, i$ = Variação do estoque de carbono de base na biomassa arbórea acima do solo no estrato *i*; t $CO_{2\text{-}e}$ ha-1

$\boldsymbol{CAB\_tree, bsl, i}$ = Estoque de carbono florestal na biomassa arbórea acima do solo no estrato *i*; t $CO_{2\text{-}e}$ ha-1

$\boldsymbol{CAB\_tree, post, i}$ = Estoque de carbono pós-desmatamento na biomassa arbórea acima do solo no estrato *i*; t $CO_{2\text{-}e}$ ha-1

Example application for UPA1

$CABtreebsl,i$	$CABtreepost, i$	$\Delta CAB\_tree, i$
18.34	12.10	6.23

Para a UPA 01

$$\Delta CAB\_tree, i = CABtreebsl, i - CABtreepost, i$$

$\Delta CAB\_tree, i$ = 18.34 - 12.10

$\Delta CBB\_tree, i$ = 6,.23 tCO_2*ha^{-1}

Table indicating the variation of carbon stock in above-ground biomass per hectare (ha).

UPA	CABtreebsl (tCO2e ha-1)	CABtreepos (tCO2e ha-1)	ΔCABtree (tCO2e ha-1)
UPA 01	18.34	12.10	6.23
UPA 02	38.70	25.54	13.16
UPA 03	273.33	180.40	92.93
UPA 04	345.40	227.96	117.43
UPA 05	223.83	147.73	76.10
UPA 06	225.36	148.74	76.62
UPA 07	284.43	187.73	96.71
UPA 08	239.76	158.24	81.52
UPA 09	295.72	195.18	100.55
UPA 10	309.13	204.03	105.10
UPA 11	283.24	186.94	96.30
UPA 12	289.99	191.40	98.60
UPA 13	311.77	205.77	106.00
UPA 14	304.35	200.87	103.48
UPA 15	249.80	164.87	84.93
UPA 16	255.54	168.65	86.88
UPA 17	322.21	212.66	109.55
UPA 18	237.77	156.93	80.84
UPA 19	305.39	201.55	103.83
TOTAL	**4,814.06**	**3,177.28**	**1,636.78**

Variation of Carbon Stock in aboveground biomass.

$$\Delta C_{AB_{tree},i} = C_{AB_{tree_{bsl}},i} - C_{AB_{tree_{post}},i}$$

Onde:

$\boldsymbol{\Delta CBB\_tree, i}$ Variation of baseline carbon stock in belowground tree biomass in the stratum *i*; t CO_{2-e} ha-1

$\boldsymbol{CBB\_tree, bsl, i}$ = Forest carbon stock in tree biomass below ground in the stratum *i*; t CO_{2-e} ha-1

$\boldsymbol{CBB\_tree, post, i}$ = Post-deforestation carbon stock in below-ground tree biomass in the stratum *i*; t CO_{2-e} ha-1

Table indicating the variation of carbon stock in below-ground biomass per hectare (ha)

UPA	Degraded Area (ha)	ECBBtreebsl (tCO2e)	EΔCBBtree (tCO2e)	ECBBtree - Post (tCO2e)
UPA 01	164,31	292,670.07	99,507.82	193,162.24
UPA 02	346,80	617,716.41	210,023.58	407,692.83
UPA 03	2,449.27	4,362,651.02	1,483,301.35	2,879,349.67
UPA 04	3,095.05	5,512,911.95	1,874,390.06	3,638,521.89
UPA 05	2,005.69	3,572,530.38	1,214,660.33	2,357,870.05
UPA 06	2,019.44	3,597,025.65	1,222,988.72	2,374,036.93
UPA 07	2,548.78	4,539,894.16	1,543,564.01	2,996,330.14
UPA 08	2,148.48	3,826,867.14	1,301,134.83	2,525,732.31
UPA 09	2,649.95	4,720,094.77	1,604,832.22	3,115,262.55
UPA 10	2,770.08	4,934,062.35	1,677,581.20	3,256,481.15
UPA 11	2,538.05	4,520,776.52	1,537,064.02	2,983,712.50
UPA 12	2,598.60	4,628,633.36	1,573,735.34	3,054,898.02
UPA 13	2,793.76	4,976,256.85	1,691,927.33	3,284,329.52
UPA 14	2,727.29	4,857,855.69	1,651,670.93	3,206,184.76
UPA 15	2,238.44	3,987,107.00	1,355,616.38	2,631,490.62
UPA 16	2,289.83	4,078,644.92	1,386,739.27	2,691,905.65
UPA 17	2,887.28	5,142,823.89	1,748,560.12	3,394,263.77
UPA 18	2,130.67	3,795,148.18	1,290,350.38	2,504,797.80
UPA 19	2,736.53	4,874,318.93	1,657,268.44	3,217,050.49
TOTAL	**43,138.29**	**76,837,989.23**	**26,124,916.34**	**50,713,072.89**

$CBBtreebsl,i$	$CBBtreepost,i$	$\Delta CBB\_tree,i$
6.78	4.48	2.31

Exemplo aplicação para a UPA1

$\boldsymbol{\Delta CBB\_tree,i = CBBtreebsl,i - CBBtreepost,i}$

$\boldsymbol{\Delta CBB\_tree,i}$ = 6.78 - 4.48

$\boldsymbol{\Delta CBB\_tree,i}$ = 2.31 tCO_2*ha^{-1}

Table indicating the variation of carbon stock in belowground biomass per hectare at baseline.

UPA	CABtreebsl (tCO2e ha-1)	CABtreepos (tCO2e ha-1)	ΔCABtree (tCO2e ha-1)
UPA 01	6.78	4.48	2.31
UPA 02	14.32	9.45	4.87
UPA 03	101.13	66.75	34.38
UPA 04	127.80	84.35	43.45
UPA 05	82.82	54.66	28.16
UPA 06	83.38	55.03	28.35
UPA 07	105.24	69.46	35.78
UPA 08	88.71	58.55	30.16
UPA 09	109.42	72.22	37.20
UPA 10	114.38	75.49	38.89
UPA 11	104.80	69.17	35.63
UPA 12	107.30	70.82	36.48
UPA 13	115.36	76.13	39.22
UPA 14	112.61	74.32	38.29
UPA 15	92.43	61.00	31.42
UPA 16	94.55	62.40	32.15
UPA 17	119.22	78.68	40.53
UPA 18	87.98	58.06	29.91
UPA 19	112.99	74.58	38.42
TOTAL	**1,781.20**	**1,175.59**	**605.61**

Part. 2 Change in baseline carbon stock

$$\Delta C_{BSL,i,t} = AA_{planned,i,t} * (\Delta C_{AB_{tree},i} - \Delta C_{WP,i} + \Delta C_{AB_{non-tree},i} + \Delta C_{LI,i})$$
$$+(\sum_{t-10}^{t} A_{planned,i,t}) * (\Delta C_{BB_{tree},i} + \Delta C_{BB_{non-tree},i} + \Delta C_{DW,i}) * \left(\frac{1}{10}\right)$$
$$+(\textstyle\sum_{t-20}^{t} AA_{unplanned,i,t}) * \left(C_{WP100,i} + \Delta C_{SOC,i}\right) * \left(\frac{1}{20}\right)$$

Where:

$\boldsymbol{\Delta CBSL, i, t}$ = Sum of change in baseline carbon stocks in all stratum i land pools in Year t, tCO_2-e;

$\boldsymbol{AAplaneado, i, t}$ = Base annual planned deforestation area for stratum i in year t; ha;

$\boldsymbol{CWP100, i}$ = Stock of carbon entering the wood product pool at the time of deforestation that is expected to be emitted over 100 years from Stratum i; t CO_2- e ha-1;

$\boldsymbol{\Delta CAB_{tree}, i}$= Change in baseline carbon stock in aboveground tree biomass in stratum i; t CO_2-e ha-1;

$\boldsymbol{\Delta CBB_{tree}, i}$ = Change in baseline carbon stock in underground tree biomass in stratum i; t CO_2-e ha-1;

$\boldsymbol{\Delta CAB_{non} - tree}$,**I =** change in baseline carbon stocks in aboveground non-tree biomass in stratum i; tCO_2-e ha-1;

$\boldsymbol{\Delta CBB_{non} - tree, i}$ = Change in baseline carbon stock in subterranean non-tree biomass in stratum i; tCO_2-e ha-1;

$\boldsymbol{\Delta CWP, i}$ = Change in baseline carbon stocks in wood products in stratum i; t CO_2-e ha-1;

$\boldsymbol{\Delta CDW, i}$ = Change in base carbon stock in deadwood in stratum i; t CO_2-e ha-1;

$\boldsymbol{\Delta CLI, i}$ = Change in basal carbon stocks in the stratum i bed; t CO_2-e ha-1;

$\boldsymbol{\Delta CSOC, i}$ = Change in baseline carbon stocks in soil organic carbon in stratum i; t CO_2-e ha-1;

i 1, 2, 3, … M strata;

t 1, 2, 3, … t* years elapsed since the projected start of the project activity.

Parameter table:

AAplanned,i,t	CWP100,i	ΔCAB_tree,i	ΔCBB_tree,i	ΔCAB_non-tree,i	ΔCBB_non-tree,i	ΔCWP,i	ΔCDW,i	ΔCLI,i	ΔCSOC,i
1,725.5315	2.82	6.23	2.31	0	0	0	0	0	0

UPA	AAplanned,i,t	CWP100,i	ΔCAB_tree,i	ΔCBB_tree,i	ΔCAB_non-tree,i	ΔCBB_non-tree,i	ΔCWP,i	ΔCDW,i	ΔCLI,i	ΔCSOC,i	tCO2e
UPA 01	1,725.5315	2.82	6.23	2.31	0	0	0	0	0	0	231,734.0919
UPA 02	1,725.5315	2.82	13.16	4.87	0	0	0	0	0	0	354,197.4979
UPA 03	1,725.5315	2.82	92.93	34.38	0	0	0	0	0	0	1,765,126.9162
UPA 04	1,725.5315	2.82	117.43	43.45	0	0	0	0	0	0	2,198,495.4946
UPA 05	1,725.5315	2.82	76.10	28.16	0	0	0	0	0	0	1,467,443.6253
UPA 06	1,725.5315	2.82	76.62	28.35	0	0	0	0	0	0	1,476,672.3841
UPA 07	1,725.5315	2.82	96.71	35.78	0	0	0	0	0	0	1,831,904.4661
UPA 08	1,725.5315	2.82	81.52	30.16	0	0	0	0	0	0	1,563,266.7180
UPA 09	1,725.5315	2.82	100.55	37.20	0	0	0	0	0	0	1,899,796.2635
UPA 10	1,725.5315	2.82	105.10	38.89	0	0	0	0	0	0	1,980,409.9970
UPA 11	1,725.5315	2.82	96.30	35.63	0	0	0	0	0	0	1,824,701.7673
UPA 12	1,725.5315	2.82	98.60	36.48	0	0	0	0	0	0	1,865,337.5585
UPA 13	1,725.5315	2.82	106.00	39.22	0	0	0	0	0	0	1,996,307.0567
UPA 14	1,725.5315	2.82	103.48	38.29	0	0	0	0	0	0	1,951,698.6216
UPA 15	1,725.5315	2.82	84.93	31.42	0	0	0	0	0	0	1,623,638.1693
UPA 16	1,725.5315	2.82	86.88	32.15	0	0	0	0	0	0	1,658,125.6988
UPA 17	1,725.5315	2.82	109.55	40.53	0	0	0	0	0	0	2,059,062.3170
UPA 18	1,725.5315	2.82	80.84	29.91	0	0	0	0	0	0	1,551,316.3880
UPA 19	1,725.5315	2.82	103.83	38.42	0	0	0	0	0	0	1,957,901.2582
TOTAL	43,138.29	2.82	1,636.78	605.61							96,854,267.0042

Considering the total area of the project, the variation of the carbon stock in the baseline will be:

$\Delta CBSL,i,t$ = 96,854,267.0042

The variation in values related to the width of the roads is due to extremely unstable terrain, where there are drastic variations in unevenness at various points, alternating wet areas and firm terrain. In the management plan prepared for the highlighted area, for the dimensioning of these roads, only the roadway was considered, disregarding the cuts and embankments necessary for its implementation.

In this sense, this work considered, in addition to the carriageway, the landfills, cuts and crossings of streams and other water resources, where the correction of the ground level should be made to stabilize the slopes, so that there is structure for the transit of loaded vehicles and heavy, including areas for the necessary maneuvers. The stabilization of cut and fill slopes of natural slopes is of extreme importance, to avoid erosive processes, making the operation and transport of the necessary material, inefficient.

Table relating UPAs with areas degraded by the implementation of access and transport routes

UPA	Area UPA (ha)	Length of Tracks (m)	Estimated Width (m)	Total Area (m2)	Total Area (ha)
UPA 01	483.27	15,017.19	40	600,687.60	60.07
UPA 02	1,019.99	31,695.34	40	1,267,813.80	126.78
UPA 03	7,203.75	223,850.11	40	8,954,004.51	895.40
UPA 04	9,103.09	282,870.49	40	11,314,819.44	1.131.48
UPA 05	5,899.08	183,308.62	40	7,332,344.94	733.23
UPA 06	5,939.52	184,565.28	40	7,382,611.23	738.26
UPA 07	7,496.42	232,944.59	40	9,317,783.65	931.78
UPA 08	6,319.04	195,663.60	40	7,826,544.10	782.65
UPA 09	7,793.97	242,190.76	40	9,687,630.46	968.76
UPA 10	8,147.28	253,169.46	40	10,126,778.45	1.012.68
UPA 11	7,464.85	231,963.49	40	9,278,539.49	927.85
UPA 12	7,642.95	236,660.10	40	9,466,403.98	946.64
UPA 13	8,216.95	254,430.55	40	10,177,222.03	1.017.72
UPA 14	8,021.45	248,377.04	40	9,935,081.65	993.51
UPA 15	6,583.64	204,580.66	40	8,183,226.27	818.32
UPA 16	6,734.79	209,277.60	40	8,371,104,00	837.11
UPA 17	8,491.99	262,947.03	40	10,517,881.26	1,051.79
UPA 18	6,266.67	194,731.08	40	7,789,243.32	778.92

UPA 19	8,048.63	250,104.12	40	10,004,164.93	1,000.42
TOTAL	126,877.32	**3,938,347,13**	**40**	**157,533,885.11**	**15,753.39**

Table relating the UPAs with the areas degraded by the implementation of access and transport roads that was determined by multiplying the area degraded by the implementation of roads by the average carbon stock hectare, 1,676.87 tCO2e/ha.

