JUTAITUBA REDD+ PROJECT

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Project Title	Project REDD+ Jutaituba
Version	v.1
Date of Issue	July 20,2022
Project Location	Pará - Brasil
Project Proponent(s)	Biofilica Ambipar Enviromment and Martins Agropecuária
Prepared By	Biofilica Ambipar Enviromment
Validation Body	Earthood Services Private Limited "ESPL"
Project Lifetime	January 14, 2021 through January 13, 2051 - 30 years

GHG Accounting Period	January 14, 2021 through January 13, 2051 - 30 years
History of CCB Status	First validation attempt
Gold Level Criteria	GL3 Gold Level – Exceptional Benefits to Biodiversity
Expected Verification Schedule	First Verification in CCBS every three years after validation/verification and thereafter every two years throughout the Project life cycle. VCS checks are expected every three years.

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1 SUMMARY OF PROJECT BENEFITS

1.1 Unique Project Benefits

The results or summary impacts of expected benefits in the Jutaituba REDD+ Project are reported in Table 1 below.

Table 1 - Summary of the expected benefits in the Jutaituba REDD+ Project.

Outcome or Impact Estimated by the End of Project Lifetime	Section Reference
1) Expected benefits for the Climate: with the Jutaituba REDD+ Project, it is expected that after its life cycle, based on the first baseline defined for the Project, it will help mitigate climate change with a total avoided emission of 2,633.55 tCO2eq. The avoided deforestation in the scenario with the Project is 6,685 hectares during the Project life cycle and an average of 263,256 tCO2eq of reduced emissions.	3
2) Expected benefits for Communities: The benefits for the community located in the Project Zone and other stakeholder's actors will be focused on the aspects of formalizing access to the farm, supporting and optimizing non-timber forest management, promoting sustainable practices, and articulating ways to educate people, environmentally speaking, on issues related to hunting and fishing. Therefore, we intend to influence the social issues and the living conditions of the communities surrounding the Project area, reducing social vulnerability and rural exodus, generating value in the adaptation to climate change, increasing the level of socioeconomic conditions and the quality of life of families, and helping to obtain partnerships to help aggregate the generation of goods and services that promote economic and social well-being.	4
3) Expected benefits for Biodiversity: the Jutaituba REDD+ Project provides for the maintenance of fauna and flora in the Project Area, ensuring the protection and conservation of local habitats and biodiversity, including endemic species and with some degree of threat according to the IUCN RedList. In addition, the Project Area plays a role of "ecological corridor", which connects several Conservation Units in the vicinity and has international national relevance as a priority area for conservation.	5

1.2 Standardized Benefit Metrics

Various metrics are shown below with an estimate of the net benefit that the Jari/Pará REDD+ Project aims to achieve over the Project Lifecycle (Table 2).

Table 2 – Estimates of the net benefit for different metrics during the lifecycle of the Jutaituba REDD+ Project.

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
GHG emission reductions or removals	Net estimated emission removals in the project area, measured against the without-project scenario	Not applicable	-
	Net estimated emission reductions in the project area, measured against the without-project scenario	2,633.55 tCO2eq	3
Forest[1] cover	For REDD projects: Estimated number of hectares of reduced forest loss in the project area measured against the without-project scenario	6,685 hectares	3
	For ARR projects: Estimated number of hectares of forest cover increased in the project area measured against the without-project scenario	Not applicable	-
Improved land management	Number of hectares of existing production forest land in which IFM practices are expected to occurred as a result of project activities, measured against the without-project scenario	Not applicable	-
	Number of hectares of non-forest land in which improved land management practices are expected to occurred as a result of project activities, measured against the without-project scenario	Not applicable	-
Training	Total number of community members who are expected to have improved skills and/or knowledge resulting from training provided as part of project activities	Potential 18,334 residents, 3,188 families and 29 communities	4
	Number of female community members who are expected to have improved skills and/or knowledge resulting from training as part of project activities	To be mapped	4
Employ ment	Total number of people expected to be employed in project activities, expressed as number of full-time employees[2]	To be defined	-

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
	Number of women expected to be employed as a result of project activities, expressed as number of full-time employees	To be defined	-
Livelihoods	Total number of people expected to have improved livelihoods[3] or income generated as a result of project activities	Potential 18,334 residents, 3,188 families and 29 communities	4
	Number of women expected to have improved livelihoods or income generated as a result of project activities	To be mapped	4
Health	Total number of people for whose health services are expected to improve as a result of project activities, measured against the without-project scenario	Potential 18,334 residents, 3,188 families and 29 communities	4
	Number of women for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	To be mapped	4
Education	Total number of people for whom access to, or quality of, education is expected to improve as result of project activities, measured against the without-project scenario	Potential 18,334 residents, 3,188 families and 29 communities	4
	Number of women and girls for whom access to, or quality of, education is expected to improve as result of project activities, measured against the without-project scenario	To be mapped	4
Water	Total number of people who are expected to experience increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	Not applicable	-
	Number of women who are expected to experience increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	Not applicable	-
Well-being	Total number of community members whose well-being[4] is expected to improve as a result of project activities	Potential 18,334 residents, 3,188 families and 29 communities	4

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
	Number of women whose well-being is expected to improve as a result of project activities	To be mapped	4
Biodiversity conservation	Expected change in the number of hectares managed significantly better by the project for biodiversity conservation,[5] measured against the without-project scenario	131,132 hectares	5
	Expected number of globally Critically Endangered or Endangered species[6] benefiting from reduced threats as a result of project activities,[7] measured against the without-project scenario	6 species	5

2 GENERAL

2.1 Project Goals, Design and Long-Term Viability

2.1.1 Summary Description of the Project (G1.2)

The Jutaituba REDD+ Project is a partnership between the Biofílica Ambipar Environment and Martins Agropecuária, belonging to the Martins Group and aims to promote forest conservation and mitigate climate change by reducing greenhouse gas (GHG) emissions from changes in land use. In addition to climate benefits, the Project also aims to generate socio-environmental benefits based on sustainable economic development practices and the improvement of the well-being of surrounding communities, while preserving the culture and tradition of local peoples.

The Project Area has 129,417 ha of Amazon rainforest and is located almost entirely in the mesoregion of Marajó, in the State of Pará, covering the cities of Bagre, Portel, Baião and Oeiras do Pará. It is located near BR 422, known as the Transcametá highway, and near the rivers Pacajá, Jacundá and Tocantins. Communities that are directly or indirectly influenced by the Project were identified, either because they provide labor to Fazenda Jutaituba or are geographically close to the Project Area and depend on the forest resources present in the area, such as nuts and medicinal herbs.

The region has great relevance in relation to its biodiversity, being an ecological corridor that makes it possible to connect Conservation Units (UCs) that are nearby. The predominant vegetation is the Dense Ombrophilous Forest with a high density of medium and large trees, as well as woody and epiphytic lianas. It houses at least 24 species of fauna and flora with some degree of threat according to the IUCN Red List, some of which are endemic to the region.

It was identified that the main agents of deforestation and forest degradation in the region are small and medium family farmers and large rural owners, as well as local sawmills, loggers and charcoal plants. From this context, the activities of the Project were designed to ensure the conservation and protection of biodiversity and natural resources, through mitigating and preventive measures such as the strengthening of land and heritage inspection, social inclusion and regional socioeconomic development through alternative practices to deforestation, environmental education as a strategy to discourage hunting and predatory fishing, the engagement and involvement of stakeholders and the promotion of adaptive and assertive governance.

Thus, the Jutaituba REDD+ Project hopes, in addition to climate impacts, to improve the well-being of communities and generate exceptional benefits for local biodiversity

2.1.2 Project Scale

Project Scale	
Project	
Large project	X

2.1.3 Project Proponent (G1.1)

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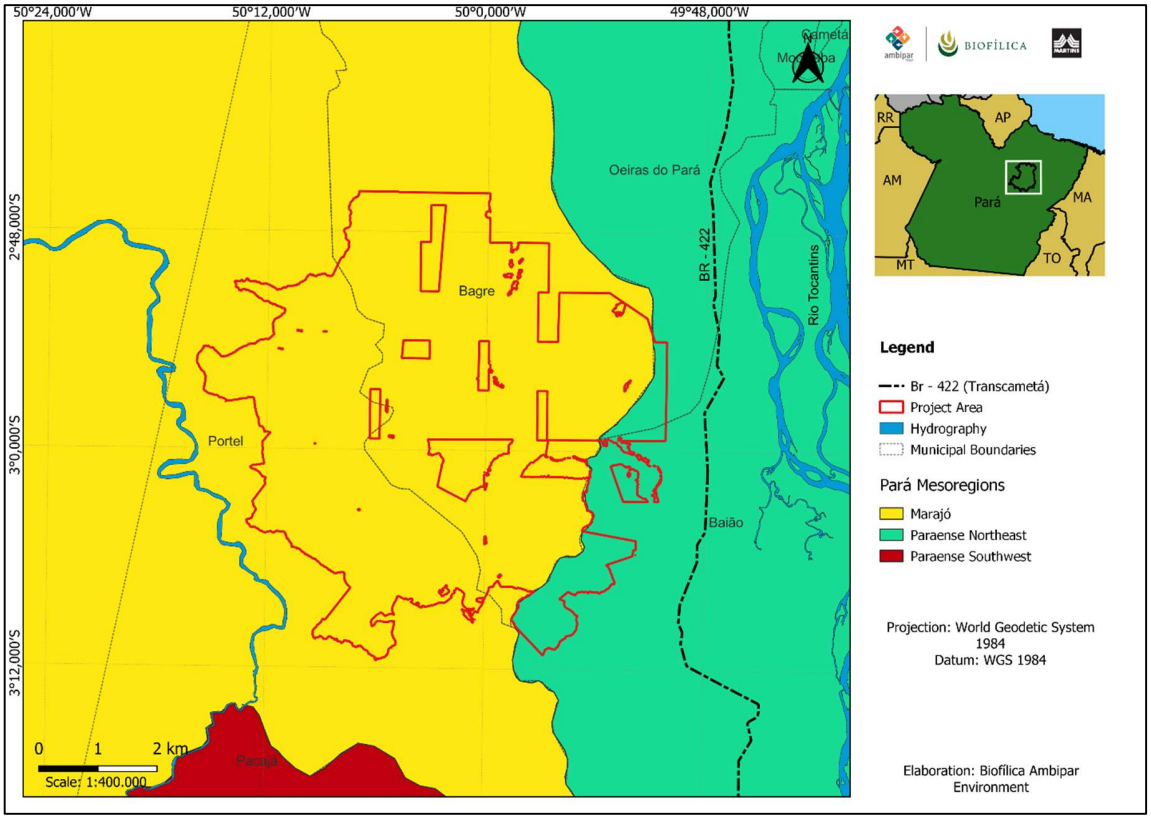
2.1.5 Physical Parameters (G1.3)

The Jutaituba REDD+ Project is located almost entirely in the mesoregion of Marajó, in the state of Pará, covering the cities of Bagre, Portel, Baião and Oeiras do Pará. It is located near Br – 422, Transcametá highway, and near the bank of the Tocantins River, an important Brazilian river, between the parallels 2°48'S and 3°12'S, meridians 50°24'W and 49°48'W (.Figure 1).

Access to the Project location is given in the following ways:

- By land: access through Belém – PA, through PA-483 and PA-151 to Baião – PA. Crossing the Tocantins River by ferry in the city of Baião and access to BR-422 (Transcametá Highway) until km 105 – entrance extension to the farm, being a journey of approximately 8 hours.

- By air: access by Belém to Tucuruí-PA airport (1:30 h of flight) and by BR-422 (Transcametá highway) to km 105 – extension of access to the farm, with 3 hours of travel.



.Figure 1 - Location of the Jutaituba REDD+ Project Area.

The geological, geomorphological, pedological, climatic and hydrological parameters were evaluated for the Reference Region (described in 3.1.3) and are presented below:

Geological Aspects

The Reference Region is located in the Amazon Craton, one of the largest pre-Cambrian areas in the world and one of the main tectonic units in South America, with a formation dating from approximately 1 billion years ago. In the state of Pará, the Amazon Craton includes five provinces: Carajás, Transamazonas, Tapajós-Parima, Amazônia Central [Central Amazon] and Rondônia-Juruena. These provinces are divided into 11 domains (Juruena, Erepecuru – Trombetas Oeste [West], Erepecuru – Trombetas Leste [East], Iriri-Xingu, Tapajós, Carecuru, Paru, Bacajá, Santana do Araguaia, Carajás and Rio Maria). The eastern portion of the state also includes the provinces

of Parnaíba and Tocantins, divided into three pre-Cambian domains: São Luís, Gurupi and Araguaia (SCANDOLARA, 2006)8.

The southern portion of the Reference Region covers the Transamazonas Province (Bacajá domain), and the central-north area of the Reference Region covers the Phanerozoic Sedimentary Basin of rocks of varying ages and different forms of depositional environment (SANTOS, 2003)[9].

The Reference Region has a diverse geology, comprising 15 lithostratigraphic units, which are: Ortognaisse Pacajá, João Jorge, Alter do Chão, Bacajaí, João Jorge, Aruanã, Tucuruí, Sedimentos Pós Barreiras, Sedimentos Pós Barreiras, Arapari and five alluvial Deposits units. Such units have igneous, sedimentary rocks and surface materials (VASQUEZ; ROSA-COSTA, 2008)[10].

Geomorphological Aspects

Most of the territory of the state of Pará is comprised of the Amazonian Morphoclimatic Domain, with the presence of equatorial forested lowlands, with constant rains of great activity in summer and autumn. The relief of the state is characterized by the domain of dimensions less than 250 meters. In the northern and southern regions of the state, the quotas can reach 600 to 800m, presenting higher elevation terrain (AB'SABER, 196911; DANTAS; TEIXEIRA, 2013)[12].