Table of GHG emissions generated by the opening of access and transport routes

UPA	Road Area (ha)	Inventory Issued (CAB X1676,87)	Inventory Issued (CBB X620,44)	Total Stock (∑ CAB+CBB)
UPA 01	60.07	100,727.50	37,269.06	137,996.56
UPA 02	126.78	212,595.89	78,660.24	291,256.13
UPA 03	895,40	1,501,470.15	555,542.26	2,057,012.41
UPA 04	1,131.48	1,897,348.13	702,016.66	2,599,364.79
UPA 05	733.23	1,229,538.93	454,928.01	1,684,466.94
UPA 06	738.26	1,237,967.93	458,046.73	1,696,014.66
UPA 07	931.78	1,562,471.19	578,112.57	2,140,583.76
UPA 08	782.65	1,312,409.70	485,590.10	1,797,999.80
UPA 09	968.76	1,624,489.69	601,059.34	2,225,549.03
UPA 10	1,012.68	1,698,129.10	628,305.84	2,326,434.94
UPA 11	927.85	1,555,890.45	575,677.70	2,131,568.16
UPA 12	946.64	1,587,392.88	587,333.57	2,174,726.45
UPA 13	1,017.72	1,706,587.83	631,435.56	2,338,023.39
UPA 14	993.51	1,665,984.04	616,412.21	2,282,396.24
UPA 15	818.32	1,372,220.66	507,720.09	1,879,940.76
UPA 16	837.11	1,403,725.32	519,376.78	1,923,102.09
UPA 17	1,051.79	1,763,711.96	652,571.42	2,416,283.38
UPA 18	778.92	1,306,154.85	483,275.81	1,789,430.66
UPA 19	1,000.42	1,677,568.40	620,698.41	2,298,266.81
TOTAL	**15,753.39**	**26,416,384.59**	**9,774,032.37**	**36,190,416.96**

$\boldsymbol{\Delta CBSL,i,t}$ = 96,854,267.0042 + 36,190,416.96

$\boldsymbol{\Delta CBSL,i,t}$ = 133,044,683.6997 tCO_{2e}

Part 3. Greenhouse gas emissions

To determine greenhouse gas emissions from burning fossil fuels, the GHG Protocol tool was used, based on data obtained from the sustainable forest management plan.

Baseline GHG emissions within the project boundary shall be estimated as:

$$GHG_{BSL,E,i,t} = E_{FC,i,t} + E_{BiomassBurn,i,t} + N_2O_{direct-N,i,t}$$

Where:

$\boldsymbol{GHGBSL, E}$ = Greenhouse gas emissions as a result of deforestation activities within the limit project in stratum i in Year t; t CO_2-e;

$\boldsymbol{EFC, i, t}$ **=** Net CO_2-e emissions from the burning of fossil fuels in stratum i in year t; $_2$-e;

$\boldsymbol{EBiomassBurn, i, t}$ = Non-CO_2 emissions due to biomass burning in stratum i in year t; t CO_2-e;

$\boldsymbol{N2Odirect - N, i, t}$ = Direct emission of N_2O as a result of the application of nitrogen in alternative land use within the project boundary in stratum i in Year t; t CO_2-e;

$\boldsymbol{i}$ = 1, 2, 3, … M strata;

$\boldsymbol{t}$ =1, 2, 3, … t* years since the start of the REDD VCS project activity.

EFC, i, t	$EBiomassBurn, i, t$	$N2Odirect - N, i, t$
575,627.45 tCO2-e	0	0

For UPA 01

$\boldsymbol{GHGBSL, E}$ = 2,192.52 + 0 + 0

$\boldsymbol{GHGBSL, E}$ = 2,192.52 tCO_2e

For the total project area:

UPA	Areas	$GHG_{REDD\_BSL,SS,i,pool\#}$ TCO2e
UPA 1	164.3105	2,192.5212
UPA 2	346.7976	4,627.5875
UPA 3	2,449.2742	32,682.5533
UPA 4	3,095.0523	41,299.6681
UPA 5	2,005.6856	26,763.4092
UPA 6	2,019.4377	26,946.9142
UPA 7	2,548.7818	34,010.3603

UPA 8	2,148.4751	28,668.7587
UPA 9	2,649.9498	35,360.3230
UPA 10	2,770.0752	36,963.2490
UPA 11	2,538.0488	33,867.1416
UPA 12	2,598.6017	34,675.1450
UPA 13	2,793.7640	37,279.3467
UPA 14	2,727.2914	36,392.3511
UPA 15	2,238.4367	29,869.1866
UPA 16	2,289.8278	30,554.9377
UPA 17	2,887.2779	38,527.1743
UPA 18	2,130.6674	28,431.1379
UPA 19	2,736.5342	36,515.6845
TOTAL	**43,138.2897**	**575,627.4500**

The base net GHG emissions for the planned degradation shall be determined as:

For REDD project activities (non-wet):

$$\Delta C_{BSL,planned} = \sum_{t=1}^{t*} \sum_{i=1}^{M} \left(\Delta C_{BSL,i,t} + GHG_{BSL-E,i,t} \right)$$

For APWD-REDD (terrestrial carbon stocks) project activities, we have:

$\Delta CBSL, i, t$	$GHGBSL - e, i, t$	$\Delta CBSL, planned$
133,044.683.6997	575,627.45	133,044,683.6997 tCO_2e

Result:

$\boldsymbol{\Delta CBSL, planned}$ = 137,046,740.3712 + 575,627.45

$\boldsymbol{\Delta CBSL, planned}$ = 137,622,367.8212 tCO_2e

Part 4. Baseline renewal frequency

The baseline will be reviewed every ten years for ongoing planned deforestation.

4.1.3 Baseline - long-term wood products

For long-term baseline of wood products, the *VMD0005 - Estimate of carbon stocks in the pool of long-term wood products (CP-W)*, V. 1. 1, on carbon storage module was used.

Adjusting the areas of the UPAs of the Sustainable Forest Management Plan (135.282,9279 ha) proportionally to the area of the VCUs project (126.157,82 ha). Discount:

1. Zone of silence 4,028.3262 ha;
2. Permanent protection areas 8,337.3521 ha;
3. Degraded areas by riparian communities 6,480.2599 ha;
4. Belt of 50 around the areas degraded by the riparian 3,626.2599 ha.

UPA	Forest management plan area	Adjust the project area
UPA 01	515.28	483.27
UPA 02	1,087.57	1,019.99
UPA 03	7,680.99	7,203.75
UPA 04	9,706.17	9,103.09
UPA 05	6,289.89	5,899.08
UPA 06	6,333.02	5,939.52
UPA 07	7,993.05	7,496.42
UPA 08	6,737.68	6,319.04
UPA 09	8,310.32	7,793.97
UPA 10	8,687.04	8,147.28
UPA 11	7,959.39	7,464.85
UPA 12	8,149.29	7,642.95
UPA 13	8,761.33	8,216.95
UPA 14	8,552.86	8,021.45
UPA 15	7,019.80	6,583.64
UPA 16	7,180.97	6,734.79
UPA 17	9,054.59	8,491.99
UPA 18	6,681.83	6,266.67

UPA 19	8,581.85	8,048.63
TOTAL	**135,282.93**	**12,6877.32**

OPTION1

Direct volume extraction estimate

- **Step 1:** identify the class of wood products (es) (*ty*; defined here as saw wood, wood-based panels, other industrial stalks, paper, and others) which are the anticipated end use of the extracted carbon calculated in Step 2.

- **Step 2:** calculate biomass carbon from the volume extracted by the type of wood product from within the project boundary:

Equation for estimation of biomass stock extracted by stratum:

$$C_{XB,ty,i} = \frac{1}{A_i} * \sum_{j=1}^{S} (V_{ex,ty,j,i} * D_j * CF_j * \frac{44}{12})$$

Where:

$\boldsymbol{CXB, ty, i}$ = Carbon stock of biomass extracted by wood product class ty of stratum i; t CO2-e ha-1;

$\boldsymbol{Ai}$ = Total area of stratum *i*; ha;

$\boldsymbol{Vex, ty, j}$ = Volume of wood extracted from within stratum i (does not include bar left in place) by species j and wood product class ty; m3;

$\boldsymbol{Dj}$ = Average wood density of species j; t d.m.m-3;

$\boldsymbol{CFj}$ = Biomass carbon fraction for tree species j; t C t-1 d.m.;

j 1, 2, 3, … = Tree species

$\boldsymbol{ty}$ = Class of wood products – defined here as SAWNWOOD(S), wood-based panels (W), other industrial roundwood (OIR), paper and paper board (P), and others (O);

$\mathbf{44/12}$ = Molecular weight ratio of CO2 to carbon, t CO2-, and t C-1.

$\boldsymbol{Ai}$ (ha)	$\boldsymbol{Vex, ty, j}$	$\boldsymbol{Dj}$	$\boldsymbol{CFj}$	Razão de peso molecular de (CO_2)
126,157.82	1,834.2665	0.66	0.47	44/12

$\boldsymbol{CXB, ty, i} = 4.25$

Equation for estimating carbon stock in wood products reservoir

Step 3: Calculate the biomass extracted from carbon entering the pool (stock) of wood products at the time of deforestation.

$$C_{WP,i} = \sum_{ty=s,w,oir,p,o} C_{XB,ty,i} * (1 - WW_{ty})$$

Where:

$\boldsymbol{CWP, i}$ = Carbon stock entering the pool of wood products of stratum i; t CO2-e ha-1;

$\boldsymbol{CXB, ty, i}$ = Carbon stock of biomass extracted by wood product class ty of stratum i; t CO2-e ha-1;

$\boldsymbol{WWty}$ = wood waste. The fraction immediately emitted through the inefficiency of the mill by wood product class ty; dimension;

$\boldsymbol{ty}$ = Class of wood products – defined here as SAWNWOOD(S), wood-based panels (W), other industrial roundwood (OIR), paper and paper board (P), and others (O);

$\boldsymbol{i}$ = *1, 2, 3, …* Estratos M.

$\boldsymbol{CXB, ty, i}$	$\boldsymbol{WWty}$
4.25	0.24[15]

[15] Winjum, J.K., Brown, S. and Schlamadinger, B. 1998. Forest harvests and wood products: sources and sinks of atmospheric carbon dioxide. Forest Science 44: 272-284

$$\boldsymbol{CWP, i = 3.23}$$

Step 4: Calculate the number of wood products entering the reservoirs at the time of deforestation (CWP, i, calculated in C-WP) to be issued over a 100-year term.

$$\boldsymbol{CWP100, i = CWP, i – CWP, i * (1 - SLFp) * (1 - Ofp)}$$

Where:

$\boldsymbol{CWP100, i}$ = Carbon stock entering the pool of wood products at the time of deforestation that is expected to be emitted over 100 years from strata *i*; t CO_2-e ha^{-1};

$\boldsymbol{CWP, I}$ = Carbon stock entering the wood product pool at the time of Stratum deforestation *i*; t CO_2-e ha^{-1};

$\boldsymbol{SLFty}$= Fraction of wood products that will be emitted into the atmosphere within five years of wood harvest by wood product class ty; dimensionless;

$\boldsymbol{0fp}$= Fraction of wood products that will be emitted into the atmosphere between 5 and 100 years of wood harvest per class of wood products ty; dimensionless;

$\boldsymbol{ty}$= Wood product class-defined here as sawn wood (s), wood-based panels (w), other round wood industrial (oir), paper and paper board (p), and others (o);

$\boldsymbol{i}$ = *1, 2, 3,* … Strata M.

CWP, i	$SLFp = CWP, i/ CXB, ty, I$	Ofp
3.23	0.2	0.84

$\boldsymbol{CWP100, i = CWP, i – CWP, i * (1 - SLFp) * (1 - Ofp)}$

$\boldsymbol{CWP100, i}$ = 3.23 – 3.23∗ (1 – 0.48) ∗ (1 – 0.2)

$\boldsymbol{CWP100, i}$ = 2.82 t CO_2-e ha^1

4.2 Project Emissions

For the calculation of project emissions, the guidelines, criteria, and assumptions contained in Section 8 – Quantification of GHG Emission Reductions and Removals - of the VCS M0007 methodology, v1.6 were used. In particular, the VMD0015 module deals specifically with the monitoring of GHG emissions and removals in REDD and CIW (M-REDD) V. 2.2 projects.

4.2.1 Monitoring GHG emissions and removals in REDD and CIW projects (M-REDD) – (VMD0015)

For the project area of REDD project activities, net GHG emissions, in the case of the project, are equal to the sum of stock changes due to deforestation and forest degradation, plus total GHG emissions, minus any eligible increase in forest carbon stock:

$$\boldsymbol{\Delta CWPS - REDD} = \boldsymbol{\Sigma\Sigma}(\boldsymbol{\Delta CP, DefPA, i, t} + \boldsymbol{\Delta CP, Deg, i, t} + \boldsymbol{\Delta CP, DistPA, i, t} + \boldsymbol{GHGP - E, i, t} - \boldsymbol{\Delta CP, Enh, i, t})$$

Where:

$\boldsymbol{CWPS - REDD}$ = Net GHG emissions in the REDD project scenario to the year $t*$; t CO_2-e;

$\boldsymbol{\Delta CP, DefPA, i, t}$ = Net change in carbon stock as a result of deforestation in the project area in the case of the project in the stratum *i* in the year *t*; t CO_2-e;

$\boldsymbol{\Delta CP, Deg, i, t}$ = Net change in carbon stock as a result of degradation in the project area in the case of the project in the stratum *i* in the year *t*; t CO_2-e;

$\boldsymbol{\Delta CP, DistPA, i,t}$ = Net change in carbon stock as a result of natural disturbance in the project area in the case of the project in the stratum *i* in the year *t*; t CO_2-e;

$\boldsymbol{GHGP - E, i, t}$ = Greenhouse gas emissions as a result of deforestation and degradation activities within the project area in the case of the project in the stratum *i* in the year *t*; t CO_2-e;

$\boldsymbol{\Delta CP, Enh, i, t}$= Net change in carbon stock as a result of forest growth and sequestration during the project in areas projected to be deforested at baseline2 in the stratum *i* in the year t; t CO_2-e;

$\boldsymbol{i}$ = 1, 2, 3, … Strata M;

$\boldsymbol{t}$ = 1, 2, 3, … t* years elapsed since the start of the project activity.

Carbon variation in aboveground biomass

For estimating the variation in biomass, it was decided to insert variations in biomass resulting from forest growth at this point. The rate used was based on the values indicated in 2006 IPCC (Guidelines for National Greenhouse Gas Inventories - TABLE 4.9 ABOVE-GROUND NET BIOMASS GROWTH IN NATURAL FORESTS Chapter 4: Forest Land). for the indication of biomass increment rate, the average value of 9,32t/ha/year was adjusted to 16,06tCO2e/ha/year to represent the increment rate in tons of carbon equivalent.

Table indicating the increment of carbon stored in biomass resulting from forest regeneration.

UPA	Área Degrada (ha)	ΔCP,DefPA,i,t	GHG REDD	ΔCP,Enh	$\Delta CWPS\text{–}REDD$
UPA 01	164.3105	0.0000	0.0000	63,331.83	63,331.83
UPA 02	346.7976	0.0000	0.0000	128,100.09	128,100.09
UPA 03	2,449.2742	0.0000	0.0000	865,377.56	865,377.56
UPA 04	3,095.0523	0.0000	0.0000	994,130.79	994,130.79
UPA 05	2,005.6856	0.0000	0.0000	612,014.91	612,014.91
UPA 06	2,019.4377	0.0000	0.0000	583,779.06	583,779.06
UPA 07	2,548.7818	0.0000	0.0000	695,868.41	695,868.41
UPA 08	2,148.4751	0.0000	0.0000	552,072.15	552,072.15
UPA 09	2,649.9498	0.0000	0.0000	638,372.91	638,372.91
UPA 10	2,770.0752	0.0000	0.0000	578,336.31	578,336.31
UPA 11	2,538.0488	0.0000	0.0000	489,132.77	489,132.77
UPA 12	2,598.6017	0.0000	0.0000	417,335.43	417,335.43
UPA 13	2,793.7640	0.0000	0.0000	358,942.80	358,942.80
UPA 14	2,727.2914	0.0000	0.0000	306,602.10	306,602.10
UPA 15	2,238.4367	0.0000	0.0000	215,695.76	215,695.76
UPA 16	2,289.8278	0.0000	0.0000	183,873.17	183,873.17
UPA 17	2,887.2779	0.0000	0.0000	139,109.05	139,109.05
UPA 18	2,130.6674	0.0000	0.0000	68,437.04	68,437.04
UPA 19	2,736.5342	0.0000	0.0000	0.00	0.00
TOTAL	**43,138.2897**	**0.0000**	**0.0000**	**7,890,512.13**	**7,890,512.13**

4.3 Leakage

For the calculation of emissions by leakage of the project, the guidelines, criteria, and assumptions contained in Section 8 – Quantification of GHG Emissions Reductions and Removals - of the VCS VM0007, v1.6 methodology were used, specifically the modules namely: VMD0009, VMD0011, VMD0012, and VMD0044, better described below:

4.3.1 Estimate emissions from activity change to prevent planned deforestation/forest degradation and prevent planned wetland degradation (VMD0009) (LK-ASP), v1.3.

- **Part 1: Where the Specific Deforestation Agent was identified.**

$$\Delta C_{LK-AS,planned} = \sum_{t=1}^{t*} \sum_{i=1}^{M} \left(LKA_{planned,i,t} \times \Delta C_{BSL,i} \right) + GHG_{LK,E,i,t}$$

Where:

$\boldsymbol{\Delta CLK - AS}$ = *net planned emissions* of greenhouse gases due to the leakage of activity change to projects preventing planned deforestation by the year $t*$ (t CO_2e);

$\boldsymbol{LKAplanejado, i, t}$ = The area of activity displacing leakage in the stratum *i* in the year *t* (ha);

$\boldsymbol{\Delta CBSL, i}$ = Net change in carbon stock in all pre-deforestation reservoirs in the baseline stratum *i* (t CO_2e ha^{-1});

$\boldsymbol{GHGLK, E, i, i, t}$ = Greenhouse gas emissions as a result of leakage from prevent deforestation activities in the stratum *i* in the year *t* (t CO_2e);

$\boldsymbol{i}$ = 1, 2, 3, … *Stratum* M (without unit);

$\boldsymbol{t}$ = 1, 2, 3, … $t*$ time elapsed since the start of the project activity (years);

$LKAplanejado, i, t = 43.830{,}96$

$\boldsymbol{\Delta CBSL, i}$= 0

$\boldsymbol{GHGLK, E, i, i, t}$= $117{,}229.02$

$\boldsymbol{\Delta CLK - AS}$ = $117{,}229.02$

UPA	LKAplanned	ΔCBSL, i	GHG LK,E,i,t	ΔCLK-AS, planned
UPA 01	166.95	0.00	446.52	446.52
UPA 02	352.37	0.00	942.43	942.43
UPA 03	2,488.60	0.00	6,655.94	6,655.94
UPA 04	3,144.75	0.00	8,410.86	8,410.86
UPA 05	2,037.89	0.00	5,450.48	5,450.48
UPA 06	2,051.86	0.00	5,487.86	5,487.86
UPA 07	2,589.71	0.00	6,926.36	6,926.36
UPA 08	2,182.97	0.00	5,838.52	5,838.52
UPA 09	2,692.50	0.00	7,201.28	7,201.28
UPA 10	2,814.55	0.00	7,527.73	7,527.73
UPA 11	2,578.80	0.00	6,897.19	6,897.19
UPA 12	2,640.33	0.00	7,061.74	7,061.74
UPA 13	2,838.62	0.00	7,592.10	7,592.10
UPA 14	2,771.08	0.00	7,411.46	7,411.46
UPA 15	2,274.38	0.00	6,082.99	6,082.99
UPA 16	2,326.60	0.00	6,222.65	6,222.65
UPA 17	2,933.64	0.00	7,846.23	7,846.23
UPA 18	2,164.88	0.00	5,790.12	5,790.12
UPA 19	2,780.47	0.00	7,436.58	7,436.58
TOTAL	**43,830.96**		**117,229.02**	**117,229.02**

Step 1) Determination of the Base Rate of Forest Deforestation by Deforestation.

$$\boldsymbol{WoPRi,t = a + b \times t}$$

Where:

$\boldsymbol{WoPRi,t}$= Deforestation by the base agent of the planned deforestation in the absence of the project in the stratum *i* in the year *t*[3] (ha);

$\boldsymbol{a}$= estimated regression line intercept (ha);

$\boldsymbol{b}$ = Linear regression slope (ha yr^{-1});

$\boldsymbol{t}$ = 1, 2, 3, … $t*$ elapsed time since the projected beginning of the years of project activity).

<u>**Result:**</u> it does not apply, as there is no pre-project deforestation.

Step 2) Estimate new forest clearance projection by Deforestation Baseline Agent with project implementation if no leakage.

Subtract the total area of the baseline planned deforestation project from the historical area of deforestation to calculate the new area.

$$NewR_{i,t} = WoPR_{i,t} - \left(D\%_{planned,i,t} \times A_{planned,i}\right)$$

Where:

$\boldsymbol{NewRi,t}$ **=** New forest clearance calculated in the stratum *i* in the year *t* by baseline agent of planned deforestation where no leakage is occurring (ha);
$\boldsymbol{WoPRi,t}$ **=** Deforestation by the baseline agent of planned deforestation in the stratum *i* in year *t* in the absence of the project (ha);

$\boldsymbol{D\%planejado,i,t}$ **=** Projection of annual proportion of land that will be deforested in the stratum project *i* inyear *t* (%);

$\boldsymbol{Aplaned,i,}$ **=** Total area of planned deforestation during the base period for the stratum project *i* (ha);

$\boldsymbol{i}$ =1, 2, 3, … *Stratum* M (without unit);

$\boldsymbol{t}$ **=** 1, 2, 3, … $t*$ time elapsed since the projected start of the project activity (years).

UPA	WoPRi,t	D%planned,i,t	Aplanned,i,	NewRi,t
UPA 01	0.22	0.38%	164.31	0
UPA 02	0.96	0.80%	346.80	0
UPA 03	48.04	5.68%	2,449.27	0
UPA 04	38.36	3.59%	3,095.05	0
UPA 05	32.22	4.65%	2,005.69	0
UPA 06	32.66	4.68%	2,019.44	0
UPA 07	52.02	5.91%	2,548.78	0
UPA 08	36.97	4.98%	2,148.48	0
UPA 09	56.24	6.14%	2,649.95	0
UPA 10	30.72	3.21%	2,770.08	0

UPA 11	51.59	5.88%	2,538.05	0
UPA 12	27.04	3.01%	2,598.60	0
UPA 13	31.25	3.24%	2,793.76	0
UPA 14	59.57	6.32%	2,727.29	0
UPA 15	40.13	5.19%	2,238.44	0
UPA 16	41.99	5.31%	2,289.83	0
UPA 17	33.38	3.35%	2,887.28	0
UPA 18	36.36	4.94%	2,130.67	0
UPA 19	29.99	3.17%	2,736.53	0
TOTAL	679.68		43,138.29	0

Step 3) Monitor all deforested areas by the Deforestation Baseline Agent through the years in which planned deforestation was predicted to occur.

$$LKAplanned, i, t \Delta AdefLK, i, t - NewRi, t$$

Where:

$\boldsymbol{LKAplaned, i, t}$ = The area of activity displacing leakage in the stratum *i* in the year *t* (ha);
$\boldsymbol{NewRi, t}$ = New forest clearance calculated by the base agent of the planned deforestation in the stratum *i* in the year when no leakage occurs (ha);
$\boldsymbol{AdefLK, i, t}$ = The total area of deforestation monitored by the baseline agent of the planned deforestation in the stratum *i* in the year *t* (ha);
$\boldsymbol{i}$ = 1, 2, 3, ... *Stratum* M (without unit);
$\boldsymbol{t}$ = 1, 2, 3, ... t^* time elapsed since the start of the project activity (years).

$NewRi, t(ha)$	$AdefLK, i, t(ha)$
0	164.31 ha

$\boldsymbol{LKAplaned, i, t} = AdefLK, i, t - NewRi, t$

$\boldsymbol{LKAplaned, i, t}$ = 164.31 – 0

$\boldsymbol{LKAplaned, i, t}$ = 164.31 ha

Area to be monitored at UPA 01 = 164.31 ha

Therefore, for each UPA and consequently for the total project area, we have:

UPA	$AdefLK,i,t$	$NewRi,t$	$LKAplaned,i,t$
UPA 01	164.31	0.6258	163.68
UPA 02	346.80	2.78797	344.01
UPA 03	2,449.27	139.063	2,310.21
UPA 04	3,095.05	111.030	2,984.02
UPA 05	2,005.69	93.2529	1,912.43
UPA 06	2,019.44	94.5361	1,924.90
UPA 07	2,548.78	150.592	2,398.19
UPA 08	2,148.48	107.003	2,041.47
UPA 09	2,649.95	162.784	2,487.17
UPA 10	2,770.08	88.9385	2,681.14
UPA 11	2,538.05	149.3265	2,388.72
UPA 12	2,598.60	78.2684	2,520.33
UPA 13	2,793.76	90.4662	2,703.30
UPA 14	2,727.29	172.424	2,554.87
UPA 15	2,238.44	116.152	2,122.28
UPA 16	2,289.83	121.546	2,168.28
UPA 17	2,887.28	96.6238	2,790.65
UPA 18	2,130.67	105.236	2,025.43
UPA 19	2,736.53	86.7978	2,649.74
TOTAL	**43,138.29**	**0**	**41,170.83**

4.3.2 Estimate market effects emissions (VMD0011) (LK-ME), v1.1

Step 1) Procedure

The total leakage due to market effects is equal to the sum of the market effect leaks through the decrease in the wood harvest and the decrease in the harvest for the production of firewood/charcoal.