In the eastern portion of the Reference Region there is the Geomorphological Domain Amazonian Plain, with fluvial sediments and flood plains that have cover of igapós forests and pioneering vegetation or covered by floodplain forests. In the north-eastern portion of the Reference Region there is the Geomorphological Domain Tabuleiros de Zona Bragantina, characterized by extensive tables with relief amplitude below 30 meters (IBGE, 2006[13]; DANTAS; TEIXEIRA, 2013).

In the south-eastern portion of the Reference Region there is the Geomorphological Domain Depression of the Lower Tocantins-Araguaia, with land that may have high elevations and slope of 15 to 35° (EMBRAPA, 2006; IBGE, 2006; DANTAS; TEIXEIRA, 2013).

About half of Fazenda Jutaituba, as well as a central part of the Reference Region, is characterized by the Geomorphological Domain Low Plateaus of the Central Eastern Amazon. The low plateaus represent extensive tabular surfaces covered by Firmland forests. In the southern portion of the Reference Region, the Geomorphological Domain Planed Surfaces of the South of the Amazon occurs, being delimited to the north by the Lower Plateaus of the Central Eastern Amazon and to the east by the Depression of the Lower Tocantins-Araguaia. This domain is characterized by

[8] SCANDOLARA, Jaime Estevão. **Geology and evolution of Jamari terrain, basement of the Sunsas/Aguapeí strip, east-central Rondônia, southwest of the Amazon Craton**. 2006. 384 f. Thesis (PhD in Geology)- University of Brasília, Brasília, 2006.

[9]SANTOS, J.O.S. Geotectonics of the Guianas and Central-Brazil shield. In: BIZZI, L.A.; SCHOBBENHAUS, C.; VIDOTTI, R.M.; GONÇALVES, J.H. (Ed.). **Geology, tectonics and mineral resources of Brazil**. Brasília: CPRM, 2003. 692 p. Brasilia: CPRM, 2003. p. 169-226.

[10] VASQUEZ, M.L.; ROSA-COSTA, L.T. **Geology and mineral resources of the state of Pará. SIG: explanatory text of the geological and tectonic maps and mineral resources of the state of Pará**. 2008

[11]AB'SABER, A. N. Problemas geomorfológicos da Amazônia brasileira [Geomorphological problems of the Brazilian Amazon]. In: **SYMPOSIUM ON AMAZONIAN BIOTA**, Rio de Janeiro. Minutes of... Rio de Janeiro: CNPq, 1967

[12]DANTAS, M.E.; TEIXEIRA, S.G. Origin of the Landscapes. In: ADAMY, A. (Org.) **Geodiversity of the state of Pará**. Belém: CPRM, 2013. p.25-49

[13] IBGE - EMBRAPA. **Spatial Database – Scale 1:5,000,000**. 2006. Available at: https://www.ibge.gov.br/geociencias/informacoes-ambientais/pedologia/15829- solos.html?=&t=acesso-ao-produto. Accessed on: Sep 21st 2021.

dissected hills and low hills that have a topographic range ranging from 30 to 80 meters (EMBRAPA, 2006; IBGE, 2006; DANTAS; TEIXEIRA, 2013).

The area of Fazenda Jutaituba reaches altitudes of up to 103 meters, and the regions of tablelands, valleys and especially the Tocantins River have the lowest elevations, reaching 57 meters in the far north. The tabular hills reach different elevations in a range of 23 to 103 meters in the center-south of the farm, with an increase in altitude in the center-south direction and the presence of a dense drainage network (EMBRAPA, 2006; IBGE, 2006; DANTAS; TEIXEIRA, 2013).

Pedological Aspects

The Reference Region has eight types of soils, namely: Red-Yellow Argisol, Ferri-Humiluvic Spodosol, Haplic Gleisol, Yellow Latosol, Red-Yellow Latosol, Fluvic Neosol, Quartzarenic Neosol, and Clayuvic Plintossol (SANTOS et al., 2013[14]; ALMEIDA et al., 2021a[15], 2021b[16]).

In the northern portion of the Reference Region there are two types of soil, the Orthic Quartzenic Neosol and the Hydromorphic Ferrihumyluvic Spodosol. The first is characterized as a soil of an alic or dystrophic character, with little root development in depth. And the second has little fertility, with the presence of acid humus and predominantly sandy texture with strong drainage restriction (SANTOS et al., 2013; ALMEIDA et al., 2021a, 2021b).

In the northeastern portion of the Reference Region, following the banks of the Tocantins River, hydromorphic soils are observed in the flood plains, such as the Argiluvic Plintossols (IBGE, 2006; EMBRAPA, 2006).

On the banks of the Pacajá and Aruanã rivers, Eutrophic Tb Fluvic Neosols can be observed, with great agricultural potential and high fertility clay, but with restriction to crops due to moisture. Along the banks of the Tocantins river, there is the occurrence of Eutrophic Haplic Gleysol Tb, characterized by low natural fertility and water saturation periodically or permanently (SANTOS et al., 2013; ALMEIDA et al., 2021c[17]; SANTOS; ZARONI, 2021[18]; SILVA; NETO, 2021[19]).

[14] SANTOS, H.G. dos; JACOMINE, P.K.T; ANJOS, L.H.C. dos; OLIVEIRA, V. A. de; LUMBRERAS, J. F.; COELHO, M. R.; ALMEIDA, J. A. de; CUNHA, T. J. F.; OLIVEIRA, J. B. de. **Brazilian Soil Classification System. Brasilia**: Embrapa, 2013. 353p. il.

[15]ALMEIDA, E. de P C.; ZARONI, M. J.; SANTOS, H. G. dos. Neossolo Quartzarênicos. **Embrapa Information and Technology Agency**. Available at: Available at: <https://www.agencia.cnptia.embrapa.br/gestor/solos_tropicais/arvore/CONT000gn23 0xho02wx5ok0liq1mqtarta66.html>. Accessed on: Sep 29st 2021a.

[16]ALMEIDA, E. de P C.; ZARONI, M. J.; SANTOS, H. G. dos. Spodosols. **Embrapa Information and Technology Agency**. Available at: <https://www.agencia.cnptia.embrapa.br/gestor/solos_tropicais/arvore/CONTAG01_9_2 212200611539.html#>. Accessed on: Sep 29st 2021b. Accessed on: Sep 29st 2021b

[17] ALMEIDA, E. de P C.; ZARONI, M. J.; SANTOS, H. G. dos. Fluvic Neosols**. Embrapa Information and Technology Agency**. Available at: <https://www.agencia.cnptia.embrapa.br/gestor/solos_tropicais/arvore/CONT000gn23 0xho02wx5ok0liq1mqfveqah8.html> Accessed on: Sep 29st 2021c.

[18] SANTOS, H. G. dos; ZARONI, M. J. Gleissolos. **Embrapa Information and Technology Agency**. Available at: <https://www.agencia.cnptia.embrapa.br/gestor/solos_tropicais/arvore/CONTAG01_10_ 2212200611540.html> Accessed on: Sep 29st 2021

[19] SILVA, M. S. L da; NETO, M. B de O. Neossolos Flúvicos. **Embrapa Information and Technology Agency**. Available at: <https://www.agencia.cnptia.embrapa.br/gestor/solos_tropicais/arvore/CONT000gn23 0xho02wx5ok0liq1mqfveqah8.html> Accessed on: Sep 29st 2021a

The Dystrophic Red-Yellow Latosol occurs in the southern portion of the Fazenda Jutaituba, presenting high depth, good drainage and low fertility. And the Yellow Latosols occur predominantly in both the Reference Region and the Fazenda Jutaituba, extending from the center to the north, differing by the more yellow color compared to the other suborders of Latosols. They are well-drained soils with a predominance of clayey texture and low natural fertility (ALMEIDA et al., 2021e[20]).

In the southern part of the Reference Region, Dystrophic Red-Yellow Argisols are observed, with high clay concentration and low to very low natural fertility (SILVA; NETO, 2021b[21]).

Climate Aspects

The climate of the state of Pará is associated with the Amazonian macro-region in the equatorial region, which is hot and humid and regulated by the seasonal displacement of the Intertropical Convergence Zone (ITCZ) and by the Continental Equatorial Mass (CEM) of expressive behavior in summer and autumn. Therefore, there is a dry period of short winter and part of spring, ranging from two to four months (NIMER, 1989[22]).

In the Amazon, the average rainfall is approximately 2,300mm/year. The rainy months and high convective activity correspond to the period between November and March, while the months related to dry periods are between May and September, with April and October as months of transition from one regime to the other (FISCH et al., 1998[23]).

In the state of Pará, the climate can be in three categories within the Koppen parameters: Am, tropical monsoon climate, predominant in the state of Pará in the northern and southern portions, with a temperature greater than or equal to 18°C in the coldest month and precipitation of the driest month below 60 mm, with a total annual average above 1,500 mm; Af, tropical climate without dry season in the northeast and Midwest portions, with a temperature greater than or equal to 18°C in the coldest month and precipitation of the driest month above or equal to 60 mm; and a portion to the east of tropical climate with dry winter (Aw), obtaining a temperature greater than or equal to 18°C in the coldest month (ALVARES et al., 201324).

Considering two historical series of climate data of 30 years in the periods from 1961 to 1990 and from 1981 to 2010, the Tucuruí and Cametá meteorological stations, closer to the Reference Region, identified average annual rainfall accumulated in the first period of 2,528.1mm, and 2,511.9mm in the second period. For the two historical series, the months of January to May with the highest volume of precipitation are identified as rainy periods, and the driest, July to December,

[20]ALMEIDA, E. de P C.; ZARONI, M. J.; SANTOS, H. G. dos. Yellow Latosols. **Embrapa Information and Technology Agency**. Available at: <https://www.agencia.cnptia.embrapa.br/gestor/solos_tropicais/arvore/CONT000fzyjaywi02wx5ok0q43a0r58asu5l.html> Accessed on: Sep 29st 2021e.
[21] SILVA, M. S. L da; NETO, M. B de O. Red-Yellow Argisols. **Embrapa Information and Technology Agency**. Available at: <https://www.agencia.cnptia.embrapa.br/gestor/territorio_mata_sul_pernambucana/arvore/CONT000gt7eon7k02wx7ha087apz2axe8nfr.html> Accessed on: Sep 29st 2021b.
[22] NIMER, E. **Climatologia do Brasil**. Rio de Janeiro: IBGE, 1989. 448 p.
[23]FISCH, G.; MARENGO, J. A.; NOBRE, C. A. A general review of the climate of the Amazon. **Acta Amazonica**, v.28, n.2, p.101-126, 1998.
[24]ALVARES, CA; STAPE, JL; SENTELHAS, PC; GONÇALVES, JL de M.; SPAROVEK, G. Köppen's climate classification map for Brazil. **Meteorologische Zeitschrift**, v.22, n.6, p.711-728, 2013.

indicating the lowest volume of precipitation (INMET, 202125). The Figure 2 exemplifies the climatic dynamics of the region.

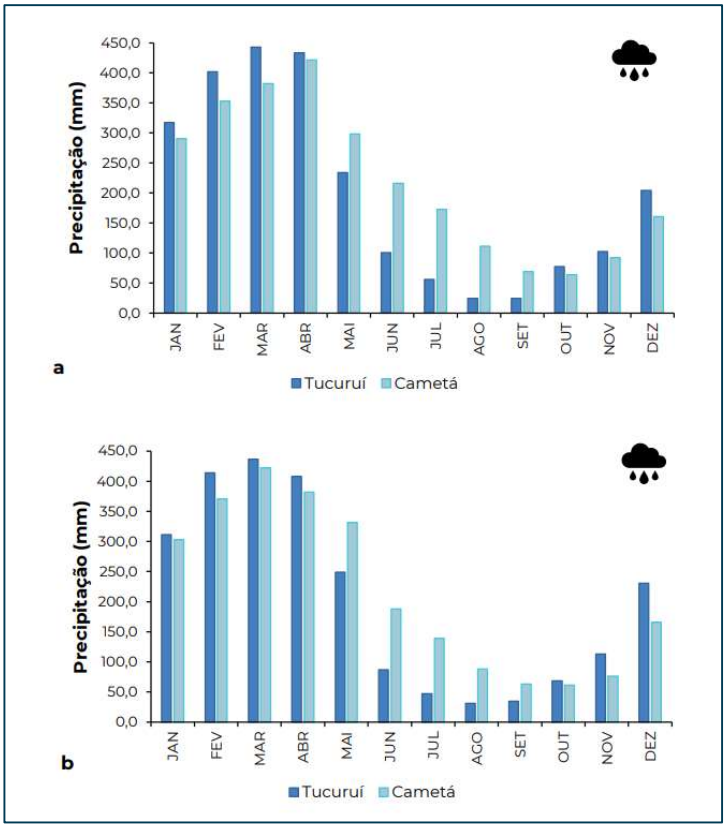


Figure 2 - Monthly accumulated precipitation of the Tucuruí and Cametá weather stations – PA. A. Historical series from 1961 to 1990; b. Historical series from 1981 to 2010.

Hydrological Aspects

The Project Area is located in the Tocantins-Araguaia Basin, more precisely in the Amazon sub-basin, between the Xingu River and its mouth. The main rivers in the Tocantins-Araguaia basin are: Tocantins, Araguaia and Mortes, which make up a 2,250 navigable kilometers waterway in three stretches (ANTAQ, 201326; ANA, 2021)[27].

[25] INMET – NATIONAL INSTITUTE OF METEOROLOGY. **Climatological Normals. Historical Series 1961-1990 and 1981-2010**. Available at: <https://portal.inmet.gov.br/servicos/normais-climatol%C3%B3gicas> Accessed on: Sep 22st 2021.