In addition, if leakage management activities are established within areas under the control of the project proponent, in order to minimize the displacement of land use activities to areas outside the project area while maintaining total biomass production in commercial species that are marketable, a leakage management system adjustment factor ($LKMAF$) can be applied. The leak management adjustment factor discounts the value $LKCP-ME,c,i$ in a proportion equal to the annual volume of biomass in commercial species that is marketable, produced by the spill management areas in relation to the total annual volume that would have been produced in the project area in the absence of the project, as follows:

$$LKMAF = 1 - (PRODMBLMA,t / PRODMB\,BL,t)$$

Where:

$LKMAF$= Leak management adjustment factor (dimensionless);

$PRODMBLMA,t$ = Biomass production in commercial species that can be marketed in the year *t,* in leak management areas (*t* per year);

$PRODMBBL,t$ = Biomass production in commercial species that are marketed in the year *t,* in the case of the baseline (*t* per year);

t = 1, 2, 3, ... t* time elapsed since the beginning of the project activity (years).

$LKMAF$ = 1 – (PRODMBLMA,t / PRODMBBL,t)

$LKMAF$ = 1 – (45,324,946.24/ 133,308,665.4106)

$LKMAF$ = 1- (0.34)

$LKMAF$ = 0.66

Leak management adjustment factor = 0.66

Step 2) The carbon emission due to displaced logging has two components: the carbon from biomass of the extracted wood) and the carbon from biomass in the forest damaged in the logging process:

$$C_{BSL,XBT\,j,t} = \left(\left(V_{BSL,XE\,j,t} \times D_{mn} \times CF\right) + \left(V_{BSL,XE\,j,t} \times LDF\right) + \left(V_{BSL,XE\,j,t} \times LIF\right)\right) \times \frac{44}{12}$$

Where:

$CBSL, XBT, i, t$ = Carbon emission due to wood harvests in the baseline scenario in the stratum i no ano t ($t\ CO_2e$);

$VBSL, EX, i, t$ = Volume of wood projected to be harvested within the project boundary during the baseline in stratum i in year t (m^3);

Dmn = Average wood density of commercially harvested species ($t\ d.m.m^{-3}$);

CF = Biomass carbon fraction for commercially harvested species j ($t\ C\ t\ d.m.^{-1}$);

LDF = Wood log damage factor ($t\ C\ m^{-3}$);

LIF = Registry infrastructure factor ($t\ C\ m^{-3}$);

i = 1, 2, 3, ... strata M;

t = 1, 2, 3, ... t^* elapsed time since the project activity's projected start (years).

Table and data extracted from the Sustainable Forest Management Plan

EXPECTED PRODUCTIVITY	5,049.773 M^3
EFFECTIVE AREA	459.59 HA
PRODUCTIVITY	10.98 M^3/HA

Dmn $d.m.m^{-3}$	CF $t\ C\ t\ d.m.^{-1}$	LIF	LDFc $t\ C\ m^{-3}$
0.63	0.47	0.29	0.53

Table Carbon emissions due to wood harvests in baseline scenario in stratum i in year t (tCO2e).

UPA	Área (ha)	$VBSL, EX, i, t$ (m3)	Dmn ($d.m.m^{-3}$)	CF ($t\ C\ t\ d.m.^{-1}$)	LIF	LDFc ($t\ C\ m^{-3}$)	Cbsl,xbt,i (tCO_2e)
UPA-01	164.31	1,805.28	0.63	0.47	0.29	0.53	7.387.86
UPA-02	346.80	3,810.27	0.63	0.47	0.29	0.53	15,593.00
UPA-03	2,449.27	26,910.18	0.63	0.47	0.29	0.53	110,126.31
UPA-04	3,095.05	34,005.34	0.63	0.47	0.29	0.53	139,162.32
UPA-05	2,005.69	22,036.47	0.63	0.47	0.29	0.53	90,181.31
UPA-06	2,019.44	22,187.56	0.63	0.47	0.29	0.53	90,799.64
UPA-07	2,548.78	28,003.47	0.63	0.47	0.29	0.53	114,600.45
UPA-08	2,148.48	23,605.30	0.63	0.47	0.29	0.53	96,601.52

UPA-09	2,649.95	29,115.00	0.63	0.47	0.29	0.53	119,149.25
UPA-10	2,770.08	30,434.82	0.63	0.47	0.29	0.53	124,550.43
UPA-11	2,538.05	27,885.54	0.63	0.47	0.29	0.53	114,117.86
UPA-12	2,598.60	28,550.84	0.63	0.47	0.29	0.53	116,840.49
UPA-13	2,793.76	30,695.09	0.63	0.47	0.29	0.53	125,615.54
UPA-14	2,727.29	29,964.75	0.63	0.47	0.29	0.53	122,626.75
UPA-15	2,238.44	24,593.70	0.63	0.47	0.29	0.53	100,646.46
UPA-16	2,289.83	25,158.34	0.63	0.47	0.29	0.53	102,957.15
UPA-17	2,887.28	31,722.52	0.63	0.47	0.29	0.53	129,820.19
UPA-18	2,130.67	23,409.64	0.63	0.47	0.29	0.53	95,800.84
UPA-19	2,736.53	30,066.30	0.63	0.47	0.29	0.53	123,042.33
	43,138.29	**473,960.39**					**1,939,619.70**

Step 3) Estimate emissions associated with displaced logging activity. This is based on the total volume that would have been recorded at baseline in the project area across all strata and time periods:

$$AL_{T,i} = \sum_{t=1}^{t} \left(C_{BSL,XBT,i,t} \right)$$

Where:

$\boldsymbol{ALT, i}$ **=** Added emissions from timber harvesting in stratum i, in the case of interlaced references through the implementation of the Carbon Project (t CO_2e);

$\boldsymbol{CBSL, XBT, i, t}$ **=** Carbon emission due to displaced timber harvests in the baseline scenario in stratum i in the year *t* (*t* CO_2e);

$\boldsymbol{i}$ **=** 1, 2, 3, ... Strata M;

$\boldsymbol{t}$ =1, 2, 3, ... *t* * time elapsed since the start of the REDD project activity project (years).

$\boldsymbol{ALT, i}$ **=**$\sum$

$\boldsymbol{CBSL, XBT, i, t}$= 1,970,764.18

$\boldsymbol{ALT, i}$ **=** 1,970,764.18

$$LK_{MarketEffects,timber} = \sum_{i=1}^{M} \left(LF_{ME} \times LK_{MAF} \times AL_{T,i} \right)$$

UPA	Area (ha)	LFME	LKMAF	AL	LKMARKETT,timber
UPA-01	163.6846	7,387.8641	0.53	0.66	2,584.2749
UPA-02	344.0096	15,593.0019	0.53	0.66	5,454.4321
UPA-03	2,310.2110	110,126.3051	0.53	0.66	38,522.1815
UPA-04	2,984.0215	139,162.3169	0.53	0.66	48,678.9785
UPA-05	1,912.4326	90,181.3069	0.53	0.66	31,545.4211
UPA-06	1,924.9015	90,799.6405	0.53	0.66	31,761.7142
UPA-07	2,398.1896	114,600.4498	0.53	0.66	40,087.2373
UPA-08	2,041.4716	96,601.5242	0.53	0.66	33,791.2132
UPA-09	2,487.1655	119,149.2499	0.53	0.66	41,678.4076
UPA-10	2,681.1366	124,550.4290	0.53	0.66	43,567.7401
UPA-11	2,388.7222	114,117.8637	0.53	0.66	39,918.4287
UPA-12	2,520.3332	116,840.4915	0.53	0.66	40,870.8039
UPA-13	2,703.2977	125,615.5437	0.53	0.66	43,940.3172
UPA-14	2,554.8664	122,626.7459	0.53	0.66	42,894.8357
UPA-15	2,122.2847	100,646.4556	0.53	0.66	35,206.1302
UPA-16	2,168.2812	102,957.1453	0.53	0.66	36,014.4094
UPA-17	2,790.6540	129,820.1920	0.53	0.66	45,411.1032
UPA-18	2,025.4304	95,800.8433	0.53	0.66	33,511.1350
UPA-19	2,649.7363	123,042.3271	0.53	0.66	43,040.2060
TOTAL	**41,170.83**	**1,939,619.70**	**0.53**	**0.66**	**678,478.9698**

Total GHG emissions due to leakage of market effects through decreased timber harvest **LKMarketEffects,timber = 678,478.9698 7tC02e.**

Step 4) Determination of fuel wood leakage.

$$\boldsymbol{LKFCMAF = 1 - (PRODFCLMA, t \,/\, PRODFCBL, t)}$$

Where:

$\boldsymbol{LKFCMAF}$ = Fuel wood/coal leakage management adjustment factor (no dimension);

$\boldsymbol{PRODFCLMA, t}$ = Production of fuel wood/charcoal in year t, in areas of leak management (t per year);

$\boldsymbol{PRODFCBL, t}$ = Production of firewood/coal *in year t* in the case of baseline (t per year);

$\boldsymbol{t} = 1, 2, 3, \ldots\ t^*$ time elapsed since the beginning of the project activity (years).

$\boldsymbol{PRODFCLMA, t}$	$\boldsymbol{PRODFCBL, t}$
0	0

$\boldsymbol{LKFCMAF} = 1 - (\mathrm{PRODFCLMA, t} \,/\, \mathrm{PRODFCBL, t})$

$\boldsymbol{LKFCMAF}$ = 1 – (0 / 0)

$\boldsymbol{LKFCMAF}$ = 1

Step 6) Estimation of emissions associated with the displaced harvesting activity.

$$AL_{FW/C,i} = \sum_{t=1}^{t} C_{BSL,XBFWC,i,t}$$

Where:

$\boldsymbol{ALFW/C, i}$ = Combined emissions from fuel wood/charcoal crops in stratum i in the case of the baseline potentially displaced through carbon implementation (t CO2e);

$CBSL, XBFWC, t$ = Carbon emission due to displaced harvests of fuel wood/charcoal in stratum i in the baseline scenario in year t *(t* CO2e);

$i = 1, 2, 3, \ldots$ M strata;

$t = 1, 2, 3, \ldots$ $t*$ time elapsed since the projected start of the REDD project activity (years).

$CBSL, XBFWC, t$
0

$ALFW/C, i$ = 0

The carbon emission due to displaced crops is calculated from the volume that would likely be extracted in the baseline scenario, minus any firewood provided in the project scenario:

$$C_{BSL,XBFWC,i,t} = \left(\left(FG_{BSL,i,t} \times D_{mn} \times CF\right) - \left(FG_{LP,i,t} \times D_{mn} \times CF\right)\right) \times \frac{44}{12}$$

Where:

$CBSL, XBFWC, i, t$ = Likely carbon emission due to displaced harvests of fuel/coal wood in the baseline scenario in stratum i in year t *(t* CO2e);

$FGBSL, i, t$ = Projected average annual volume of firewood to be collected in the project area in the base scenario in stratum i in *year t* (m3 $^{year-1}$);

$FGLP, i, t$ = Volume of fuel wood collected in the project area and in areas designated by the leak prevention project (i.e. fuel wood plantations) according to the monitoring results in stratum i in year *t* (m3 $^{yr-1}$);

Dmn = Average wood density of commercially harvested species (t d.m.m-3);

CF = Biomass carbon fraction for commercially harvested species j (t C t-1 d.m.);

i = 1, 2, 3, … MB strata in baseline scenario;

$\boldsymbol{t}$ = 1, 2, 3, … t* time elapsed since the projected start of the REDD project activity (years).

If as calculated in equation 7 is <0, then C$\boldsymbol{CBSL, XBFWC, i, t}_{BSL,XBFWC,i,t}$ must be defined equal to 0 (this prevents positive leakage).

$FGBSL, i, t$	$FGLP, i, t$	Dmn	CF
0	0	0.63	0.47

$$\boldsymbol{CBSL, XBFWC, i, t} = ((\boldsymbol{FGBSL, i, t} * \boldsymbol{Dmn} * \boldsymbol{CF}) - (\boldsymbol{FGLP, i, t} * \boldsymbol{Dmn} * \boldsymbol{CF}))/44/12$$

$\boldsymbol{CBSL, XBFWC, i, t}$ = ((0*0.63*0.47) – (0*0.63*0.47))/44/12

$\boldsymbol{CBSL, XBFWC, i, t}$ = 0

4.3.3 Estimate displacement emissions from firewood extraction (VMD0012) (LK-DFW), v1

Calculation of emissions due to leakage of activity change

Step 1) For each monitoring period, estimate the average annual amount of proven renewable biomass collected (in MG) and the volume of fuel wood collected in the project area (if any). The basic fuel wood collection rate minus this project rate and proven renewable biomass give an estimate of the non-renewable biomass harvested as a result of the implementation of the project activity. Estimates will be obtained through a Participatory Rural Assessment (PRA).

$$NRB_t = \sum_{i=1}^{M} \left(\frac{\left(FG_{BSL,i,t} - FG_{PA,i,t}\right) * D_{mn}}{0.9} \right) - DRB_t$$

Where:

$\boldsymbol{NRBt}$ **=** Non-renewable biomass collected for fuel and/or charcoal production as a result of project implementation at present *t*; t d.m.;

$\boldsymbol{FGBSL,i,t}$ **=** Projected average Volume of wood harvested in the project area for fuel and/or charcoal production in the baseline scenario in the stratum *i* in the year *t*; m^3 (from BI-DFW module);

$\boldsymbol{FGPA,i,t}$ **=** Volume of fuel wood collected in the project area from the stratum *i* at the moment *t*; m^3;

$\boldsymbol{DRBt}$ **=** Proven renewable biomass currently collected *t*; t.m.;

$\boldsymbol{Dmn}$ **=** Average wood density of commercially harvested species; t $d.m.m^{-3}$;

$\boldsymbol{CF}$**=** Carbon fraction of dry matter; t C t. d. $m.^{-1}$;

$\boldsymbol{i}$ =1, 2, 3**...** *Strata M* in the baseline scenario;

$\boldsymbol{t}$ **=** 1, 2, 3, **...** $t*$ years since the projected start of REDD project activity.