[26] AGÊNCIA NACIONAL DE TRANSPORTES AQUAVIÁRIOS – ANTAQ. **Environment – Environmental impacts.** 2014. Available at <http://www.antaq.gov.br/portal/MeioAmbiente_ImpactosAmbientais.asp> Accessed on 22 Oct. 2021

[27] NATIONAL WATER AGENCY – ANA. **Stations of the National Hydrometeorological Network (ANA and Other Entities) in Operation in June 2019 (shp)**. 2019. Available at: <https://metadados.snirh.gov.br/geonetwork/srv/por/catalog.search;jsessionid=8CBBD 6A57966FAC8D9A9ED871CD19709#/metadata/f85dbf06-a869-414c-afc5- bb01869e9156>. Accessed on Aug. 25, 2021

The Reference Region is composed of part of the Pará state basin in the north and center-west portion, the east and center-south part comprises the Caxiuanã Bay basin (Figure 3), being the predominant basin in the study area (ANA, 2021b)[28].

The Tocantins River, an important Brazilian river, is close to the project area covering the eastern portion. The three major rivers of greatest extension within the Reference Region are: Pacajá, Jacundá and Aruanã (ANA, 2021).

The Pacajá River has 33% of its length within the Reference Region and defines, in part, the western boundary of the farm. The Jacundá river extends through four priority areas for conservation in the Amazon of extremely high biological importance, and has 76% of its total length within the Reference Region, and still cuts the farm in the eastern portion towards south-north, equivalent to 16% of the river in the vicinity of the farm. The Aruanã River, in turn, has 89% of its length within the Reference Region in the central-south portion and stretches through a priority area for conservation of extremely high biological importance (ANA, 2021).

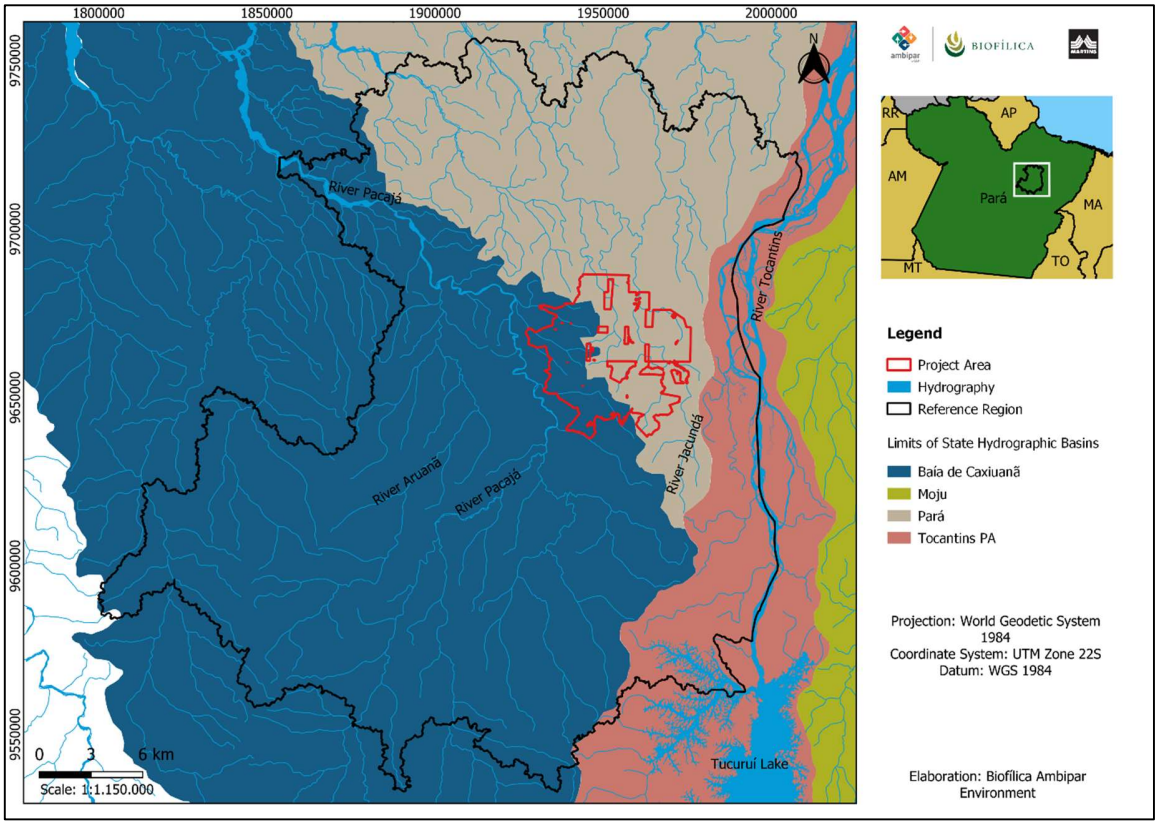


Figure 3 - Map highlighting the river basins and main rivers that are in the Project Area and Reference Region.

Vegetation

[28] NATIONAL WATER AGENCY – ANA. **Learn more (Tocantins)**. 2021. Available at: <https://www.gov.br/ana/pt-br/sala-de-situacao/tocantins/saiba-mais-tocantins/riodoce-saiba-mais>. Accessed on Sept. 15, 2021b

The region of the project is inserted in the Amazon biome, consisting of lush forest formations with great diversity in relation to the structural characteristics of vegetation such as the level of closure or opening of the canopy and the predominance of life forms such as palm trees, vines or bamboos. Less frequently, non-forest formations called Campinarana are found, which is a formation with soil climax, that is, it occurs due to the influence of soil characteristics, which is sandy and does not include forest formation (IBGE, 2012)[29]. Still, one of the main characteristics of the Amazon is the presence of forests that, because they are located in regions with abundance of water, are called Ombrophils.

Thus, from this diversity of physiognomies, the main formations for the biome are: i- Dense Ombrophilous Forest (FOD), which is characterized by a compact forest cover, with a dense canopy that intersects much of the solar radiation, making the light that reaches the lower stratum of the forest scarce; and ii- Open Ombrophilous Forest (FOA), which has a less closed canopy, allowing greater penetration of light into the lower stratum of the forest. The greater solar radiation favors the proliferation of some forms of life, which, when found in abundance, give the name to the subdivisions of this formation, called FOA with Palms, FOA with Bambú, FOA with Vines and FOA with Sororoca (type of plant). Ombrophilous forests can also be categorized as to the altitude at which they occur, in alluvial, lowlands, submontane, montane and upper montane (IBGE, 2012). Figure 4 Presents the forest formations found in the Reference Region and Project Area.

For the Amazon Ombrophilous Forest, it is usual to use a nomenclature that differentiates formations in a more simplified way, using two designations: Firmland Forest and Alluvial Forest (PIRES and PRANCE, 1985[30]; VELOSO et al, 1991[31]). Basically, the Firmland Forest is the one that occurs in flood-free areas due to the higher relief, favoring the development of a tall and compact forest, with very large emerging trees, such as the chestnut (*Bertholletia excelsa*), the red angelim (*Dinizia excelsa*) and the maçaranduba (*Manilkara elata*); while the Alluvial Forest is the one subject to periodic or constant flooding, occurring in flat areas and adjacent to watercourses, with species adapted to water saturation such as the summa (*Ceiba pentandra*) and the açaí (*Euterpe oleracea*).

[29] IBGE. **Technical manual of Brazilian vegetation.** Coordination of Natural Resources and Environmental Studies. 2 ed. Rio de Janeiro. 2012.
[30] PIRES, JM; PRANCE, GT **The vegetation types of the Brazilian Amazon**. In: Prance, G.T.; Lovejoy, T.E. (Eds.). Key environments Amazonia. New York: Pergamon Press. p. 109-145. 1985.
[31]VELOSO, H.P.; RANGEL FILHO, A.L.R.; LIMA, J.C.A. **Classification of Brazilian vegetation adapted to a universal system.** Rio de Janeiro: IBGE/Department of Natural Resources and Environmental Studies. 124 pp. 1991.

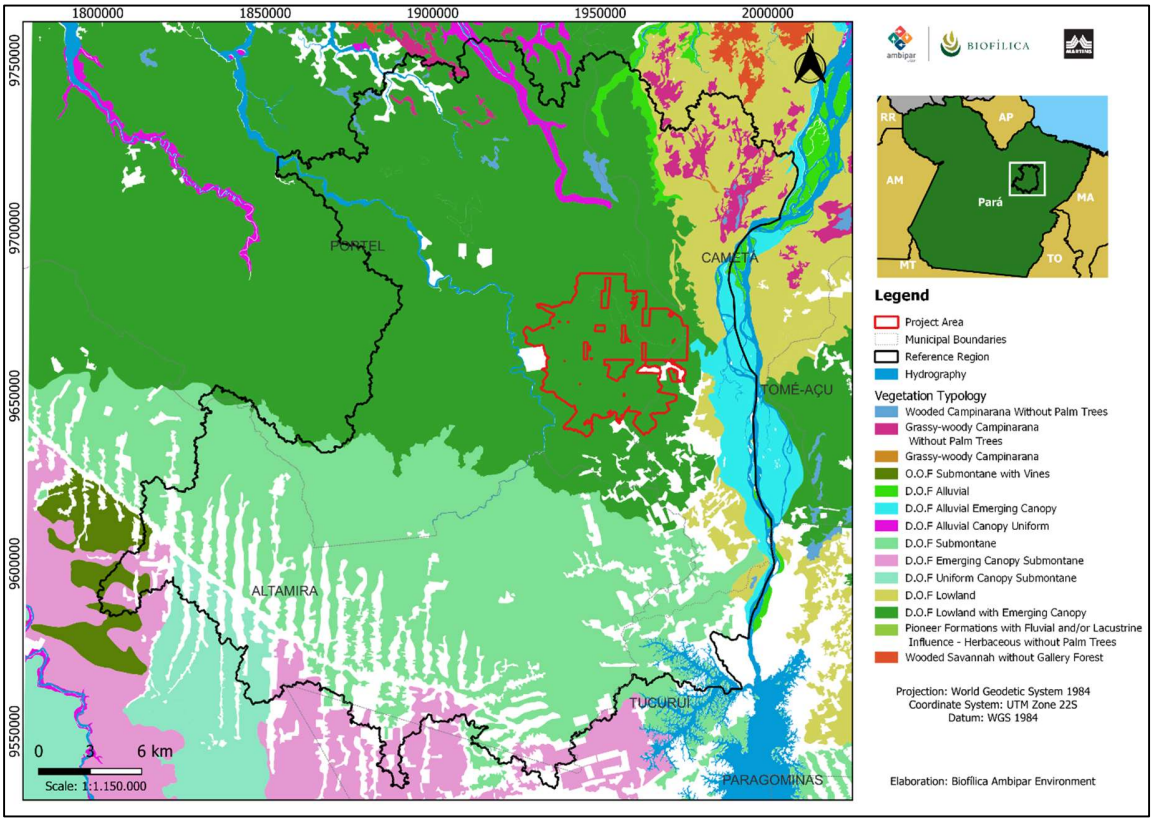


Figure 4 - Map of forest typologies found within the Project Area and Reference Region.

According to RAMOS (2019)[32], the two forest typologies that predominate in the Project Area (Fazenda Jutaituba) are Dense Firm Earth Ombrophilous Forest and the Alluvial Dense Ombrophilous Forest. In addition to these two forest typologies, the Open Ombrophilous Forest with Vines and the Alluvial Open Ombrophilous Forest and tiny stretches of "capoeira" that are areas of secondary vegetation, where there was some type of disorder, usually associated with anthropic action, also occur on the farm.

The species cataloged in the Project Area occur in four different formations: alluvial open ombrophilous forest (FOAA); open ombrophilous forest with vines (FOAC)[33]; dense ombrophilous forest (FOD)[34]; and periodically flooded dense ombrophilous forest (FODPA)[35]. For a better understanding of their peculiarities, descriptions of these forest typologies are presented below, taken from the Technical Manual of the Brazilian Vegetation (IBGE, 2012).

FOAA – "Formation established along the watercourses, occupies the plains and terraces periodically or permanently flooded, which in the Amazon constitute physiognomies of forests-de-várzea or forests-de-igapó, respectively. It has a floristic composition and predominant ecological characteristics, similar to those of the Alluvial Dense Ombrophilous Forest, only in the physiognomy

[32] RAMOS, Y.A. **Phytosociology, floristics and modeling of diametric distribution in two different forest formations in the state of Pará.** Master's dissertation. Graduate Program in Forestry and Environmental Sciences at the Federal University of Tocantins. 75p., 2019.
[33]Also referred to as Open Umbrophilous Lowland Forest (FOATB)
[34]Also called Lowland Dense Ombrophilous Forest (FODTB)
[35]Also called Alluvial Dense Ombrophilous Forest (FODA)

stands out for presenting many large palm trees that, not infrequently, form gregarisms. Sometimes it also stands out for the dominance of woody and herbaceous lianas, covering a rarefied stratum of trees".

FOAC – "This formation is more expressive in the south of the State of Pará, especially in the circular depressions of the Precambrian and there called" coppice forest ", is distributed throughout the Amazon. On the slopes of the plateaus and in the mountains, the ombrophilous forest open with vines presents a physiognomy with large elements isolated and surrounded by woody lianas. These woody lianas, with predominance of genera of the Fabaceae and Bignoniaceae families, have wide dispersion within the forests, but commonly found in greater numbers in the open and well-lit environments ".

FOD – "This type of vegetation is characterized by a high density of medium and large trees, in addition to woody and epiphytic lianas in abundance, which differentiate it from other classes of formations. However, its main ecological characteristic resides in the ombrophilous environments (with high humidity). Thus, the ombrothermic characteristic of the dense ombrophilous forest is attached to tropical climatic factors of high temperatures (averages of 25°C) and high rainfall, well distributed during the year (from 0 to 60 dry days), which determines a situation with virtually no biologically dry period ".

FODPA – Basically, they are areas of FOD in low elevation terrain, close to watercourses that overflow periodically, flooding stretches of the forest. "This formation consists of fast-growing trees, usually of smooth bark, conical trunk, sometimes with the characteristic shape of a cylinder and tabular roots. It often features a uniform emerging canopy. It is a formation with many palm trees, with the presence of shrubs in the middle of seedlings of the dense natural reconstitution. In contrast, the formation has many woody and herbaceous lianas, as well as a large number of epiphytes and few parasites. "

2.1.6 Social Parameters (G1.3)

The seventeenth century was marked by the occupation of the Lower Tocantins estuary with the Portuguese expeditions, resulting in the foundation of the village of Cametá in 1635. The towns and parish landmarks were built on the banks of the rivers, serving mainly as gateways for blacks enslaved by the mills, but also as an escape route for these slaves.

The formation of quilombola communities in the region can be attributed to the ability of these groups to articulate with society through trade. The region was marked by strong resistance from the black population to slave labor, with records of insurgent movements, in which the escapes from the mills resulted in the formation of aquilombamentos, where blacks sought to remake social and economic life in Lower Tocantins.

Through the black movements supported by the Catholic Church, which strengthened community organization and political mobilization, discussions began on territorial rights under the quilombo category. The demand for the demarcation of the remaining territories of quilombos demanded from the State the reparation for the centuries of enslavement. In this sense, the legislation underwent reforms to meet the political pressure imposed by the quilombola groups, such as Article 8 of Decree No. 3.572 of July 22, 1999[36], which regulates the process of recognition of the

[36] Decree No. 3.572, of July 22, 1999 - Pro-Indian Commission of São Paulo (cpisp.org.br)

quilombola territories of the state of Pará. With the joint work of the National Institute of Colonization and Agrarian Reform (INCRA) and the Terras do Pará Institute (ITERPA), from 2007, the state reached a significant number of regularized quilombola territories.

At the entrance of the Fazenda Jutaituba, there are a total of 29 communities, between quilombolas and rural, and four cities closer: Bagre, Baião, Oieras do Pará and Portel. The economic activities that plead the region refer mainly to agricultural crops, especially cassava, livestock and extraction of forest products. In this scenario, Baião and Portel have the largest participation in harvested area of cassava cultivation, with 84% of a total of 29,030 ha. In a more micro perspective, among the productive structure of the communities around the farm, subsistence agriculture is at the base, with agroextractivist and livestock activities. When it comes to non-timber forest extraction, communities extract products such as bacaba, açaí, brazil nut, bacuri, uxi, piquiá, in addition to flowers, vines and various straws. Among the most commercially important products among communities, cassava flour leads the list, followed by black pepper.

Considering the extraction of forest products, açaí has greater prominence and ancestry under the other products. The city of Oeiras do Pará, shows a greater quantity in tons of açaí collected compared to the other 3 cities analyzed. Regarding timber extraction, the highlight of the region is timber, with wide participation of the city of Portel, which in 2019 extracted 1,000,000 m3, followed by Baião with 95,000 m3. It can be inferred, therefore, that the extraction of wood is one of the predominant economic activities in the region. In the communities around Fazenda Jutaituba, the pressure on forest areas is constant and grows every year, with reports of illegal logging and smuggling with sawmills in the region. In addition, the exploitation of wood occurs not only by third parties, but also by families of communities, being a source of financial resources in times of greater need.

Regarding the characterization of the region where the Fazenda Jutaituba is located (cities of Baião, Bagre, Oeiras do Pará and Portel), according to the census data made available by IBGE on the cidra platforms (IBGE System of Automatic Recovery[37]) and IBGE Cities[38], when comparing the count of 2000 with 2010, the city of Baião presented the largest population increase, above 11,577 inhabitants (31.39%). The city of Bagre has the second largest increase, in relation to the percentage, 7,461 inhabitants (31.26%). In Portel, the percentage increase in population was 20.65% (10,773 inhabitants). In the city of Oeiras do Pará, the population growth was much less expressive, being 4,255 inhabitants (14.88%). In all cities, the rural population is quite significant, with the urbanization rate in 2010, below 50%, with the exception of the city of Baião, which presented an urbanization rate equal to 50%.

Regarding Health, the 4 cities together have a total of 88 health establishments, with the Basic Health Units (BHU) with the largest contingent (29 establishments). Together, the cities have 352 professionals in the area, with greater emphasis on nursing technicians (169) and nurses (83). Among the four cities, there are only 1 speech therapist (Portel), 2 pharmacists (Baião and Portel) and 4 psychologists (Baião, Oeiras do Pará and Portel), with fewer professionals. The city of Portel has a greater diversity of health professionals. Despite these numbers, access to health services by the communities of the Fazenda Jutaituba is precarious, limited to the care of community health agents. The communities have only two Health Posts (Balieiro and ARQUITA) and two Basic Health Units (ARQIB and Umarizal).

[37] IBGE Automatic Recovery System - CIDER
[38] IBGE Cities Platform. Available at: https://cidades.ibge.gov.br

Regarding education, the cities together have a total of 193 and 310 pre-school and elementary schools, respectively all under the administration of the municipal government. As a qualitative indicator of education, we used the school performance and dropout rates, which allow us to perceive the dynamics of school success. The years 2015 and 2019 were considered as a database.

For 2015, Baião presented good approval indicators, 79.9% in elementary school and 76.9% in high school, with dropout rates of 5.6% and 15.1% for these same levels of education, respectively. For the performance of the other cities in the region, the approval rate of elementary school is below 75%. Regarding high school, the city of Oeiras do Pará is highlighted for presenting the lowest approval rate 58.2% and with an evasion of 26.7%. When comparing the 2015 data with that of 2019, it is observed that for elementary school, the cities of Bagre and Portel presented an increase in the approval rate, with 7.4% and 1.9% respectively. In relation to high school, Oeiras do Pará has the highest percentage increase in the approval rate 8.9%. The other cities showed a reduction in the approval rate and an increase in the school dropout rate.

In the case of basic sanitation, among the communities, only 46% have access to water from the general supply network, the other percentage (54%), accesses water for consumption from wells, springs, ponds or directly from the river. In addition, 82% of families have bathrooms or toilets at home, and most families (69%) burn their solid waste in lots, the other part (19%) buries them. Given this, no family has access to solid waste collection services.

2.1.7 Project Zone Map (G1.4-7, G1.13, CM1.2, B1.2)

The boundary of the Project Area, as defined in Figure 5, was defined from a buffer of 15 km from the boundary of the Project Area, with a greater amplitude in the northeast to include all potentially impacted communities in the vicinity of the Jutaituba REDD+ Project. The High Conservation Value Area (HCVA) coincides with the Project Area according to the studies that were previously done.

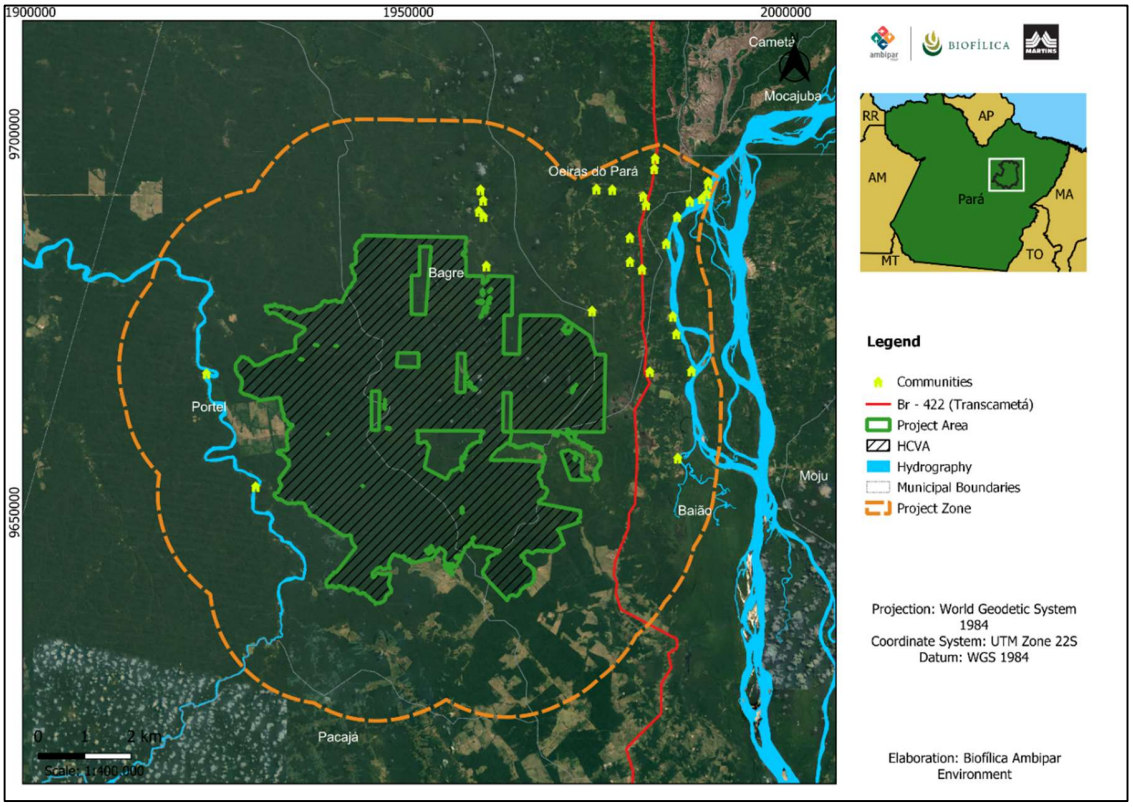


Figure 5 – Jutaituba REDD+ Project Zone Limit.

2.1.8 Stakeholder Identification (G1.5)

Through a socioeconomic diagnosis carried out by the company STA (Environmental Technical Solutions) together with Martins Agropecuária, rural communities were identified in the vicinity of Fazenda Jutaituba, as well as other stakeholders who have relationship and interaction, such as community groups, which influence or may be influenced by the activities of the Project. The project area does not have resident communities or families.

In the diagnosis, the communities were consulted and presented to the objectives of the Jutaituba REDD+ Project using the Rapid Participatory Rural Diagnosis (DRP) methodology. The process was developed through conversations, illustrations, drawings, diagrams and field observations.. Interviews were conducted with key informants of the communities, obtaining, from this, specific information related to health, education, culture, social organization and infrastructure.

In addition to the communities, individual interviews were conducted with all workers at Martins Agropecuária and the companies LN Guerra and GB Florestal, employees who work at Fazenda Jutaituba. For the interviews, a form with discursive and multiple-choice questions was used, in order to understand the reality of the workers, as well as the existence of training, the number of inhabitants of the communities working in the area and the understanding or access to information on labor issues.

Interviews were also conducted with representatives of rural properties in the vicinity of the farm. The interviews were conducted by a questionnaire with discursive and multiple-choice questions, with the following objectives:

- Identification of the rural property/owners;
- Identification of the productive activities they carry out;
- Among the productive activities, identification of practices that could be characterized as drivers or causes of deforestation;
- Among the productive activities, identify risks that can cause deforestation;
- Identification of the prospects for future land use, if they intended to increase the productive area to the point of being a driver of deforestation;
- Identification if there was any sustainable productive practice that could be encouraged in the future with the project.

2.1.9 Stakeholder Descriptions (G1.6, G1.13)

The communities identified at the entrance of Fazenda Jutaituba are 86% quilombolas and 14% riverside and rural, out of a total of 29 communities. All communities identified are described in Table 3.

Table 3 - Communities identified in the vicinity of Fazenda Jutatiuba.

Name	Classification
Araquembaua	Quilombola
Baixinha	Quilombola
Campelo	Quilombola
Carará	Quilombola
Itaperuçu	Quilombola
Cupu	Quilombola
Igarapé Preto	Quilombola
França	Quilombola
Igarapezinho	Quilombola
Pampelônia	Quilombola
Teófilo	Quilombola
Varginha	Quilombola
Tatituquara	Quilombola
Ajará	Quilombola
São Sebastião	Quilombola
Boa Esperança	Quilombola
Bailique Beira	Quilombola
Bailique Centro	Quilombola
Poção	Quilombola
São Bernardo	Quilombola

Name	Classification
Umarizal Beira	Quilombola
Umarizal Centro	Quilombola
Boa Vista	Quilombola
Paritá Miri	Quilombola
Balieiro	Quilombola
Joana Peres	Quilombola/Extractivist
Combucão	Rural Community
São Tomé	Riverside Community
Nova Canaã	Riverside Community

The Araquembaua, Baixinha, Campelo, Carará, Itaperuçu, Cupu, Igarapé Preto, França, Igarapezinho, Pampelônia, Teófilo and Varginha communities form the quilombola territory ARQIB, the Tatiquara, Ajará, São Sebastião and Boa Esperança communities form the quilombola territory ARQUITA. These communities, in particular, will not be individualized in the data, due to the demand of their associations, the communities must be treated and analyzed as the set of communities that form the quilombola territories.

In addition to the communities, other stakeholders were identified, such as:

- Martins Agropecuária;
- Biofílica Ambipar Environment;
- Rural properties in the vicinity of Fazenda Jutaituba;
- Workers of Fazenda Jutaituba (LN Guerra, GB Florestal and Martins Agropecuária);
- Public Bodies;
- Academic and research institutions.

In the vicinity of Fazenda Jutaituba, there are a total of 21 rural properties, presented in the Table 4 below along with the city to which they are inserted.

Table 4 - Rural properties identified at the entrance of Fazenda Jutaituba.

Rural properties	City
Fazenda Tucunaré	Oeiras/Bagre
Fazenda Água Boa	Oeiras/Bagre
Fazenda Vale Verde	Oeiras/Bagre
Fazenda Jatobá	Oeiras/Bagre
Sítio Boa Sorte I	Baião
Fazendinha	Portel
Fazenda Esqueiro	Baião
Fazenda Beleza/Primavera	Baião
Fazenda Progresso	Baião

Rural properties	City
Fazenda Abençoada I	Baião
Fazenda Abençoada II	Baião
Fazenda Abençoada III	Baião
Fazenda Cumaru	Portel
Fazenda Pacajá	Baião
Fazenda Umuarama	Baião
Fazenda Transamazônica	Baião
Fazenda São Raphael	Baião
Fazenda Joana Peres I	Baião
Fazenda Joana Peres II	Baião
Fazenda Joana Peres III	Baião
Fazenda Cumarumã	Portel

In addition, regarding the workers of Fazenda Jutaituba, a total of 77 workers were identified among the three companies that operate on the farm: GB Florestal, LN Guerra and Martins Agropecuária. Table 5 Presents the number of farm workers and the related company.