$FGBSL, i, t$	$FGPA, i,$	Dmn	DRB
0	0	0.63	0

$NRBt$ = ((0 – 0 * 0.63)/0.9)- 0

$NRBt$= 0

Step 2) The leakage of greenhouse gas emissions due to the displacement of fuel wood collection should be estimated as follows:

$$GHG_{LK,E,t} = NRB_b * GHG_{E,FACTOR}$$

$$GHG_{E,FACTOR} = \frac{GHG_{BSL,E}}{\left(\left(FG_{BSL} * D_{mn}\right)/0.9\right)}$$

$$FG_{BSL} = \sum_{t=1}^{t*} \sum_{i=1}^{M} FG_{BSL,i,t}$$

Where:

$\boldsymbol{GHGLK,E,tE,tE,t}$ = Greenhouse gas emissions as a result of leakage from degradation activities; t CO^2-e;

$\boldsymbol{GHGE, FACTOR}$ = Greenhouse gas emissions in relation to biomass collected as a result of leakage from degradation activities; t CO^2- e/t d.m.;

$\boldsymbol{GHGBSL, E}$ = Greenhouse gas emissions as a result of degradation activities within the project boundary at the baseline; t CO^2-e;

$\boldsymbol{NRBt}$= Non-renewable biomass collected for fuel and/or charcoal production as a result of project implementation at present *t*; t d.m.;

$\boldsymbol{FGBSL}$= Sum of the projected volume of wood collected in the project area for fuel and/or charcoal production in the baseline scenario; m^3;

$\boldsymbol{FGBSL, i}_{,t}$ = Projected average Volume of wood harvested in the project area for fuel and/or charcoal production in the baseline scenario in the stratum *i* in the year *t*; m^3 (from BI-DFW module);

$\boldsymbol{Dmn}$ = Average wood density of commercially harvested species; t d.m.m^{-3};

$\boldsymbol{i}$ **=** 1, 2, 3… *Strata M* in the baseline scenario;

$\boldsymbol{t}$ **=** 1, 2, 3, … t* years since the projected start of REDD project activity.

$GHGBSL, E$	$FGBSL$	Dmn
0	0	0.63

$GHGE, FACTOR$ = 0/ ((0 * 0.63/0.9)

$GHGE, FACTOR$ = 0 t CO_2-e

$NRBt$	$GHGE, FACTOR$
0	0

$GHGLK, E, tE, t$ = 0 * 0

$GHGLK, E, tE, t$ = 0 t CO^2-e

$FGBSL, i, t$ = 0: assuming there will be no removal of wood from the project area

Step 3) Leakage due to displacement of fuel wood collection should be estimated as follows:

$$\Delta C_{LK-AS,\text{degrad-FW/C}} = \sum_{t=1}^{t^*}\left(\left(NRB_t * CF * \frac{44}{12}\right) + GHG_{LK,E,t}\right)$$

Where:

$\boldsymbol{\Delta CLK - AS, degrada - FW/C}$ = Net greenhouse gas emissions due to leakage from activity change to degradation caused by logging for fuel; t CO^2-e;

$\boldsymbol{NRBt}$ = Non-renewable biomass collected for fuel and/or charcoal production as a result of project implementation at present *t*; t d.m.;

$\boldsymbol{CF}$ = Carbon fraction of dry Matter; t C t d. m.$^{-1}$;

$\boldsymbol{GHGLK, E, tE, tE, t}$ = Greenhouse gas emissions as a result of leakage from degradation activities; t CO_2-e;

$\boldsymbol{t}$ = 1, 2, 3, ... $t*$ years since the projected start of REDD project activity.

$NRBt$	CF	$GHGLK, E, t$
0	0.47	0

$\Delta CLK - AS, degrada - FW/C$ = $((0* 0.47*44/12) + 0$

$\Delta CLK - AS, degrada - FW/C$ = 0 t CO_2-e

Final step) The carbon in commercial species in "market escape forests" CCS, i is estimated as the carbon of potentially extracted wood biomass:

$$C_{CS,i} = \left(V_{MLF,i} \times D_{mn} \times CF\right) \times \frac{44}{12}$$

Where:

$\boldsymbol{CCS, i}$ = Carbon in commercial species in market leakage forests in stratum I (*t* CO^2-e);

$VMLF,i,t$ = Volume of wood in stratum i in leaky forest market (m^3);

Dmn = Average wood density of commercially harvested species; t d.m.m^{-3}. The value should be the same as used in Equation (4);

CF= Biomass carbon fraction for commercially harvested species j (t C t d.m.-1). The value should be the same as used in the equation;

i = 1, 2, 3, ... Strata M.

Table indicating carbon stocks leaked from the project due to displacement of the harvest of commercial species.

UPA	Area (ha)	VBSL,EX,i,t	CCS,i
UPA 01	164.31	1,805.28	12,510.58
UPA 02	346.80	3,810.27	26,405.14
UPA 03	2,449.27	26,910.18	186,487.52
UPA 04	3,095.05	34,005.34	235,657.00
UPA 05	2,005.69	22,036.47	152,712.72
UPA 06	2,019.44	22,187.56	153,759.81
UPA 07	2,548.78	28,003.47	194,064.02
UPA 08	2,148.48	23,605.30	163,584.70
UPA 09	2,649.95	29,115.00	201,766.94
UPA 10	2,770.08	30,434.82	210,913.28
UPA 11	2,538.05	27,885.54	193,246.81
UPA 12	2,598.60	28,550.84	197,857.30
UPA 13	2,793.76	30,695.09	212,716.94
UPA 14	2,727.29	29,964.75	207,655.72
UPA 15	2,238.44	24,593.70	170,434.37
UPA 16	2,289.83	25,158.34	174,347.28
UPA 17	2,887.28	31,722.52	219,837.08
UPA 18	2,130.67	23,409.64	162,228.83
UPA 19	2,736.53	30,066.30	208,359.46
TOTAL	**43,138.29**	**481,570.77**	**3,284,545.49**

Carbon in commercial species in market leakage forests is **3,284,545.49** t CO-e).

4.3.4 Estimate emissions per ecological leak (VMD0044) (LK-ECO), v1. 1

Table 1 Processes

Processes associated with ecological leakage related outside the project boundary

Prevention of ecological leakage process outside the project boundary	Criterion for circumvention (relating to external conditions of the project boundary)
Reduced water table causing increased soil carbon oxidation.	Maintain moist soil conditions (for example, converting from seized water to moist soil does not cause soil oxidation).
Reduction of water table causing increase in N2O emissions.	There is no open water conversion to the non-seaweed pantanal.
Elevation of the water table causing increased CH4 emissions	No conversion from non-moist to moist soil.
Increase in water volume that causes a decrease in vegetation production that causes a decrease in soil carbon sequestration.	No causality of vegetated (or poorly vegetated) conditions.

The project REDD+ Tauari Forest Conservation Project had its geographical design adjusted to keep the project areas away from any water bodies by at least 30 m for small watercourses and streams, 50 meters for medium courses, and 100 m from the main body of water that crosses the area, the Gregório River.

Thus, it can be inferred that there will be unnatural variations in water levels in the soil, and neither floods that can alter CH_4 emissions and N_2O.

In this way, we assume that emissions from ecological leakage are equal to zero.

$\boldsymbol{GHGLK - ECO}$ **=** 0 t CO_2-e

4.4.4 Uncertainty estimate for REDD project activities (VMD0017) (X-UNC), v2.2

Part 1: Uncertainty in REDD baseline estimates

Step 1) Assess uncertainty in the projection of the base rate of deforestation or degradation

Because it is based on a real forest management plan, it is assumed that there is no uncertainty in the basic rate of deforestation or degradation. In these specific cases, we assume that the uncertainty is equal to zero:

$\boldsymbol{UncertaintyBSL, RATE}$ = 0

Step 2) Assess the uncertainty of emissions and removals in the project area in the baseline scenario.

Table 2: Parameters and Modules for REDD

$CAB - tree$	CP-AB
$CBB - tree$	CP-AB
CDW	CP-D
CLI	CP-L
$CSOC$	CP-S
$CWPfm$	CP-W
$Ebiomassbum$	E-BPB
EFC	E-FFC
$N2odirect - N$	E-NA

$$U_{REDD-BSL,SS,i} = \frac{\sqrt{\sum_1^n (U_{REDD-BSL,SS,i,pool\#} \times E_{REDD-BSL,SS,i,pool\#})^2}}{\sum_1^n E_{REDD-BSL,SS,i,pool\#}}$$

Where:

$\boldsymbol{UREDD_{BSL}, SS, i}$ = Percentage of uncertainty in the combined carbon stocks and greenhouse gas sources in the stratum i REDD baseline scenario (%);

$\boldsymbol{UREDD_{BSL}, SS, i, pool}$ = Percentage uncertainty for carbon stocks and greenhouse gas sources in the stratum i REDD baseline scenario (%);

$\boldsymbol{EREDD_{BSL}, SS, i, pool}$ **=** Carbon stock or GHG sources in the REDD baseline scenario (t CO_2e);

$\boldsymbol{i}$ = 1, 2, 3 … m strata (unitless).

UPA	$E_{REDD\_BSL,SS,i,pool\#}$ TCO_2e	$U_{REDD-WPS,SS,i,pool\#}$	Support
UPA 01	1,083,670.2462	0.05	2,935,853,006.17
UPA 02	2,287,220.2189	0.05	13,078,440,824.63
UPA 03	16,153,599.7236	0.05	652,346,960,079.39
UPA 04	20,412,673.9881	0.05	1,041,693,148,361.34
UPA 05	13,228,017.8841	0.05	437,451,142,853.10

UPA 06	13,318,716.5897	0.05	443,470,528,990.93
UPA 07	16,809,878.3713	0.05	706,430,027,142.86
UPA 08	14,169,751.2911	0.05	501,954,629,130.58
UPA 09	17,477,107.6568	0.05	763,623,230,118.14
UPA 10	18,269,366.0134	0.05	834,424,336,326.78
UPA 11	16,739,091.4459	0.05	700,492,956,082.38
UPA 12	17,138,453.2390	0.05	734,316,448,563.23
UPA 13	18,425,599.6705	0.05	848,756,808,046.40
UPA 14	17,987,195.3938	0.05	808,847,995,336.09
UPA 15	14,763,071.8677	0.05	544,870,727,426.30
UPA 16	15,102,009.5678	0.05	570,176,732,463.66
UPA 17	19,042,347.9244	0.05	906,527,536,188.48
UPA 18	14,052,305.4369	0.05	493,668,220,229.94
UPA 19	18,048,153.8746	0.05	814,339,645,702.49
TOTAL	**284,508,230.40**	**2.500**	**11,819,405,366,872.90**

$$UREDD_{BSL}, SS, i \ = 1.21\%$$

Uncertainty estimate for GHG emissions in the REDD project scenario:

UPA	Areas (ha)	$GHG_{REDD\_BSL,SS,i,pool\#}$ (tCO_2e)	$UGHG_{REDD\_BSL,SS,i,pool\#}$ (%)
UPA 01	164.31	2,192.52	0.05
UPA 02	346.80	4,627.59	0.05
UPA 03	2,449.27	32,682.55	0.05
UPA 04	3,095.05	41,299.67	0.05
UPA 05	2,005.69	26,763.41	0.05
UPA 06	2,019.44	26,946.91	0.05
UPA 07	2,548.78	34,010.36	0.05
UPA 08	2,148.48	28,668.76	0.05
UPA 09	2,649.95	35,360.32	0.05
UPA 10	2,770.08	36,963.25	0.05
UPA 11	2,538.05	33,867.14	0.05
UPA 12	2,598.60	34,675.14	0.05
UPA 13	2,793.76	37,279.35	0.05
UPA 14	2,727.29	36,392.35	0.05
UPA 15	2,238.44	29,869.19	0.05
UPA 16	2,289.83	30,554.94	0.05
UPA 17	2,887.28	38,527.17	0.05
UPA 18	2,130.67	28,431.14	0.05

UPA 19	2,736.53	36,515.68	0.05
TOTAL	**43,138.29**	**575,627.45**	**2.50**

$UGHG_{REDD\_BSL,SS,i}$ = 1.21%

Step 3) Estimate total uncertainty in the REDD project baseline scenario

$$Uncertainty_{REDD-BSL,t*} = \sqrt{Uncertainty_{BSL,RATE,t*}{}^2 + Uncertainty_{REDD-BSL,SS}{}^2}$$

Where:

$\boldsymbol{UncertaintyREDD - BSL, t*}$ = Cumulative uncertainty in the REDD baseline scenario through the year $t*$ (%);

$\boldsymbol{UncertaintyREDD - BSL, TAX, t*}$ = Cumulative uncertainty in baseline deforestation rate through the year t (%);

$\boldsymbol{IUncertaintyREDD - BSL, SS}$ = Total uncertainty in combined carbon stocks and greenhouse gas sources in the baseline REDD scenario (%);

t = 1, 2, 3, … $t*$ time elapsed since the beginning of the project activity (years).