Table 5 - Number of employees of each company operating on Fazenda Jutaituba

Enterprises	Number of Workers
GB Forestry	31
LN Guerra	5
Martins Agropecuária	41
Total	77

All stakeholders should be invited to be part of the discussions of the Jutaituba REDD+ Project, in order to have a space for articulation and communication between Martins Agropecuária and the communities and other stakeholders involved in the Project. The evaluation of the rights, interests and relevance of each group of actors in relation to the Project was carried out, together with the employees of Martins Agropecuária and is specified in the Table 6 below.

Table 6 - Description of the actors involved in the Jutaituba REDD+ Project

Group of actors involved in the Project	Rights in relation to the Project	Interests in your participation in the Project	Relevance in the participation of the Project
Martins Agropecuária	Holder of the right of credits, responsible for the investments, development and implementation of the Project. Execution and	Ensure the inclusion of communities in the activities of the Project and that the activities of Technical Assistance and Rural	High – Due to its great influence in the region, it becomes a primary component in the containment of deforestation, in addition

Group of actors involved in the Project	Rights in relation to the Project	Interests in your participation in the Project	Relevance in the participation of the Project
	local management of social activities. It is also the organization responsible for managing financial resources.	Extension also incorporate a look at issues such as education, health, guarantee of human rights, environment, culture and generation of employment and income.	to the opportunity for the communities of the activities already carried out and those foreseen by the Project.
Communities	Beneficiaries of social activities	Access alternatives of rural and socioeconomic technical assistance services to improve their living conditions.	High – They are essential components of social activities, deforestation control and development of a local economy model based on sustainable and harmonious practices with the forest.
Workers of Fazenda Jutaituba	Beneficiaries of social activities	With a constant presence in the project area, workers help to contain deforestation, in addition to accessing alternatives for rural and socioeconomic technical assistance services to improve their living conditions.	High – many workers are also community workers, in this sense, they are essential components of social activities and containment of deforestation, due to their constant presence in the project area.
Rural properties in the vicinity of Fazenda Jutaituba	Beneficiaries of social activities	Access alternatives of rural and socioeconomic technical assistance services to improve their living conditions.	High – They are essential components of social activities
Public Bodies	Articulate with the other actors in order to improve the implementation and permeability of public policies, support in complementary actions for the implementation of the Project	Bringing public power closer to community demands and strengthening government relations, which are currently fragile. Participate in the monitoring of the development of private and voluntary REDD+	Medium – The actors are officially responsible for developing and implementing socio-environmental and economic public policies.

Group of actors involved in the Project	Rights in relation to the Project	Interests in your participation in the Project	Relevance in the participation of the Project
		initiatives, cooperate with the development of public policies.	
Public, private, non-governmental organizations, associations and others	Not applicable	Develop partnerships, carry out technical assistance, promote job creation, expand action, improve local governance, carry out research, produce and disseminate knowledge, promote forest management for sustainable production, ensure permanence of traditional communities, develop and publish scientific papers, guarantee an area of rich socioeconomic and environmental context, etc.	High – In order for the social activities of the Project to have maximum effectiveness in practice, the Project will seek to establish partnerships in the region, whether public, private, third sector and/or organizations. Through partnerships, it is expected that there will be greater strengthening and involvement of all stakeholders, as well as mutual collaboration and exchange of expertise in the demands mapped by the Project.

2.1.10 Sectoral Scope and Project Type

- **Sectoral Scope:** 14 – Agriculture, Forestry and Other Land Uses (AFOLU);
- **Project Category:** Reducing Emissions from Deforestation and Forest Degradation (REDD);
- **Activity Type:** Avoided Unplanned Deforestation (AUD);
- **Grouped Project:** No.

2.1.11 Project Activities and Theory of Change (G1.8)

The theory of change is nothing more than a strategy of changing something and “the reasoning behind how and why a purpose or outcome should be achieved in a particular context.” Result chains can help address these challenges by helping project teams articulate strong and clear theories of change, focus and organize efforts, prepare for effective performance monitoring, learn what works and what does not, understand important conditions for success, and practice adaptive management.

For the elaboration and design of this Project, the result chain guided the use of the theory of change and was considered an important step in the process of developing the activities to help proponents clarify how they support the proposed strategic approach and will affect the change in the identified problem(s).

In this sense, the Jutaituba REDD+ Project aims to promote joint actions with the objective of generating net benefits for the climate, communities and biodiversity. Thus, the Project's activities were outlined, and the actions proposed by the Project will predominantly seek to ensure the conservation and protection of biodiversity and natural resources, the reduction of unplanned deforestation and greenhouse gas emissions, local socioeconomic development, social inclusion, the engagement and involvement of stakeholders and the promotion of adaptive and assertive governance.

This set of interconnected actions will allow the generation of financial resources, mainly from the commercialization of REDD+ credits registered in the VCS (Verified Carbon Standard) associated with social development and the conservation of natural resources, seeking to ensure adequate financing to meet the objectives mentioned above, as well as allowing its maintenance throughout the life cycle of the Jutaituba REDD+ Project.

To this end, the development of the following series of activities proposed for the Project was prepared after carefully evaluating and accounting for the ideas and wealth of knowledge accumulated for the Project Zone. In addition, the activities defined are divided by scopes for better understanding, namely: “Initial Studies and Articulations”, “Implementation, Monitoring and Evaluation of Activities Developed by the Project”, “Strengthening Governance”, “Improving Asset Surveillance within the Farm”, “Monitoring of Deforestation via Satellite Images”, “Formalizing access to the Fazenda Jutaituba for stakeholders”, “Non-timber forest management at the Fazenda Jutaituba”, “Promoting sustainable practices”, “Promotion of Environmental Education for Hunting and Fishing” and “In-situ Biodiversity Monitoring”.

The summary of the activities as well as their scopes are described below.

a. General Scope

Initial Studies and Joints

The beginning of the Project includes the articulations that extend from the signing of the contract, where a long-term partnership was defined aiming at environmental conservation and socioeconomic development of the region, as well as meetings with technical partners to start the initial studies of the Project.

The initial studies provide technical support for the preparation of the project management plan. Among the studies carried out are: the survey of the estimate of the forest carbon stock and the elaboration of the deforestation baseline, which results in direct climatic impacts; Socioeconomic Diagnosis and Consultation with communities, which have deepened the studies already carried out in the area and resulted in direct social impacts; and Environmental Diagnostics, which, as well as the Socioeconomic Diagnosis, supported the construction of actions to ensure sustainable economic development and sustainable use of natural resources, as well as ensuring the conservation of the standing forest, basing the proposed activities, resulting in direct impacts on communities and biodiversity.

Implementation, monitoring and evaluation of the activities developed by the Project

As an essential part for deliveries of net benefits of a REDD+ Project, it must be monitored within the activities, indicators, tasks and monitoring plan proposed in the PDD. For this to occur, good management of the Project is necessary, ensuring that the activities are carried out, that possible risks are mitigated and, in addition, that there is always a continuous improvement in the implementation of the activities proposed by the Project. Briefly, this activity will therefore focus on improving the management of the Project, comparing the real scenario, verifying the failures and risks and reflecting in a dedicated space to make official the historical milestones of the Project, the changes that have occurred, adaptations made over the credit generation period associated with more assertive and better guided decision-making during the implementation and monitoring stages. This will bring more effective adaptive management, promoting more assertive decisions as well as aligned with the assumptions drawn in the PDD.

Thus, the activity "implementation, monitoring and evaluation of the activities developed by the Project" has its foundations in conducting throughout the life cycle of the Project an efficient management, thus achieving the expected positive impacts. In order for the objectives to be achieved, actions such as producing reports of Project activities, evaluation of indicators and results, definition of planning and priority of tasks for all years, tactical plans to be followed and implementation of tools that can express the historical milestones and adaptive changes found to evaluate activities with stakeholders are suggested.

This activity has great synergy with the activity described below: "Strengthening of governance". The implementation of a partnership for *on-site activities,* as proposed by the activity below, will dialogue with the scope proposed in this activity, since the partner expected to be hired to assist in the development of *on-site* activities will constantly report to the Project proponents on the activities developed, as well as in helping to define the most relevant and urgent commitments of the Project.

Also, if well conducted, the actions will lead to a greater understanding of the impacts generated and opportunities to redirect demands at priority levels, establishing procedures and protocols to be followed by stakeholders. That said, constant alignment and common strategies among stakeholders are indispensable so that this activity actually occurs and demonstrates, in detail, the efforts of the actors in the implementation and monitoring of the Project. All this assists the Project proponents in the continuous improvement of the implementation of the proposed activities, due to the identification of bottlenecks, ineffectiveness and failures.

Strengthening governance

Aiming at the implementation of the activities proposed by the Jutaituba REDD+ Project, the "Strengthening of governance" activity has as its scope the implementation of a working partnership for *on-site* action, facilitating the operationalization in the day-to-day monitoring of the execution of the activities proposed in this document. In this sense, from the implementation of a working partnership with a local partner, procedures will be structured to assist in the implementation of the activities of the Project, as well as in the monitoring of these activities, corroborating so that in fact the Project is implemented in the best possible way, as well as helping the proponents in the monitoring and operationalization of the demands and the proposed activities.

That said, the consolidation of a partnership will strengthen the governance of the Jutaituba REDD+ Project once the *on-site* presence of Project representatives for constant assistance is established, being a central pivot in understanding the local reality. In addition, it is expected that there will be the routine presence of partners in the area, reflecting a greater power to contain deforestation, since it strengthens the relationship with the communities surrounding the Fazenda Jutaituba,

avoiding illegal entries and activities, in addition to monitoring the effectiveness of the other activities proposed by the Project.

In addition, this partnership will aim to define better strategies for engagement, working together and strengthening all stakeholders, including those responsible for forest management on the farm. In this sense, in order to facilitate interaction with all stakeholders and co-management with all actors that make up this scenario, in addition to mapping and resolving suggestions and complaints, the activity proposes the action of implementing and consolidating a communication channel that should dialogue with what was proposed by the Project's communication plan (section 2.3.8). The strengthening of the communication channel will allow a collaboration of stakeholders on decisions and implementations of the Project's activities, thus assisting in the best performance of this partnership and the Project with the benefits to the climate, community and biodiversity.

b. Climate Scope

Improvement of property surveillance within the farm

The asset surveillance activity is related to climate benefits and its main objective is to mitigate and prevent the occurrence of unplanned deforestation in the Project Area as well as the consequent reduction of greenhouse gas emissions.

Currently, surveillance actions are carried out in the area by the workers of Fazenda Jutaituba themselves, however, without very well-defined procedures and conduct. The purpose of the activity is to improve and adapt the processes related to surveillance actions, including training for workers to take appropriate measures in cases of illegal activities in the area, in addition to preventive measures to avoid unwanted entry of third parties. In the same sense, the Project will seek to strengthen local partnerships, especially with supervisory bodies, to assist in combating illegal activities within the area and facilitate communication for possible reports of complaints.

Within this scope, as an improvement in the processes already carried out by farm workers, the Project proposes to assist field activities through the interconnection of the satellite image monitoring activity (described below) with the patrimonial surveillance activity. Thus, the products of the satellite image monitoring activity will be used by the heritage surveillance team to evaluate the areas detected in the monitoring in the field, understanding the context of greater deforestation pressure in the area and being more assertive in the actions to prevent and combat illegal activities.

Monitoring deforestation via satellite image

Currently, covering the entire area of Fazenda Jutaituba and its surroundings, remote monitoring is carried out, through the processing and analysis of satellite images, of the quality related to forest management activities and human pressure. In relation to forest management, monitoring allows to qualify the exploration in good, intermediate and low. The evaluation of human pressure focuses on identifying the opening of unofficial roads, illegal logging, deforestation, forest degradation and burning.

Thus, since 2009, the proponent of the Project (Martins Agropecuária S/A) has a contract with IMAZON (Institute of Man and Environment of the Amazon), in which it monitors the area of the Fazenda Jutaituba as a whole, as well as a buffer zone around 5 kilometers, communicating with the actions and patrols carried out by property surveillance.

That said, this activity provides for the maintenance and improvement of this remote monitoring of deforestation, developing reports that monitor and record the deforested areas in the Project Zone, as well as the strengthening and formalization of communication with surveillance actions. Also, through the preparation of these reports, it will be possible to maintain the evaluation of the impacts generated by the forest management activities inserted within the Fazenda Jutaituba, mitigating and verifying the risks of exploitation for forest conservation over time.

In addition to this monitoring, the Project will seek to monitor deforestation through other available data as well as other high-resolution satellite images. This monitoring will result in bulletins with the deforestation points that will be forwarded to the interested parties, and, in this way, this additional remote monitoring will compose a better support for the strategic plan of patrol in the field.

These actions are directly related to containing deforestation and invasions, maintaining forest cover and, consequently, maintaining the benefits for the climate, community and biodiversity foreseen by the scenario with the Project.

c. Social Scope

The socioeconomic diagnosis of the Jutaituba REDD+ Project region (more details in Section 4.1) pointed to the existence of 18,334 residents, 3,188 families and 29 communities in the Project Zone. In addition, the activities were defined by incorporating and addressing the main focal problems associated with the way of life of these people as well as the best opportunities to act for the Project. Through this, it is evident that the Project will not be able to achieve and promote the realization of all the activities foreseen for the social scope with all the people mapped.

As a result, all activities of this nature in which they were prescribed for the Project, will have a prior action that will focus on the mapping and identification of potential stakeholders in adhering to the activities as well as the main opportunities that are in line with the proper focus of each activity.

The details as well as the specificities of this mapping applied to each social activity developed for the Project will be further detailed in the following activities.