UABREDD_BSL,SS,i	UGHGREDD_BSL,SS,i	UncertaintyREDD-BSL,t
1.21%	1.21%	1.71%

Part 4: Uncertainty *Ex-Post* in the context of the REDD project

$$U_{REDD-WPS,SS,i} = \frac{\sqrt{\sum_1^n \left(U_{REDD-WPS,SS,i,pool\#} \times E_{REDD-WPS,SS,i,pool\#}\right)^2}}{\sum_1^n E_{REDD-WPS,SS,i,pool\#}}$$

Where:

$\boldsymbol{UREDD-WPS,SS,i}$ = Percentage of uncertainty in the combined carbon stocks and greenhouse gas sources in the stratum I REDD project scenario (%);

$\boldsymbol{UREDD-WPS,SS,i,pool}$ = Percentage uncertainty for carbon stocks and greenhouse gas sources in the stratum i REDD project scenario (%);

$\boldsymbol{EREDD-WPS,SS,i,pool}$= Carbon stock or GHG sources in stratum i in the REDD project scenario (t CO_2);

$\boldsymbol{i}$ = 1, 2, 3, … M strata (no unit).

Part 5: Total error in REDD+ project activity

The calculation of leakage is conservative in all instances, and therefore uncertainty in leakage is not considered here. The total project uncertainty is therefore equal to the combined uncertainty in the baseline and project estimates for REDD and WRC activities:

$$NER_{REDD+ERROR} = \sqrt{(Uncertainty_{REDD_{BSL},t*} \times \Delta C_{BSL-REDD,t*})^2 + (Uncertainty_{REDD_{WPS}} \times \Delta C_{WPS-REDD,t*})^2 + (Uncertainty_{WRC_{BSL},t*} \times GHG_{BSL-WRC,t*})^2 + (Uncertainty_{WRC\_WPS,t*} \times} \left(\frac{1}{\Delta C_{BSL-REDD,t*} + \Delta C_{WPS-REDD,t*} + GHG_{BSL-WRC,t*} + GHG_{WPS-WRC,t*}}\right)$$

(21)

Where:

$\boldsymbol{NERREDD+\ \ _{ERROR}}$ = Cumulative uncertainty for REDD+ project activities (REDD and WRC) up to Year t* (%);

$\boldsymbol{UncertaintyREDD_{BSL},t*}$ = Cumulative uncertainty in the baseline REDD scenario up to Year t (%);

$\boldsymbol{UncertaintyWRC_{BSL},t*}$ = Accumulated uncertainty in WRC baseline scenario up to Year t (%);

$\boldsymbol{UncertaintyREDD_{WPS}}$ = Total uncertainty in the REDD project scenario (%);

$\boldsymbol{UncertaintyWRC_{WPS},t*}$ = Accumulated uncertainty in the WRC project scenario up to Year t (%);

$\boldsymbol{GHGBSL-WRC,t*}$ = Net GHG emissions in the WRC baseline scenario up to Year t (t CO_2e);

$\boldsymbol{GHGWPS-WRC,t*}$ = Net GHG emissions in the WRC project scenario up to Year t (t CO_2e);

$\boldsymbol{\Delta CBSL-REDD,t*}$ Net GHG emissions in the baseline REDD scenario up to Year t* (t CO_2e);

$\boldsymbol{\Delta CWPS-REDD,t*}$= Net GHG emissions in the REDD project scenario up to Year t* (t CO_2e);

$\boldsymbol{t}$= 1, 2, 3, ... t* time elapsed since the beginning of the project (year).

UREDD-WPS,SS,i (%)	$\Delta C_{BSL\text{-}REDD,t*}$ tCO2e	$\Delta C_{BSL\text{-}REDD,t*}$ tCO2e	UGHGREDD_BSL,SS,i (%)	UncertaintyREDD-BSL,t (%)	$\Delta C_{BSL\text{-}REDD,t*}$	NER_{REDD+_ERROR} (%)
1,21%	2.242,3884	575.627,45	1,21%	1,71%	577.869,84	1,05%

Cumulative uncertainty for REDD+ project activities (REDD and WRC) is 1.05%.

$U_{REDD\text{-}WPS,SS,i}$ (%)	$\Delta C_{BSL\text{-}REDD,t*}$ tCO2e	$\Delta C_{BSL\text{-}REDD,t*}$ tCO2e	$U_{GHGREDD\_BSL,SS,i}$ (%)	NER Redd (%)
1.21%	0.0000	458,398.43	1.21%	1.21%

Total *net GHG emission reductions of the REDD project activity* is equal to 1.21%.

Part 6: Implications for Project Accounting

The allowed uncertainty in this REDD+ MF methodology is +/- 15% of the *NERREDD+* at the 95% confidence level. If this level of accuracy is achieved, it should not result in uncertainty. When the uncertainty exceeds 15% of *NERREDD+* at the 95% confidence level, the deduction should be equal to the value that the uncertainty exceeds the permissible level. The adjusted value for *NERREDD+* to account for the uncertainty should be calculated as:

$$Adjusted\_NER_{REDD+} = NGR_{ARR} + (NER_{REDD} + NER_{WRC}) \times (100\% - NER_{REDD+ERROR} + 15\%)$$

NER Redd	NER_{REDD+_ERROR}	$NER_{WRC Total}$	NGR ARR	$Adjusted\_NER_{REDD}$
1.21%	1.05%	0	0	1.38%

The **AdjustedNERred** is less than 15%, so uncertainty does not generate deductions.

$$Buffer_{Planned} = \left(\left(\Delta C_{BSL,Planned} - \sum_{t=1}^{t^*} \sum_{\substack{i=1 \\ BSL\ Planned}}^{M} \left(E_{FC,i,t} + N_2O_{direct,i,t} \right) \right) - \left(\Delta C_{P,Planned} - \sum_{\substack{t=1 \\ P}}^{t^*} \sum_{\substack{i=1 \\ Planned}}^{M} \left(E_{FC,i,t} + N_2O_{direct,i,t} \right) \right) \right) \times Buffer\%$$

Year	Estimated net GHG emission reductions or removals	Total net GHG emission reductions adjusted to account for uncertainty	ex ante buffer credits	Verified Carbon Units
	NER REDD	Adjusted_NERREDD+	Bufferplanned	VCUt
	t CO2-e	t CO2-e	t CO2-e	t CO2-e
2023	419,619.19	5,790.74	413,828.44	408,037.70
2024	895,567.73	12,358.83	883,208.89	870,850.06
2025	6,388,014.50	88,154.60	6,299,859.90	6,211,705.30
2026	8,172,728.17	112,783.65	8,059,944.52	7,947,160.87
2027	5,327,006.07	73,512.68	5,253,493.39	5,179,980.71
2028	5,395,989.98	74,464.66	5,321,525.31	5,247,060.65
2029	6,852,368.81	94,562.69	6,757,806.12	6,663,243.44
2030	5,810,039.77	80,178.55	5,729,861.22	5,649,682.67
2031	7,209,629.26	99,492.88	7,110,136.37	7,010,643.49
2032	7,625,602.39	105,233,31	7,520,369.08	7,415,135.77
2033	7,027,302.14	96,976.77	6,930,325.37	6,833,348.60
2034	7,278,520.06	100,443.58	7,178,076.48	7,077,632.90
2035	7,915,186.73	109,229.58	7,805,957.15	7,696,727.57
2036	7,770,566.30	107,233.81	7,663,332.49	7,556,098.67
2037	6,412,976.26	88,499.07	6,324,477.19	6,235,978.11
2038	6,597,072.80	91,039.60	6,506,033.19	6,414,993.59
2039	8,412,105.89	116,087.06	8,296,018.83	8,179,931.77
2040	6,240,910.18	86,124.56	6,154,785.62	6,068,661.06
2041	8,104,555.11	111,842.86	7,992,712.25	7,880,869.39

2042	-3,907.63	-53.93	-3,853,71	-3,799.78
2043	-3,907.63	-53.93	-3,853,71	-3,799.78
2044	-3,907.63	-53.93	-3,853,71	-3,799.78
2045	-3,907.63	-53.93	-3,853,71	-3,799.78
2046	-3,907.63	-53.93	-3,853,71	-3,799.78
2047	-3,907.63	-53.93	-3,853,71	-3,799.78
2048	-3,907.63	-53.93	-3,853,71	-3,799.78
2049	-3,907.63	-53.93	-3,853,71	-3,799.78
2050	-3,907.63	-53.93	-3,853,71	-3,799.78
2051	-3,907.63	-53.93	-3,853,71	-3,799.78
2052	-3,907.63	-53.93	-3,853,71	-3,799.78
TOTAL	**119,812,777.36**	**1,653,416.33**	**118,159,361,03**	**116,505,944.71**

4.4 Net GHG Emission Reductions and Removals

Year	Estimated baseline removals (tCO2e)	Estimated leakage emissions (tCO2e)	Estimated net emission reductions or removals (tCO2e)
2023	506,757.0978	87,137.91	419,619.19
2024	1,069,573.5942	174,005.87	895,567.73
2025	7,553,913.5117	1,165,899.01	6,388,014.50
2026	9,545,585.9057	1,372,857.74	8,172,728.17
2027	6,185,822.6487	858,816.57	5,327,006.07
2028	6,228,236.1162	832,246.14	5,395,989.98
2029	7,860,809.3262	1,008,440.51	6,852,368.81
2030	6,626,205.7725	816,166.01	5,810,039.77
2031	8,172,825.9913	963,196.74	7,209,629.26
2032	8,543,310.0448	917,707.65	7,625,602.39
2033	7,827,707.2114	800,405.07	7,027,302.14
2034	8,014,460.9070	735,940.85	7,278,520.06
2035	8,616,369.6448	701,182.92	7,915,186.73
2036	8,411,358.4989	640,792.20	7,770,566.30
2037	6,903,660.4821	490,684.22	6,412,976.26

2038	7,062,158.0378	465,085.24	6,597,072.80
2039	8,904,779.8474	492,673.95	8,412,105.89
2040	6,571,284.5265	330,374.34	6,240,910.18
2041	8,439,864.5347	335,309.43	8,104,555.11
2042	0.0000	3,907.63	-3,907.63
2043	0.0000	3,907.63	-3,907.63
2044	0.0000	3,907.63	-3,907.63
2045	0.0000	3,907.63	-3,907.63
2046	0.0000	3,907.63	-3,907.63
2047	0.0000	3,907.63	-3,907.63
2048	0.0000	3,907.63	-3,907.63
2049	0.0000	3,907.63	-3,907.63
2050	0.0000	3,907.63	-3,907.63
2051	0.0000	3,907.63	-3,907.63
2052	0.0000	3,907.63	-3,907.63
TOTAL	133,044,683.6997	13,231,906.34	119,812,777.36

5 MONITORING

5.2 Data and Parameters Available at Validation

Date / parameter:	At
Data drive:	hectare
Used in equations:	3
Description:	Total area of stratum i
Data source:	The data source was the direct forest Inventory of the project area, distinguishing commercially viable stocks based on species and tree size and making reference to the local expertise of harvesting practices and markets; these data are contained in the sustainable forest management plan. Another source of direct data was the floristic characterization of the project area where further 114 additional random plots were raised.
Justification of the choice of data or description of measurement methods and procedures applied:	N/A
Measurement procedures (if	This parameter will be updated in the renewal of the baseline when the

any):	above-ground biomass is reinvented according to the CP-AB module (at least every 10 years).
Monitoring frequency:	At a minimum, whenever the baseline is updated (at least every 10 years).
QA/QC procedures:	N/A
Any comments:	At a minimum, whenever the baseline is updated (at least every 10 years).

Date / parameter:	Vex,i
Data drive:	m^3 |
Used in equations:	3
Description:	The volume of wood in m^3 extracted from within the stratum (does not include the bar left on site), reported by class of wood products and preferably species.
Data source:	Timber harvest records and/or estimates derived from field measurements or remote assessments with aerial photography or satellite imagery. The initial records were obtained through a sustainable forest management plan.
Justification of the choice of data or description of measurement methods and procedures applied:	Data obtained directly.
Measurement procedures (if any):	See driving plan.
Monitoring frequency:	At a minimum, whenever the baseline is updated (at least every 10 years).
QA/QC procedures:	
Any comments:	Note that this volume does not include the log bar left in place. Data compilers should also make sure that reported extracted volumes are removed gross volumes (i.e., the reported volume does not yet discount the estimated wood residues, as is often the practice in harvest records). The allocation of the extracted volume to the class(S) of wood products shall be substantiated on the basis of the results of the participatory rural assessment (PRA) (also used to assess the potential for degradation in the M-MON module) or timber sales records. The allocation of the extracted volume to species shall be substantiated on the basis of PRA results, harvest records, or a commercial inventory. Baseline removals will be known ex-ante. With the project, removals are classified as project emissions and, where expected, should be detailed ex-ante along with evidence of expected harvested volumes.

Date / parameter:	ΔCBSL, i
Data drive:	ΔCBSL, i
Used in equations:	1
Description:	Net changes in carbon stocks in all base stratum i reserves.
Data source:	BL-PL module.
Applied Value:	
Justification of the choice of data or description of measurement methods and procedures applied:	See module BL-PL.
Measurement procedures (if any):	Calculation of leakage emissions.
Monitoring frequency:	At a minimum, whenever the baseline is updated (at least every 10 years).
QA/QC procedures:	
Any comments:	

Date / parameter:	*As*
Data drive:	Ha
Used in equations:	2
Description:	Average annual area of deforestation by baseline deforestation agent in stratum i in the five years prior to project implementation.
Data source:	Own data sources or measurements.
Applied Value:	N/A
Justification of the choice of data or description of measurement methods and procedures applied:	Analysis of remote sensing data and/or legal records and/or survey; information about land owned, controlled, or previously owned, or controlled by the deforestation baseline agent.
Measurement procedures (if any):	Calculation of leakage emissions.

Monitoring frequency:	
QA/QC procedures:	
Any comments:	It should be reassessed whenever the baseline is revised.

Date / parameter:	*D%planned,i,t*
Data drive:	%
Description:	Projected annual proportion of land that will be deforested in stratum i in year t.
Equations:	5
Data source:	BL-PL module
Applied Value:	N/A
Justification of the choice of data or description of measurement methods and procedures applied:	See *BL-PL module*
Purpose of the data:	Calculation of leakage emissions.
Reviews:	

Date / parameter:	PRODBL, *c, t*
Data drive:	Tonnes of c base products per year.
Description:	c commodity production in the year *t* in the base case*
Equations:	8
Data source:	Own assessment.
Applied Value:	N/A
Justification of the choice of data or description of measurement methods and procedures applied:	Estimated taking into account the proportion of the project area that would be used for the production of the commodity; identified in each year of the reference period and the average productivity of the project area for that commodity (assessed in Step 3.1 of Approach 2).
Purpose of the data:	Calculation of leakage emissions.
Reviews:	It should be reassessed whenever the baseline is revised.

Monitored data and parameters

Date / parameter:	ASP
Data drive:	ha
Used in equations:	2, 6, 14
Description:	Area of the sample plots in ha.
Data source:	Record and archive the number and size of sample plots.
Measurement procedures (if any):	N/A
Monitoring frequency:	Monitoring should take place at least every ten years for baseline renewal. Where strengthening carbon stocks is included, monitoring shall take place at least every five years.
QA/QC procedures:	The equipment to be used must be calibrated and have a quality control seal.
Any comments:	Where the estimation of carbon stocks occurs only for the determination of the baseline, this parameter shall be known ex-ante. If part of project monitoring, the number and area of ex-ante sampling plots should be estimated based on the projected sampling effort in relation to growth and emissions projections.

Date / parameter:	N
Data drive:	Dimensionless.
Used in equations:	4, 8
Description:	Number of sample points.
Data source:	Record and archive the number and size of sample plots.
Measurement procedures (if any):	
Monitoring frequency:	Monitoring should take place at least every ten years for baseline renewal. Where strengthening carbon stocks is included, monitoring shall take place at least every five years.
Any comments:	Where the estimation of carbon stocks occurs only for the determination of the baseline, this parameter shall be known ex-ante. If part of project monitoring, the number and area of ex-ante sampling plots should be estimated based on the projected sampling effort in relation to growth and emissions projections.

Date / parameter:	DAP
Data drive:	Centimeter.
Used in equations:	1, 3
Description:	Diameter at the height of the chest of a tree in 1.3 m.
Data source:	Field measurements on sample graphs.
Measurement procedures (if any):	Usually measured 1.3 m above the ground. Measure all trees above some minimum DBH in the sample plots. The minimum DBH varies depending on the tree species and climate; for example, the minimum DBH can be as small as 2.5 cm or as high as 20 cm, but for humid tropical forests 10 cm is commonly used. The minimum DBH employed in inventories is kept constant for the duration of the project.
Monitoring frequency:	Monitoring should take place at least every ten years for baseline renewal. Where strengthening carbon stocks is included, monitoring shall take place at least every five years.
QA/QC procedures:	Standardized quality control/quality assurance (QC/QC) procedures shall be applied for forest inventory, including field data collection and data management. The QA/QCs standards already applied in national forest monitoring, or available in published manuals, or in the IPCC GPG LULUCF 2003 will be used.
Any comments:	Where the estimation of carbon stocks occurs only for the determination of the baseline, this parameter shall be known ex-ante. If it is part of the project monitoring, the ex ante DBH should be estimated based on growth projections.

Date / parameter:	Asf
Data drive:	m^2
Used in equations:	1
Description:	Area of a sampling frame.
Data source:	Sample frame chart recording and archiving size.
Measurement procedures (if any):	
Monitoring frequency:	Monitoring should take place at least every ten years for baseline renewal. Where strengthening carbon stocks is included, monitoring shall take place at least every five years.
QA/QC procedures:	N/A
Any comments:	They must be known ex-ante this aspect will be ensured by the georeferencing of the plots.

Date / parameter:	Ar
Data drive:	Hectare.
Used in equations:	12
Description:	Area of a sampling frame.
Data source:	Total area of all sample plots of the non-tree allometric method in the stratum *i*.
Measurement procedures (if any):	Record size and archiving of the sample graph of the non-arboreal allometric method.
Monitoring frequency:	Monitoring should take place at least every ten years for baseline renewal. Where strengthening carbon stocks is included, monitoring shall take place at least every five years.
QA/QC procedures:	
Any comments:	Where the estimation of carbon stocks occurs only for the determination of the baseline, this parameter shall be known ex-ante. If part of project monitoring, the number and area of ex-ante sampling plots should be estimated based on the projected sampling effort in relation to growth and emissions projections.

Date / parameter:	H
Data drive:	m
Used in equations:	1, 3
Description:	Total height of the tree.
Data source:	Field measurements on sample graphs.
Measurement procedures (if any):	Record size and archiving of the sample graph of the non-arboreal allometric method.
Monitoring frequency:	Monitoring should take place at least every ten years for baseline renewal. Where strengthening carbon stocks is included, monitoring shall take place at least every five years.
QA/QC procedures:	
Any comments:	Whenever the estimation of carbon stocks occurs only for the determination of the baseline, this parameter should be known as monitoring, growth ex-ante ex-ante. When part of the height of the project should be estimated based on the projections of CP-AB – 20.

5.3 Date and Parameters Monitored

Date / parameter:	CFj
Data drive:	tC t-1 d.m.
Used in equations:	4
Description:	Carbonic fraction of dry matter in t C t-1 d.m. for species j.
Data source:	Nogueira, Euler Melo. Densidade de madeira e alometria de árvores em florestas do “Arco do desmatamento”: implicações para biomassa e emissão de carbono a partir de mudanças de uso da terra na Amazônia brasileira / Euler Melo Nogueira.--- Manaus: [s.n.], 2008. xviii, 133 f.
Justification of the choice of data or description of measurement methods and procedures applied:	N/A
Measurement procedures (if any):	N/A
Monitoring frequency:	N/A
QA/QC procedures:	N/A
Any comments:	Whenever new species are found during monitoring, new carbon fraction values should be obtained from the literature or otherwise use the default value.

Date / parameter:	DJ
Data drive:	t d.m. m^{-3}
Used in equations:	4
Description:	Basic density of wood in t d.m. m^{-3} for the *j* species
Data source:	Nogueira, Euler. Densidade de madeira e alometria de árvores em florestas do “Arco do desmatamento”: implicações para biomassa e emissão de carbono a partir de mudanças de uso da terra na Amazônia brasileira / Euler Melo Nogueira. --- Manaus : [s.n.], 2008. xviii, 133 f.:

Justification of the choice of data or description of measurement methods and procedures applied:	N/A
Measurement procedures (if any):	N/A
Monitoring frequency:	N/A
QA/QC procedures:	N/A
Any comments:	All the species raised are from the Amazon biome, and therefore quite adjusted to the parameters employed.

Date / parameter:	Pcomi
Data drive:	Dimensionless.
Used in equations:	1
Description:	Trade volume as a percentage of total above-ground volume in the stratum *i*.
Data source:	Inventory contained in the Sustainable Forest Management Plan and primary surveys carried out in the project area.
Justification of the choice of data or description of measurement methods and procedures applied:	This parameter is updated at baseline renewal when above-ground biomass is reinvented according to the CP-AB module (at least every 10 years).
Measurement procedures (if any):	N/A
Monitoring frequency:	Minimum of 10 years.
QA/QC procedures:	N/A
Any comments:	Updated at the time of baseline review (at least every 10 years). Note that the application of the trade percentage of total volume introduces the simplifying (and conservative, since it is only used in ex-ante base calculations) assumption that all trade stocks are extracted (i.e. perfect efficiency).

Date / parameter:	Planned, i
Data drive:	Ha
Description:	Total area of planned deforestation over the entire life of the project for the stratum *i*.

Equations:	5
Data source:	Own data sources or measurements.
Applied Value:	N/A
Description of the measurement methods and procedures to be applied:	GPS coordinates and/or remote sensing data and/or legal records of orders and data obtained in the field.
Frequency of monitoring/noting:	It should be examined at least every five years or, if the check occurs less often than every five years, the examination should take place before any check event.
QA/QC procedures to be applied:	See Section 9.3 of the REDD+ MF or other VCS methodology that uses this module.
Purpose of the data:	Calculation of leakage emissions.
Calculation method:	N/A
Reviews:	N/A

Date / parameter:	OdefLK,i,t
Data drive:	Ha
Description:	The total area of deforestation by the baseline agent or agent class of the planned deforestation in the stratum *i* in the year *t*.
Equations:	6
Data source:	Own data sources or measurements.
Justification of the choice of data or description of measurement methods and procedures applied:	Analysis of remote sensing data, and/or legal records, and/or survey information for land owned, or controlled, or previously owned, or controlled by the deforestation baseline agent. Legal records will include government permits to deforest, including concession licenses. Ex-ante project proponents must determine and justify the likelihood of leakage based on the characteristics of the baseline agent or agent class.
Frequency of monitoring/recording:	It should be re-examined at least every five years or, if the check occurs less often than every five years, the examination should take place before any check event.
QA/QC procedures for Be applied:	See Section 9.3 of the REDD+ MF or other VCS methodology that uses this module.
Purpose of the data:	Calculation of leakage emissions.
Reviews:	N/A

Date / parameter:	EFC,i,t
Data drive:	t CO_2e
Description:	Emissions from fossil fuel combustion in the stratum *i* in the year *t*.
Equations:	13 - 15

Data source:	E-FFC module.
Applied Value:	n/a
Justification of the choice of data or description of measurement methods and procedures applied:	See E-FFC module.
Purpose of the data:	Calculation of project emissions.
Calculation method:	GHG Protocol (FGV) tool-E-FFC module.

Date / parameter:	CF
Data drive:	t C t d.m.$^{-1}$
Description:	Carbon fraction of dry matter.
Equations:	5, 9, 14
Data source:	IPCC or standard provided.
Applied Value:	Standard value 0.50 t C t - 1 d.m., if no species-specific values are available.
Justification of the choice of data or description of measurement methods and procedures applied:	Nogueira, Euler Melo. Densidade de madeira e alometria de árvores em florestas do "Arco do desmatamento": implicações para biomassa e emissão de carbono a partir de mudanças de uso da terra na Amazônia brasileira / Euler Melo Nogueira. --- Manaus: [s.n.], 2008. xviii, 133 f.: il.
QA/QC procedures for Be applied:	
Purpose of the data:	Calculation of leakage emissions.
Reviews:	N/A

Date / parameter:	Dmn
Data drive:	t d.m. m^{-3}
Description:	Average wood density of commercially harvested species.
Equations:	Data sources.
Data source:	Nogueira, Euler Melo. Densidade de madeira e alometria de árvores em florestas do "Arco do desmatamento": implicações para biomassa e emissão de carbono a partir de mudanças de uso da terra na Amazônia brasileira / Euler Melo Nogueira.-– Manaus: [s.n.],

	2008. xviii, 133 f.: il. And Sustainable Forest Management Plan developed for the area.
Applied Value:	0.5
Justification of the choice of data or description of measurement methods and procedures applied:	The source elaborated on studies in the Amazon biome and the values assumed in the report were decreased conservatively so as to include non-timber species. And assume plausible and conservative values according to 4.13 IPCC National Guidance for Greenhouse Gas Inventories table, AFOLU Section). d) regional average; 0.60 t d.m.m^{-3}- Tropical America.
Purpose of the data:	Calculation of leakage emissions.
Reviews:	N/A

Date / parameter:	LDF
Data drive:	t C m^{-3}
Description:	Factor for calculating the biomass of dead wood created during logging operations per cubic meter extracted.
Equations:	5
Data source:	Default value provided.
Applied Value:	Standard value for broad-leaved and mixed forests of 0.53 t Cm^{-3} Standard value for coniferous forests of 0.25 t Cm^{-3}.
Justification of the choice of data or description of measurement methods and procedures applied:	The standard value for broad-leaved and mixed forests of 0.53 t Cm^{-3} of 774 logging gaps measured by *Winrock International* in Bolivia, Belize, the Republic of the Congo, Brazil, and Indonesia can be used for tropical broadleaf forests (cf. Appendix 1).
Purpose of the data:	Calculation of leakage emissions.
Reviews:	N/A

Date / parameter:	LIF
Data drive:	t C m^{-3}
Description:	A factor for calculating emissions from the creation of logging infrastructure (roads, runways and pavements) during logging operations per cubic metre extracted.
Equations:	5
Data source:	Default value provided.
Applied Value:	Conservative standard value of 0.29 t $CO_2$and m^{-3}.

Justification of the choice of data or description of measurement methods and procedures applied:	The conservative default value of 0.29 t CO_2 and m^{-3}, calculated from 1,839 hectares of timber concessions analyzed by *Winrock International* in the Republic of Congo and Brazil can be used for tropical broadleaf forests (cf. Appendix 1).
Purpose of the data:	Calculation of leakage emissions.
Reviews:	N/A

Date / parameter:	VBSL, EX, i, t
Data drive:	m^3
Description:	Volume of wood designed to be extracted from within the design boundary during the baseline in the stratum *i* in the year *t*.
Equations:	5
Data source:	Own data sources or measurements.
Applied Value:	N/A
Justification of the choice of data or description of measurement methods and procedures applied:	The data source should be chosen with priority from top to bottom preference as follows: 1. Estimates derived from field measurements and/or 2. Ratings with aerial photography or satellite images.
Purpose of the data:	Calculation of leakage emissions.
Reviews:	Data compilers should also make sure that reported extracted volumes are removed gross volumes (i.e., the reported volume does not yet discount the estimated wood residues, as is often the practice in harvest records).