Formalization of access to Fazenda Jutaituba for stakeholders

Some riverside and extractive communities that are more isolated in the Project Zone reported having difficulties in access and displacement. Because it is the Amazon region, communities too far from any center and/or urban region generally have adversities to be able to move with greater ease and low cost, given the few access roads considered formal and with good infrastructure. The place of greatest municipal infrastructure is the city of Tucuruí, where these communities have access to specialized health, banking services as well as other public services. However, to reach the city, they travel a long way, and can be facilitated with access from inside the Fazenda Jutaituba to reach the BR-422 highway.

That said, the riverside and extractive communities reported that they have a great need to use access roads from the Fazenda Jutaituba area for displacement, as such accesses present good conditions as well as shorten the travel time traveled to access the cities.

Total release of the passage to the areas of Fazenda Jutaituba may increase the occurrence of illegal activities within the Project Area and may also hinder heritage surveillance activities given the size of the area, increasing the number of cases of illegal deforestation and forest degradation, harming the objectives of the Jutaituba REDD+ Project.

In this sense, the activity "Formalization of access to the Fazenda Jutaituba for stakeholders" proposes the identification of stakeholders who wish to use the access roads of the Fazenda Jutaituba, as well as implementing procedures for the processing of these stakeholders to the area of the farm. Thus, the activity aims to ensure the improvement of the quality of life and well-being of communities that need the ways of moving the farm to more easily access basic public services in the cities around, and obtain greater control over the entry of stakeholders, avoiding illegal entry and, consequently, illegal activities within the Project Area.

Non-timber forest management at Fazenda Jutaituba

Many communities around the Fazenda Jutaituba have, as a basis for extraction of non-timber forest products (PFNM), collection areas located within the farm. Its use is for subsistence extraction, mainly used to feed the families of these communities, but also for income generation (Sections 4.1.3 e 4.1.4).

The extraction of these products is mainly concentrated in vines, herbs, flowers, chestnuts and açaí. These inputs, if not well controlled and recorded, can generate negative impacts for the forest and local biodiversity. As a consequence, these actions may increase the risk that these extractions are made in an unsustainable and disorderly manner as well as favoring malicious practices related to illegal deforestation and forest degradation, increasing GHG emissions from these practices.

The monitoring of the communities and their activities will increase the property security of the Project Area, since it aims to strengthen Martins' management over its own territory, mitigating any risks of activities that may trigger deforestation and consequently GHG emissions. The monitoring will involve mapping the stakeholders that already enter the ownership and implementation of procedures and protocols on good practices to be adopted within the farm in order to make official the use of non-timber forest products by the communities. Regarding the better development of activities already carried out by the community members, the Project will seek to map opportunities for improvement for better use of non-timber forest resources, oriented to promote training and other actions within the potential lines of non-timber forest management, consequently increasing the clarification on the importance of natural resources and ecosystem services, delimiting and implementing procedures and protocols on non-timber forest management, mapping stakeholders with the potential to adhere to non-timber forest management actions, monitoring stakeholders and their activities developed within the Fazenda Jutaituba, in addition to implementing partnerships for the development of activities.

Therefore, this activity has two main objectives: to have better control over the practices of NFP extraction in which they are developed by the community members within the Project Area and to contribute to a better development of these activities, through training and other forms of action.

Thinking about the dependence of areas by families for their survival, it is necessary to take actions aimed at the sustainable use of natural resources, to avoid a scenario of degradation and compromise the well-being of families. By developing this activity, the Project will enable over time the valorization of sustainable practices applied to the extraction of NFP, generation of income for stakeholders, strengthening of the territorial bond, permanence of families in the territory, maintenance and protection of HCVAs, in addition to promoting socioeconomic development in the Project Zone.

Fostering sustainable practices

The communities surrounding the Fazenda Jutaituba use natural resources from the forest for their livelihoods, mainly related to the feeding and extraction of herbal products and also to generate income for families (Sections 4.1.3 and 4.1.4). Many activities carried out by families are guided by the extraction of non-timber and timber forest products.

As an example, the Umarizal community has a Group of Midwife Women and a Group of Women of Medicinal Herbs that extract herbal medicines from the forest. Still, the exploitation of timber products by families has the purpose of producing handicrafts, manufacturing furniture for the houses, manufacturing work instruments, such as scythe cables and hoes. Some sustainable economic activities were identified, among them ecotourism practiced in streams, rivers and beaches, religious and cultural tourism, agroforestry systems (SAFs), Brazil nut extraction, acai planting, extraction of varied fruits, primary processing of products, gastronomic cuisine, in addition to artisanal fishing and local fairs of family farming bioeconomy.

During the diagnosis, the economic activities developed by the surrounding rural properties were also identified. Among the activities, beef cattle leads the production on the properties, in addition to it, there is milk cattle, animal husbandry, the extraction of non-timber forest products (chestnut and açaí), furniture and forest management. Still, it is important to note that landowners prohibit hunting on their land, only one property reported that it hunts species for its own consumption. Through this, the Project proposes to also reach out to rural producers.

In this scenario, the Jutaituba REDD+ Project proposes the activity of "Fostering sustainable practices" with actions aimed at mapping the main development opportunities focused on sustainable practices, together with the demands of communities and other stakeholders, in order to foster those that are already practiced and those that have potential.

In this line, the Project proposes to map stakeholders with the potential to adhere to actions to promote sustainable practices and map and implement partnerships for the development of activities, bringing more robustness, in addition to financial resources from these partnerships, in order to develop techniques of specific actions and even higher levels of knowledge. Within the potential mapped lines, the Project will seek to develop actions and training with stakeholders.

In addition, acting on the basis of community education, promoting training and other actions within the lines mapped by the Project, brings benefits to the support of these practices over time, by increasing clarification about the importance of maintaining natural resources and ecosystem services and the need to reconcile economic practices with sustainable development. Furthermore, the promotion and articulation of environmental education actions is extremely important for the consolidation of knowledge about actions aimed at protecting and conserving the environment, allied with economic and subsistence activities without causing damage and impacts.

Promotion of environmental education for hunting and fishing

Some communities located in the surroundings of the Project carry out hunting and fishing for subsistence consumption, being considered the practice by families as essential to ensure a better diet. That said, all communities reported that hunting activities are practiced and that, for the most part, by people who are from other regions, using for this purpose, areas of legal reserve of the communities and, mainly, places within the limits of the Project Area.

However, although hunting and fishing is considered an essential mechanism for the livelihood of families in the Project Area, it is common to identify and even denounce unsustainable practices applied by people to hunt and fish. This means that, in the long run, these resources may become

scarce, reducing the permanence of families in the region and becoming a major threat to local biodiversity.

It is important to note that, for this activity, the mapping of stakeholders with the potential to adhere to this activity as well as the implementation of partnerships for the development of actions will act in synergy with the previous proposed activity of "Promotion of Sustainable Practices", that is, to expand and enhance the performance of the Project, the two activities will seek to act with the same families/communities mapped, seeking partnerships with the potential to meet the two scopes together.

In relation to the specific actions to be implemented for this activity, they are dedicated and will seek to take into account the cultural elements associated with hunting and fishing and only the practices used considered inadequate, respecting local habits and customs, as well as focusing interventions in a more assertive way, concentrating efforts on the species culturally hunted and fished by families and on the applied habits considered unsustainable.

However, the great difference in the commitment to sustainable practices is focused on promoting environmental education actions, acting at the root of the problem essentially related to hunting and fishing, promoting a better educational base, environmentally speaking, for the communities mapped by the Project.

a. Biodiversity scope

***In situ* monitoring of biodiversity**

The main cause of biodiversity loss in the Amazon is deforestation, which has a severe impact on biodiversity and tropical forest areas where the vast majority of species present cannot survive the radical changes caused by forest cutting and burning.

Thus, the central theme of the Project, in which it strives to contain deforestation in the area that was inserted, reflects in a great ally in the maintenance and preservation of local biodiversity. Thus, just by monitoring and providing the maintenance of forest cover in the Project Zone, it contributes efficiently to the conservation and protection of the habitats and species present on the site, generating positive net benefits, foreseen for biodiversity for the scenario with the Project.

However, to provide the generation of consistent positive impacts, conservation initiatives must act comprehensively, acting not only in relation to reducing greenhouse gas emissions and generating positive social impacts, but also in monitoring and mitigating biodiversity-related impacts.

Thus, one of the activities identified in the development of the theory of change that is proposed for biodiversity in the Jutaituba REDD+ project is the "*In situ* Biodiversity Monitoring". The activity proposes to monitor biodiversity that, in other words, perform a set of long-term activities that will allow assessing the responses of populations and ecosystems to conservation practices through a REDD+ Project and the impacts of external factors such as habitat loss, landscape changes, species overexploitation and climate change.

When well conducted, *in situ* monitoring of biodiversity produces a set of data capable of reflecting the conservation panorama found in the areas where it is applied, giving important indications about the impacts on biota, both from direct human threats and resulting from complex long-term climate dynamics (PEREIRA et al, 2013)[39].

[39]PEREIRA, RC; ROQUE, FO; CONSTANTINO, PAL; SABINO, J.; UEHARA-PRADO, M.; **In situ monitoring of biodiversity: Proposal for a Brazilian Biodiversity Monitoring System**. Brasília/DF: ICMBio, 2013, 61p.

In view of this, the monitoring of long-term biodiversity, guided by periodic evaluation expeditions, which will be organized and implemented throughout the Project, will generate a robust database on the population dynamics of the area and its biological indicators, providing an accumulation of monitoring information, being possible to observe trends of variation of these indicators over time, maintaining the integrity and biodiversity of the Project Area and even enabling the identification of any problem and threat, giving the possibility of anticipating, providing solutions in this regard.

Also, since one of the greatest sources of global threat to biodiversity comes from the conflict between man and nature, the involvement of people in monitoring activities is a mechanism that can strengthen management and promote the conservation of biodiversity, both by sensitizing them about the relevance of conservation, being an effective way to raise awareness about the importance of biodiversity, both by promoting the empowerment of these people about the characteristics of the local biota in which they themselves are part. Therefore, the greater the involvement of people in this process, the greater the expected potential for biodiversity conservation in the Project Zone. In view of this, it is intended that this activity is oriented towards articulating the involvement in biodiversity monitoring by the stakeholders involved in the Project, as well as future stakeholders.

This involvement will be stimulated by the Project and must be guided in order to seek the inclusion of stakeholders, mainly community and farm workers, in the monitoring itself as well as in the presentation of the results obtained by the monitoring expeditions. Thus, the dissemination of this monitoring is not only allowed but encouraged by the Project, since it should disseminate knowledge about the biological diversity still little accessed.

In addition to the direct benefit of generating knowledge and engagement about the local nature, this involvement may cause other indirect benefits. Such benefits are associated with the physical presence of people in the Project Area, helping to inhibit illegal activities, such as hunting and plant collection, advertising about the biodiversity generated by monitoring expeditions, in which they may increase public interest and may even reflect on strengthening the management and governance of the Project and the influence of adjacent areas to adhere to the REDD+ mechanism and, finally, information about the conservation status of critical species and habitats may increase the environmental awareness of the local population, enhancing the Project's efforts.

In addition to the involvement of Project stakeholders in biodiversity monitoring, this activity also contemplates the search for the inclusion of indirect and future stakeholders that may be incorporated by the Project, as well as specifically to contribute in some way to the monitoring of biodiversity in the region. As an example, these actors can be defined as universities, research institutions, government agencies, third-party companies, etc.

Finally, the Jutaituba REDD+ Project aims to generate a series of positive impacts on biodiversity, such as conservation of already diagnosed species, including those that present some degree of threat, preservation of local habitats, conservation of HCVAs, generation and dissemination of knowledge and environmental awareness related to biodiversity, dissemination of results to stakeholders, permanence of ecosystem services, mapping of new areas of great relevance for conservation and maintenance of connectivity in the landscape. In addition, the commonly desired conservation results seek to impact the conservation of local biodiversity as well as changes in the attitudes and behavior of the Project's stakeholders, in addition to greater involvement of future stakeholders in relation to the use and management of natural resources.

The Table 7Provides a description of the activities and key outcomes and impacts that will contribute to achieving the project's anticipated benefits for Climate, Community and Biodiversity.

Table 7 - Activities of the Jutaituba REDD+ Project and their respective impacts in the short, medium and long term.

Theme	Activity description	Expected climate, community, and/or biodiversity			Implementation Period
		Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
Initial Studies	Estimation of carbon stock	- Estimate the carbon stock for the Forest class through the Forest inventory in the Project area; - Generate the technical report.	- Generate knowledge about carbon stock, including differentiation between administered and unmanaged areas. - Contribution to the accounting of reduced emissions.	- Ensure a better design of the management plan project; - Generation of inputs for long-term forest monitoring; - Identification of priority areas for stock conservation.	
	Determination of baseline	- Conducting the study to determine the spatial limits of the project and determine the deforestation baseline; - Generation of technical report; - Modeling of future deforestation	- Generation of knowledge about deforestation dynamics in the region; - Contribution to the accounting of reduced emissions; - Determination of the area of greatest risk to conduct field actions.	- Generation of inputs for long-term forest monitoring; - Generation of relevant data to be used by the government in the projection of future jurisdictional systems.	
	Socioeconomic diagnosis	- Preparation of the contextualization of cities, communities, rural priorities and workers of Fazenda Jutaituba; - Conducting the Socioeconomic Study;	- Generation of the socioeconomic context of the updated region; - Supply of inputs for the design of the proposed activities in line	- Improvement of socioeconomic conditions; - Long-term prevention of deforestation in the Project area;	

Theme	Activity description	Expected climate, community, and/or biodiversity			Implementation Period
		Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
		- Generation of technical reports	with the local context; - Providing input to the work of other stakeholders.	- Ensure proper management of productive areas, forests and other natural resources.	
	Biodiversity Diagnosis	- Preparation of contextualization of aspects of local biodiversity; - Conducting the Biodiversity Study; - Generation of technical report.	- Update of biodiversity studies; - Supply of inputs for the design of the proposed *in situ* biodiversity monitoring activities; - Providing input to the work of other stakeholders.	- Improving knowledge about local biodiversity; - Long-term prevention of deforestation in the Project area; - Ensure proper management of productive areas, forests and other natural resources.	
	Returning with communities	- Inform the interested parties of the REDD+ Project; - Identification, understanding and prioritization of problems encountered in the communities of the region; - Conducting interviews and workshops with the communities involved directly and indirectly to design and present the activities of the Project;	- Allow an adaptive management of the project to incorporate the needs and reality of families; - Definition of Parameters to measure the benefits and impacts of the Project on communities; - Share information about REDD+ and promote	- Strengthening communication between stakeholders; - Improving the quality of life and socioeconomic aspects of communities; - Empowering communities with respect to their rights, duties and importance in involvement in the Project.	

Theme	Activity description	Expected climate, community, and/or biodiversity			Implementation Period
		Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
		- Generation of technical reports.	community engagement.		
Implementation, monitoring and evaluation of the activities developed by the Project	The Project aims to monitor the implementation of the proposed activities, to mitigate risks and ensure a continuous improvement of activities, increasing the level of Project Management.	- Production of reports on the Project's activities; - Evaluation of the indicators and results of the actions implemented; - Definition of activity planning for the following year; - Implementation of milestones for evaluation of Project activities with stakeholders.	- Greater understanding of the impacts generated with stakeholders; - Opportunity to redirect the activities of the Project to those of higher priority; - Refinement of data collection methods.	- Efficient management and implementation of the Project; - Scope of the impacts expected by the Project.	
Strengthening governance	From the implementation of an *on-site* partnership, the Project aims to facilitate the day-to-day operationalization of the monitoring of the execution of the proposed activities	- Implementation of a working partnership to act *in locu* of the Project; - Consolidation of procedures with the local partner for implementation of the Project; - Implementation and consolidation of a communication channel with stakeholders.	- Implementation of Project activities with stakeholders; - Stakeholders with access to Project information; - Collaboration and participation of stakeholders on decisions and implementations of the Project activities;	- Strengthening of governance; - Efficient management and implementation of the Project; - Strengthening communication between stakeholders, assisting the Project's performance with climate,	

Theme	Activity description	Expected climate, community, and/or biodiversity			Implementation Period
		Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
			- Mapping and resolution of suggestions and complaints from interested parties; - Creation of opportunities for exchanges of experiences.	community and biodiversity benefits.	
Improvement of property surveillance within the farm	The Project aims to intensify and improve inspection activities within the farm, increasing the efficiency of these actions and promoting greater containment of illegal deforestation and invasions, as well as the maintenance of forest cover and, consequently, the maintenance of benefits for the climate, community and biodiversity by the scenario with the Project.	- Improvement and adequacy of asset surveillance actions and tactics; - Field verification of areas detected in remote deforestation monitoring; - Training and qualification of employees working in asset surveillance; - Improvements in working conditions; - Strengthening local partnerships to combat illegal deforestation.	- Greater understanding of the dynamics and agents of deforestation; - Conducting more effective asset surveillance; - Facilitation of the relationship with the environmental inspection body and reporting of illegal activities; - Refinement of remote monitoring by field verification.	- Mitigation and prevention of deforestation; - Reduction of emissions from deforestation and forest degradation.	
Monitoring deforestation via satellite image		- Monitoring and evaluation of deforestation areas remotely;	- Greater understanding of the dynamics of deforestation	- Mitigation and prevention of deforestation;	

Theme	Activity description	Expected climate, community, and/or biodiversity			Implementation Period
		Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
		- Generation of deforestation reports; - Monitoring and evaluation of the impacts generated by forest management activities within the Project Area.	to conduct more effective asset surveillance; - Supply of inputs for design and improvement of interventions in the field; - Possibility of working with forest management to mitigate risks related to forest conservation.	- Reduction of emissions from deforestation and forest degradation.	
Formalization of access to the Fazenda Jutaituba for stakeholders		- Mapping of interested parties that aim to circulate within the Fazenda Jutaituba; - Delimitation and implementation of procedures and protocols for entry into Fazenda Jutaituba.	- Increased property security; - Increased Martins' governance over Fazenda Jutaituba; - Facilitation in the displacement of isolated communities; - Strengthening the territorial bond for isolated communities;	- Improving the well-being of communities; - Mitigation and prevention of deforestation; - Reduction of emissions from deforestation and forest degradation.	

Theme	Activity description	Expected climate, community, and/or biodiversity			Implementation Period
		Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
			- Permanence of families present in isolated communities in the territory; - Decreased pressure for poaching and illegal fishing.		
Non-timber forest management on the Fazenda Jutaituba		- Mapping of stakeholders with the potential to adhere to non-timber forest management actions within the Fazenda Jutaituba; - Mapping of the main opportunities; - Delimitation and implementation of procedures and protocols on non-timber forest management at Fazenda Jutaituba; - Mapping and implementation of partnerships for the development of activities; - Promotion of training and other actions/interventions within the potential	- Increased property security; - Increased Martins' governance over Fazenda Jutaituba; - Maintenance and protection of AACV 5; - Valuation of sustainable practices; - Income generation for stakeholders involved in the actions; - Increased clarification on the importance of natural resources and	- Improving the well-being of communities; - Mitigation and prevention of deforestation; - Reduction of emissions from deforestation and forest degradation.	

Theme	Activity description	Expected climate, community, and/or biodiversity			Implementation Period
		Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
		lines mapped by the Project; - Monitoring of stakeholders and their activities/actions developed within Fazenda Jutaituba.	ecosystem services.		
Fostering sustainable practices		- Mapping of stakeholders with the potential to adhere to actions to promote sustainable practices; - Mapping of the main development opportunities focused on sustainable practices; - Mapping and implementation of partnerships for the development of activities; - Training and other actions/interventions within the potential lines mapped by the Project; - Promotion and articulation of environmental education actions in scenarios where there is synergy with the	- Development and valorization of sustainable practices; - Income generation for stakeholders involved in the actions; - Increased clarification on the importance of natural resources and ecosystem services; - Strengthening of the territorial bond; - Permanence of families in the territory.	- Promotion of socioeconomic development in the Project Zone; - Empowerment of the community; - Mitigation and prevention of deforestation; - Reduction of emissions from deforestation and forest degradation.	

Theme	Activity description	Expected climate, community, and/or biodiversity			Implementation Period
		Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
		implemented actions.			
Promotion of Environmental education for hunting and fishing		- Identification of the cultural elements associated with the culture of hunting and fishing by stakeholders; - Mapping of unsustainable practices used for hunting and fishing; - Definition of environmental education solutions and actions that will be implemented by the Project; - Mapping and implementation of partnerships for the development of environmental education actions to be implemented.	- Improvement of practices used for hunting and fishing; - Promotion and access to environmental education by families; - Construction of values, knowledge, skills, attitudes and competencies aimed at the conservation of the environment for stakeholders.	- Reduction of the impacts generated by hunting and fishing in the Project Area; - Development of sustainability focused on activities related to hunting and fishing; - Cultural preservation and guarantee of best livelihood practices of families in the Project Zone.	
In situ monitoring of biodiversity	This activity is focused on monitoring biodiversity in the Project Area (fauna and flora) over time, contributing to the conservation and protection of local biodiversity throughout the Project's life cycle. In addition, this activity is	- Organization and implementation of long-term biodiversity monitoring in the Project Area; - Articulation of the involvement of direct and indirect stakeholders in participating in biodiversity monitoring	- Increased knowledge on regional biodiversity; - Obtaining data that follow the population dynamics and behavior of species, including endangered	- Engagement and empowerment of all stakeholders on local biodiversity; - Robust database on local biodiversity;	

Theme	Activity description	Expected climate, community, and/or biodiversity			Implementation Period
		Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
	guiding the Project's efforts to include the involvement of Project and future stakeholders in monitoring, given the importance of adding these actors to the Project's activities and implementation, as well as joining efforts focused on the conservation of local biodiversity.	throughout the project; - Assessment of the possibility of involvement of future stakeholders in monitoring.	and endemic ones; - Local environmental engagement and awareness about biodiversity and its importance; - Greater clarification of the difficulties encountered in this activity, providing the prescription of adjustments and control of changes in the implementation of the Project.	- Balanced ecosystem and stabilized environment for resident biodiversity; - Perpetuation and addition of endangered and endemic species on site.	

2.1.12 Sustainable Development

The Jutaituba REDD+ Project has as one of its objectives to promote sustainable development in the region, and the joint actions of all stakeholders, under the facilitation and encouragement of Martins Agropecuária, are the drivers of net benefits for climate, biodiversity and local communities. Based on this support and in line with the expected impacts, the project will contribute to the following UN Sustainable Development Goals:

Objective 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture	
2.4	By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, help maintain ecosystems, strengthen adaptability to climate change, extreme weather conditions, droughts, floods and other disasters, and progressively improve land and soil quality
The project combines the socioeconomic demands of communities with local opportunities aimed at more resilient economic activities, through the "Promotion of sustainable practices". For this, the project enables environmental education actions and community training, in association with different partners and extension workers, in order to promote knowledge about the importance of reconciling good productive practices with the preservation and maintenance of natural resources. In addition to fostering perceptions about the relevance and advantages of sustainable production systems, the project also acts on awareness actions of extractive families about the value of sustainable exploitation of non-timber forest resources for their survival, income generation, well-being and, consequently, maintenance of the standing forest. Formalizing, in parallel, the access to the Fazenda Jutaituba for riverside and extractivists.	
Objective 4. Ensure inclusive and equitable quality education, and promote lifelong learning opportunities for all	
4.4	By 2030, substantially increase the number of young people and adults who have relevant skills, including technical and professional skills, for employment, decent work and entrepreneurship
4.7	By 2030, ensure that all students acquire the knowledge and skills necessary to promote sustainable development, including, but not limited to, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and enhancement of cultural diversity and the contribution of culture to sustainable development
The project enables and encourages access to education through technical courses and training aimed at the environmental and socioeconomic areas, especially on resilient agricultural production practices, sustainable extraction of non-timber forest products, education on hunting, fishing and preservation of endangered species. In addition, it provides specific training aimed at the workers of Fazenda Jutaituba, especially those who belong to the patrimonial patrol, knowledge and guidelines on appropriate measures to be taken in cases of illegal activities in the area. For this, it has the support and collaboration of specialized partners, in order to ensure the effectiveness and engagement of stakeholders. These training activities promoted by the project enable the strengthening of local governance, the consolidation of the feeling of belonging, access to information, better employment conditions and income diversification; especially for extractivists and small rural producers, consequently leading to the maintenance of the forest and its resources.	
Objective 12. Ensure sustainable production and consumption patterns	
12.2	By 2030, achieve sustainable management and efficient use of natural resources
12.8	By 2030, ensure that people everywhere have relevant information and awareness for sustainable development and lifestyles in harmony with nature

The project includes the "Promotion of sustainable practices" with actions aimed at identifying potential activities related to subsistence resilient agriculture, sustainable livestock and low impact forestry extraction and management; according to the demand and profile of local communities. In this sense, the project works in the dissemination of knowledge, instructions and experiences focused on the efficient use of natural resources and environmental preservation; focusing on sustainable business chains through greater integration between stakeholders, thus generating income, well-being and cultural identity for the communities fostered. Thus, in addition to formalizing access to the Fazenda Jutaituba; the learning, engagement and pre-disposition of these families in activities to improve productive and extractive practices, increase the governance of the project and assist in maintaining forest cover and preserving its ecological aspects.	
Objective 13. Take urgent action to combat climate change and its impacts	
13.2 Integrate climate change measures into national policies, strategies and planning	
13.3 Improve education, raise awareness and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	
13.b Promote capacity building mechanisms for climate change-related planning and effective management in least developed countries, including focusing on women, youth, local and marginalized communities	
In general, all activities developed by the project aim to take actions to combat climate change and its impacts and, consequently, reduce environmental degradation in the project area. In this sense, in addition to the engagement of stakeholders and the strengthening of governance, the project also promotes the monitoring of deforestation via satellite and in the field. Property surveillance within Fazenda Jutaituba, equipped with geospatial information, is more effective and assertive in preventing and combating illegal activities. For this to occur, the project acts to improve the registration and dissemination of pressured and deforested sites in the project area, as well as invests in training workers to make adequate decisions in cases of identification of irregular activities. As a result, reducing the emission of greenhouse gases, collaborating directly with the Brazilian goal of reducing emissions, the project has the potential to reduce XX tCO2e of GHG emissions in 10 years.	
Objective 15. Protect, restore and promote the sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss	
15.1 By 2020, ensure the conservation, restoration and sustainable use of inland terrestrial and freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in accordance with obligations under international agreements	
15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase forestation and reforestation globally	
15.5 Take urgent and significant measures to reduce natural habitat degradation, halt biodiversity loss and, by 2020, protect and prevent the extinction of endangered species	
15.7 Take urgent action to end poaching and trafficking of protected flora and fauna species and address both the demand and supply of illegal products of life	
15.a Mobilize and significantly increase, from all sources, financial resources for the conservation and sustainable use of biodiversity and ecosystems	

15.b	Mobilize significant resources from all sources and at all levels to finance sustainable forest management and provide adequate incentives to developing countries to promote sustainable forest management, including for conservation and reforestation
15.c	Strengthen global support for efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities
Considering the relevance of Fazenda Jutaituba for biodiversity; the project focuses efforts on the long-term monitoring of ecological indicators associated with practices arising from REDD+ conservation activities on populations and ecosystems, within and outside the property boundaries. Thus, the project aims to minimize habitat loss, landscape changes, species overexploitation and climate change. To this end, it seeks to engage, engage and sensitize all stakeholders regarding the importance of biodiversity of fauna and flora in the provision of ecosystem services, the maintenance of landscape connectivity, the control of environmental degradation and the limitation of the excessive use of natural resources. Environmental education lectures on hunting and fishing; training on sustainable livelihoods and workshops and activities on local ecological aspects are mainly aimed at farm workers and surrounding communities, including extractivists and riverside dwellers; who circulate around the property and use forest resources. This participatory involvement, access to knowledge and results, and knowledge of good production practices; promote the strengthening of local governance and the inhibition of irregular actions; ensuring positive impacts on biodiversity in the project area.	