Date / parameter:	EREDD, WPS, SS, i, Pool#
Data drive:	t CO_2e
Description:	Carbon stock or GHG sources (e.g. trees, dead wood, soil organic carbon, fertilizer addition emission, biomass burning emission, etc.) in the project scenario.
Equations:	10
Data source:	The terms denoting significant carbon stocks, GHG sources or leakage emissions used in calculating the net emission reductions of the following relevant modules: CP-AB, CP-D, CP-L, CP-S, CP-W, E-BB, E-FFC, E-NA.
Measurement description. Justification of the choice of data or description of measurement methods and procedures applied:	See the relevant modules.
Applied Value:	N/A
Frequency of monitoring/recording:	N/A

QA/QC procedures to be applied:	N/A
Purpose of the data:	Calculation of uncertainty.
Calculation method:	N/A
Reviews:	The ex-ante estimate shall be derived directly from the originating estimates of the relevant modules: CP-AB, CP-D, CP-L, CP-S, CP-W, E-BB, E-FFC, E-NA.

5.4 Monitoring Plan

This monitoring plan was developed in line with Module VMD0015 of the REDD methodological module, "Methods for monitoring greenhouse gas emissions and removals (M-MON)".

The text below sets out the procedures for monitoring deforestation and illegal degradation, natural disturbance, and emissions in the project area and in the spill areas. The parameters below also define the procedures for updating forest carbon stocks and revising the baseline.

For calculation purposes, the project conservatively assumes forest reserves without additions to their stable stocks and any monitoring of biomass will be intended to update the stocks to update the baseline.

The organizations responsible for monitoring are listed below in Table 4.8. These organizations are responsible for performing all aspects of a given monitoring task, as described in the monitoring subsections below.

Estimation Of Net Changes In Ex-Post Carbon Stocks And Greenhouse Gas Emissions

Net ex-post changes in carbon stocks and greenhouse gas emissions can only be calculated after monitoring:

- The net change in carbon stock as a result of deforestation in the project area;
- The net change in carbon stock as a result of degradation in the project area;
- The net change in carbon stock as a result of natural disturbances in the project area;

• Greenhouse gas emissions as a result of monitoring activities and surveillance activity of the project area.

Monitoring deforestation and natural disturbances

The change of forest cover due to unplanned deforestation and/or natural disturbance will be monitored through periodic monitoring carried out by the surveillance and image evaluation teams in the project area. In addition to the project area, neighboring areas bordering the project will be monitored, but subject to interference from the riverside communities that inhabit the region; such a measure aims to monitor the evolution and pace of eventual vegetation losses in order to establish more precise actions to contain local deforestation. Importantly, such areas are outside the project area. Inventory estimates of the initial field inventory completed in 2022, are valid for 10 years (per VM0007). It should be noted that accessory monitoring will be carried out annually and every five years.

Table 4.1. Data and parameters for monitoring deforestation and natural disturbance.

PARAMETERS	DESCRIPTION	UNITY	SOURCE/JUSTIFICATION FOR THE CHOICE OF DATA OR DESCRIPTION OF MEASUREMENT METHODS
ΔCP,Def,i,t	Net change in carbon stocks as a result of deforestation, in the case of the project in the project area in stratum i, at time t	t CO_2e	Based
ΔCP,DistPA,i,t	Net change in carbon stocks as a result of natural disturbances, in the case of the project in the project area in stratum i, at Time t	t CO_2e	Based
ADistPA,q,i,t	Area impacted by nature post-natural disturbance, disturbance of Stratum q in stratum i, at time t	Ha	Monitored for each verification event
CBSL,i	Carbon stocks in all pools of baseline case, in stratum i	t CO_2e ha^{-1}	Estimated from forest carbon inventory

Changes in forest cover will be monitored through data provided by satellite images, images acquired monthly through the platforms:

1. Earth Explorer (http://earthexplorer.usgs.gov), which provide Landsat images with 30 meters accuracy; and/or,
2. Sentinels (http://sentinels.copernicus.eu/web/sentinel/home), which provide Sentinel 2 imaging with 10-meter accuracy.

In addition to these resources, the monitoring will make use of information made available by the UCGEO classification system of the state of Acre, which includes atmospheric and geometric correction and uses a supervised classification approach. *Landsat* images with cloud cover covering less than 10% of a scene were downloaded and corrected for any atmospheric problems (using the Carlotto HAZE algorithm) and geometric correction (using Geocover 2000 images). The image processing phase includes image segmentation (in statistically homogeneous areas) using the *Landsat* 3, 4, and 5 (blue, green, and red) bands.

Then, representative samples from the forest and non-forest areas are selected by Mata Nativa BR technicians using specialized knowledge that will be distributed throughout the image and represent variability within each class.

Additional details on preprocessing can be found in the UCEGEO methodology. Deforestation and natural disturbance will be distinguished using auxiliary data that may include but is not limited to, high-resolution images, digital elevation models, information from local managers, etc.

In the event that this data set is no longer available, *ex-post* deforestation will be determined by the classification of remote sensing images and land use change detection procedures, by the surveillance system installed on site.

The project area, as defined in the PD, will serve as the initial" forest cover reference map " against which changes in forest cover will be assessed over the interval of the first monitoring period; the entire project area has been demonstrated to meet the forest definition at the beginning of the credit period. For subsequent monitoring periods, the change in forest cover will be evaluated in relation to the forest cover map constructed at the time of preparation of the descriptive project, which is based on all surveys and inventories of the study area, which mark the beginning of the monitoring interval. Thus, the map of the project area will be updated at each monitoring event or when extraordinary events occur.

Monitoring illegal degradation

Emissions, due to illegal logging, will be tracked by conducting surveys of the surrounding areas on a monthly basis by the management and surveillance system that will employ frequent incursions and satellite imagery. Locations surveyed will include:

- Project area;
- Local community areas surrounding the project.

The reports will produce information on the illegal logging that may occur in the project area and, from the surveys, an estimate of the emissions associated with the area where the illegal logging occurred will be issued and based on the inventories identified from the field survey/inventory data.

In the event an initial assessment indicates that illegal logging is occurring and is significant in the area, the area of potential degradation within the project area will be delineated based on the survey results, incorporating general area information and depth of penetration. Degradation monitoring plots will be allocated to target a representative sample of this area. Plots of 50mX50m (0.25 ha area) will be randomly or systematically allocated in the area, enough to produce a significant sample of the degraded area and its carbon stock, and any freshly cut stumps or other indications of illegal harvesting will be noted and recorded. The diameter at breast height or the diameter at cut height, whichever is lower of the cut stumps will be measured. Biomass will be estimated from measured diameters (conservatively assuming that stump diameters cut below chest height are equivalent to the diameter at breast height) by applying Higuchi's (2004) allometric equations and otherwise maintaining consistency with the analytical procedures applied in the original forest inventory report. Emissions from illegal logging ($\Delta CP,DegW,i,t$) are estimated by multiplying the area (ADegW,i) by the average biomass carbon of the trees cut and removed per unit area ($CDegW,i,t\ /APi$).

Sampling will be conducted once every suppression indicative where initial surveys continue to indicate the possibility of illegal logging in the project area to produce an estimate of emissions resulting from illegal logging ($\Delta CP,DegW,i$). Emissions estimates will be annualized (to produce estimates in t $CO_2$and per year) by dividing the emission for the monitoring interval by the interval period.

Project Emissions Monitoring

With the project, emissions are calculated as the sum of emissions from the combustion of fossil fuels (EFC,i,t). As stipulated in the methodology, the combustion of fossil fuels in all situations is an optional emission source. In addition, no nitrogen is applied in the project area and therefore the project emissions are equal to EBiomassBurn and are calculated using the GHG Tool Protocol.

Market leak

Market breakout figures calculated *ex-ante* are also used *ex-post*, since the harvesting of wood, firewood or charcoal is not intended for commercial markets. See table 3.32 for market leakage estimates.

Forest carbon stock estimates will be derived from field measurements less than or equal to 10 years old.

Above-and below-ground living tree stocks will be reassessed in or before 2025.

For each stratum, when the remeasured estimate is within the 95% confidence interval of the estimate t=0, the inventory estimate t=0 takes precedence and is re-employed, and when the remeasured estimate is outside (i.e., greater than or less than) the 95% confidence interval of the estimate t=0, the new inventory estimate takes precedence and is used for the subsequent period.

Sample plots will be randomly located in areas within the PROJECT NAME and measured following standard operating procedures. Biomass shall be estimated by applying the following allometric equations and otherwise maintain consistency with the analytical procedures applied in the original inventory.

For living trees, biomass is calculated as a function of diameter at breast height (DBH; in cm) using the predictive model developed by Higuchi (2004) for forest stands in the Amazon biome.

Equation 4.1

Leak Monitoring Of Changes In Carbon Stock And Greenhouse Gas Emissions

Activity Displacement Leak

Activity displacement leakage will be monitored by tracking deforestation areas (*AdefLK,i,t*) on all land outside the project area owned or managed by the base agent, Mata Nativa BR. This will be done by examining remote sensing data and/or legal records and/or information from field research and daily monitoring.

Agents of degradation from deforestation will be searched for each verification event. In addition, this information will be verified against aerial/remote sensing imagery where available, including but not limited to the most recent deforestation dataset from the state of Acre, Google Earth, or others. In the event that deforestation is noted, further confirmation will be made that the deforestation resulted from unauthorized activities.

Baseline review

The baseline will be reviewed every 10 years from the project start date. From 2023, the baseline is therefore limited to emissions accounted for by the project and will only deal with emissions from project activities. Deforestation maps will be prepared by classifying remote sensing images and field activities.

Quality Assurance/Quality Control and Data Archiving procedures

Monitoring of deforestation, natural disturbances, and leaks

To ensure consistent and quality results, the spatial analysts performing the image alteration processing, interpretation, and detection procedures will strictly follow best practices and good practice guidelines when using the alternative method to quantify deforestation. All data sources and analytical procedures will be documented and archived (detailed in the data archive below).

The accuracy of grading, both for baseline renewal and monitoring, will be assessed by comparing grading with points on the ground.

Any data collected from points of truth on the ground will be recorded (including GPS coordinates, identified land use class, and supporting photographic evidence) and archived. Any high-resolution image sample points used to assess classification accuracy will also be archived. The samples used to assess classification accuracy will be well distributed throughout the project area (as far as possible, considering the availability of high-resolution images and/or ground real data acquisition logistics).

The classification shall only be used in the forest cover change detection step if the overall classification accuracy, calculated as the total number of correct samples/the total number of samples, is equal to or greater than 95%.

All data sources and procedures for processing, classifying, and detecting changes will be documented and stored in a dedicated electronic archive for the long term.

Information related to monitoring and deforestation will be kept on file and will include:

• Forest/non-forest maps;

• Documentation of the type of software and procedures applied (including all pre-processing steps and corrections, spectral bands used in final classifications, and classification methodologies and algorithms applied), if applicable; and

• Data used in the accuracy assessment-points of truth on the ground (including GPS coordinates, identified land use class, and supporting photographic evidence) and/or high-resolution image sample points.

Forest carbon stocks and degradation

The following steps will be followed to control errors in field sampling and data analysis:

1. Trained field teams will perform all field data collection and follow standard operating procedures. Pilot-sample plots will be measured prior to the start of formal measurements to evaluate field teams and identify and correct any errors in field measurements. Field team leaders will be responsible for ensuring that field protocols are followed to ensure accurate and consistent measurements. To ensure accurate measurements, the height from diameter

to breast height (1.3 m) will be periodically reassessed by personnel during the course of the inventory.

2. Field measurement data will be recorded on standard field data sheets and electronic devices (*tablets*) and entered into an Excel database for data management and quality control. Possible errors in data entry (anomalous values) will be checked or corrected by consulting the original data sheets, or the personnel involved in the measurement. The original data sheets will be permanently archived in a dedicated long-term electronic archive. The electronic database will also archive GIS coverages detailing forest and strata boundaries and plot locations.

Quality control procedures for sample degradation will include steps 1 and 3, above. The quality control procedures related to the monitoring of leaks include the carrying out of surveys of leakage agents and the review of the records that document deforestation by the respective deforestation agent and the verification of these numbers in relation to remote detection images, in this way, a history with the evolution of the dynamics of Floristic evolution will be built enabling more directive actions to contain possible leaks.

Personnel involved in the baseline review will have detailed knowledge regarding spatial modeling and land-use change, as well as deep familiarity with REDD methodologies. The remote sensing data used will include an officially published dataset, classified images, which meet the accuracy assessment requirements, and image acquisition provided commercially by qualified companies as set out in the methodology.

Data archiving

Archived data will be kept for at least two years after the end of the project credit period.

All project records are secure and retrievable. This includes project documents saved on the Mata Nativa BR Director's desktop and stored in the Director's file cabinets (based in Ribeirão Preto).

An identical version of the project documents will be saved remotely on an external hard drive and in a contracted data cloud. In addition, many project documents (e.g. VCS Project Description, Monitoring Reports, Project Implementation Reports, Validation and Verification Reports, etc.) will be publicly available and stored on the certifier's website.

Organization, Responsibilities And Frequency Of Monitoring

For all aspects of project monitoring, the Acre Project team will ensure that the recording, processing, analysis, management, and archiving of data is conducted in accordance with the monitoring plan.

Type of monitoring and party responsible for monitoring

All monitoring will be the responsibility of the company Mata Nativa BR.

APPENDIX

Use appendices for supporting information. Delete this appendix (title and instructions) where no appendix is required.