2.1.13 Implementation Schedule (G1.9)

The schedule with the main dates and milestones for the development of the Jutaituba REDD+ Project has already been presented in the section 2.1.11, Table 6. The summary schedule of these activities can be found in the table below (Table 8).

Table 8 - Detailed schedule of implementation of the main activities related to the Jutaituba REDD+ Project.

Date	Milestone(s) in the development and implementation of the Project
1 to 1.5 years before validation and first verification	Activities planning meeting
	Articulation between institutions and identification of partnerships
	Consolidation of the Schedule of Activities
	Conducting socioeconomic and environmental diagnoses
	Estimation of carbon stock
	Determination of the baseline and potential for credit generation
	Planning and Workshops for project design
	Feedback and stakeholder consultation

Date	Milestone(s) in the development and implementation of the Project
	Consolidation of the design, action plan and draft of the project design document
	Revision and translation of the project design document (DCP)
	Preparation of the monitoring report
In the year of validation and first verification	Selection and Hiring of the Validation/Verification body and the Credit Registration platform
	Production of validation/verification audit follow-up bulletins
	Follow-up of the field audit
	Registration of the Project and Credits
From year 3 to year 30	Development and Monitoring of socio-environmental management activities
	Monitoring of deforestation and emissions
	Monitoring of Biodiversity (fauna and flora) and High Conservation Value Areas (HCVA)
	Verification of credits (Selection and contracting of the verification body; Production of Follow-up Bulletins for verification; Monitoring of field audit; Registration of credits)
	Conducting the credit marketing process

2.1.14 Project Start Date

The start date of the Jutaituba REDD+ Project was set on January 14, 2021, as it represents the moment of formalization of the proposal for a partnership between Martins Agropecuária and Biofílica Ambipar Environment for the development of the Project.

2.1.15 Benefits Assessment and Crediting Period (G1.9)

The accreditation period of the Jutaituba REDD+ Project will occur from January 14, 2021 (start date) to January 13, 2051, covering a period of 30 years.

There will be continuous monitoring of the benefits to climate, communities and biodiversity, being submitted to verification with the CCBA, ideally every three years, throughout the duration of the Project.

2.1.16 Differences in Assessment/Project Crediting Periods (G1.9)

The period of accreditation of the Project is marked by the formalization of the proposed partnership between Martins Agropecuária and Biofílica Ambipar Environment for the development of the Project, as mentioned in *Section* 2.1.14. After the officialization of the partnership, the Project

begins and, consequently, the first major investments for the development of technical studies such as the determination of the baseline and socioeconomic and environmental diagnoses.

The development of activities related to the scope of climate, community and biodiversity, together with the monitoring of the attributes related to these scopes, occurs through a second and large investment by the Project. This investment is made through the collection of the first carbon credits sold, which come from the first verification of the Project by VCS certification.

Thus, the evaluation of changes related to the benefits of climate, community and biodiversity begins in a period shortly after the beginning of the Project's crediting period.

2.1.17 Estimated GHG Emission Reductions or Removals

Table 9: Estimated GHG emission reductions or removals for the Jutaituba REDD+ Project.

Years	Estimated GHG emission reductions (tCO2e)
2021	161,395
2022	246,636
2023	186,421
2024	108,949
2025	198,872
2026	278,680
2027	330,350
2028	294,384
2029	436,308
2030	391,560
Total estimated Ers	2,633,555
Total number of credit years	30
Average annual Ers	263,356

2.1.18 Risks to the Project (G1.10)

Through the tool "AFOLU Non-Permanence Risk Tool v3.2", the probable natural and human-induced risks to climate benefits were verified, reported in the Non-Permanence Risk Report of the Jutaituba REDD+ Project, as summarized in the table below (Table 10). The Non Permanence Risk analysis through the mentioned tool generated a buffer of 10%.

Table 10- Final non-permanence risk score for the Jutiatuba REDD+ Project.

Category	Score
Internal Risk	0,00
External Risk	0,00
Natural Risk	1,00
Overall Score (a + b + c)	10

The probable risks to the expected benefits for the climate, community and biodiversity during the life of the Project were identified, as well as their respective mitigating measures, described in Table 11.

Table 11 - Identification of risks to the expected benefits for climate, communities and biodiversity and their mitigating measures for the Jutaituba REDD+ Project.

Identify Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
Lack of interest from stakeholders in participating in Project activities, especially communities and public bodies	The lack of interest in participating in the Project's activities directly impacts the benefits that would be generated at the community level. Also, the lack of interest on the part of public agencies may compromise potential partnerships for the development of Project activities.	Strengthening and stimulation for greater involvement of all parties involved in the design and decision-making processes in relation to the Project activities, through the proposed activities. Another extremely important measure is linked to the improvement and dissemination of existing communication tools among the actors involved, such as the virtual media with the WhatApp application, e-mail, as well as other information channels and complaint repair procedures (section 2.3.
Market risk - Difficulty in marketing verified carbon credits	The difficulty in marketing the credits generated by the Jutaituba REDD+ Project can directly impact the proposed activities, consequently impacting the three scopes of the Project: climate, community and biodiversity, since it would not be possible to invest in the activities.	Constant search for new financing opportunities, business and activities, such as partnerships and donations for direct use in the Project's activities (not necessarily linked to the sale of credits). In addition, consolidation and expansion of the network of commercial contacts in order to publicize the Project, for this Biofílica has a robust commercial sector responsible for the development of materials for the dissemination of the Project, participation in national and international events related to the subject.
Failure to communicate with stakeholders	Failure to communicate with stakeholders may hinder the progress of the activities proposed by the Project, resulting in failure to effectively implement and achieve the expected	Establishment of communication channels appropriate to the local context, facilitating the availability of available communication channels. Establishment of a

Identify Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
	objectives. There is also the possibility of establishing possible conflicts.	communication plan with conflict management procedures.
Failure to manage financial resources	Difficulty in implementing the activities proposed by the Jutaituba REDD+ Project, in addition to the difficulty of allocating resources for the conservation and sustainable development of the region.	Biofílica Ambipar Environment has a financial team responsible for managing the project's resources.

2.1.19 Benefit Permanence (G1.11)

All activities designed for the Project and their positive impacts in the short, medium and long term were carefully designed and planned, in addition to having been considered in this planning, the need for the results to become self-sustaining in the long term.

That said, in order to maintain and improve the benefits for climate, community and biodiversity during the 30 years in force as well as beyond that time, several activities of the Project are focused on improving local capacities for governance, management, education, fostering, decision-making and increased awareness and capacity for sustainable management of resources for all stakeholders. These activities will have short-, medium- and long-term impacts and will therefore help empower and guide all stakeholders in self-determining sustainable pathways to achieve benefits for climate, community and biodiversity well beyond the life of the Project.

The strategies associated with each activity for the benefits to occur during the life cycle of the Project and after this period are:

- **Improvement in asset surveillance procedures**: through the provision of additional tools such as remote monitoring by high-resolution satellite images, the acquisition of support equipment, and the provision of training for the asset surveillance team, the Project aims to increase the efficiency of asset surveillance operations. In this way, surveillance operations will have a large increase in the intelligence process related to territorial monitoring and management, which should directly reflect the maintenance of climate benefits beyond the life of the Project;

- **Non-timber Forest Management at Fazenda Jutaituba**: with the knowledge of the main opportunities aimed at improving the best use of non-timber forest products, in addition to training promotions and other actions within the mapped potential lines, the Project aims to increase the clarification of stakeholders about the importance of natural resources and ecosystem services, valuing sustainable practices, in addition to strengthening the territorial bond and, consequently, the reduction of rural exodus. Thus, the project should ensure the long-term maintenance of the benefits generated, from the empowerment of stakeholders on the extraction of non-timber forest products, income generation and, consequently, mitigation and prevention of deforestation and forest degradation;

- **Formalization of access to Fazenda Jutaituba**: through the delimitation and implementation of procedures and protocols to enter the Fazenda Jutaituba, in addition to the mapping of stakeholders interested in making use of roads and access roads, linked to heritage surveillance actions, the Project will provide increased governance of Martins under the territory, provided a safe

displacement and with well-defined rules, mitigation and preventing illegal activities, improving the well-being of communities by facilitating the displacement of isolated communities and also reducing the rural exodus because of the difficult logistics that exists in the region. It is expected that the formalization of this access as well as the procedures that will be carried out for this to occur within the life cycle of the Project, will be perpetuated beyond the established time since, over time, the trust between the parties and the problems associated with this activity will be solved, providing a relationship of trust between all stakeholders who move through Fazenda Jutaituba;

- **Fostering sustainable practices and environmental education related to hunting and fishing**: through the mapping of opportunities for development and improvement of sustainable practices, the promotion of training and other assessments within the potential mapped lines, as well as the development of environmental education actions related to hunting and fishing, the Project aims in the long term, promoting the socioeconomic development of the region, the empowerment of communities, reducing the impacts generated by hunting and fishing actions and, consequently, the knowledge about these issues, promoting a mitigation and prevention of deforestation and unsustainable activities, in addition to the consequent reduction of emissions and pressure on local biodiversity. Therefore, the skills, training and educational activities that will be behind these activities, will be learned by stakeholders throughout the life of the Project and will remain, providing lessons learned and greater enrichment of learning beyond the life of the Project;

- **Biodiversity Monitoring**: the Project has as its axis of action the implementation of biodiversity monitoring in the Project Area throughout its life cycle, but, going forward, it will seek to provide feedback and improve the engagement of stakeholders in this activity, seeking environmental involvement and awareness. In this way, the benefits associated with these actions are expected to help, in some way, to change the view of stakeholders on local biodiversity, providing greater knowledge for people and thus reducing the impacts caused between human conflict and nature beyond the lifetime of the Project.

2.1.20 Financial Sustainability (G1.12)

The proponents of the Project have a solid partnership signed in 2021 with the objective of enabling conservation investments in the Fazenda Jutaituba through the commercialization of environmental assets. The Jutaituba REDD+ Project will be an initiative that should enable in the medium and long term the continuous investment of resources aimed solely at conservation and sustainable development in the region.

Considering the current premises of the carbon market and the potential for generating GHG Emission Reductions, the financial flow of the Jutaituba REDD+ Project presents very attractive results. In this model, the proponents expect to recover the investment made on the Project, when the commercialization of GHG Emission Reductions will begin.

Other information related to the financial analysis of the Jutaituba REDD+ Project and financial health statements of the partner institutions (project proponents) are considered commercially sensitive information and were shared with the audit team on a confidential basis

2.1.21 Grouped Projects

Not applicable.

2.2 Without-project Land Use Scenario and Additionality

2.2.1 Land Use Scenarios without the Project (G2.1)

To determine the land use scenario in the absence of the Project (baseline scenario), the approved VCS VM0015 version 1.1 methodology was used together with the approved VCS tool "VT0001 - Tool for the Demonstration and Assesment of Addicionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities", version 3.0.

The analysis of deforestation, agents, drivers and underlying causes, as well as the probable without-project land use scenarios were performed based on the baseline scenario, so more details can be found in Section 3.1.4.

2.2.2 Most-Likely Scenario Justification (G2.1)

The Reference Region, which encompasses the Project Area, has an area of 2,581,612 hectares and has a historical deforestation rate, between 2009 and 2020, of 21,848 hectares per year (1.29% per year).

Among the realistic and credible alternative land use scenarios that would occur within the limits of the Project in the absence of AFOLU Project activity recorded in the VCS, the following were considered:

I) Continuation of land use prior to the Project (baseline scenario): Deforestation is caused, in general, by illegal logging, and by the historical practice of production based on "overturning and burning", mainly for livestock cutting and production of commodities, especially grains. In addition to being directly linked to expansion projects for infrastructure and logistics.

Between 2009 and 2020, 262,174 hectares were deforested in the Reference Region for these activities. For the next 10 years (2021-2030), a loss of 269,828 hectares of native forest is projected in the absence of the Project, of which 6,685 hectares are expected to be deforested in the Project Area. In this scenario, this process tends to remain until much of the forest cover is changed, not contributing to the mitigation of climate change and generating an immeasurable impact on local biodiversity, in addition to further deepening with social and economic problems;

II) Wood Management with REDD+ activities without registration as a VCS AFOLU Project: in this scenario there is the conduction of sustainable forest management activities with compliance with all relevant regulations, norms, standards and legislation, complementary activities to contain and monitor deforestation caused by deforestation agents and investments in activities for communities and biodiversity. In order to be effective in implementing a management plan in this scenario, specific investments are necessary, such as training of specialized professionals, investment in technology and intelligence, specific technical studies to the REDD, intensification of heritage surveillance, strengthening of associations of local producers, improvement of biodiversity monitoring, making the practice even more bureaucratic and costly and not guaranteeing advantages in the market for the entrepreneur. Therefore, the viability of forest management activity is reduced and may even become unfeasible, without the aggregation of additional revenue resulting from the commercialization of credits recorded in the VCS.

Detailed information on the land use scenarios proposed by the Project activity can be found in Section 3.1.5.

2.2.3 Community and Biodiversity Additionality (G2.2)

The current scenario, which considers the absence of the Project, would be limited in generating benefits to climate, community and biodiversity. This panorama without the activities of the REDD+ Project tends to induce and enhance illegal practices, such as the exploitation of commercially valuable timber for timber, sawmills and charcoal plants; associated with the conversion of land to subsistence agriculture under conventional "cutting and burning" practices, agricultural grain production, cattle raising in extensive pastures and the possibility of implementing and maintaining infrastructure and logistics projects. Thus, environmental degradation would be leveraged by the increase in deforestation pressure in the reference region, gradually advancing to the limits of Fazenda Jutaituba. This context is best presented, described and explored in Sections 2.3.4 (Costs, risks and benefits of the Community), step 3 (Analysis of agents, determinants and underlying causes of deforestation and its likely future development), 4.1.4 (Scenario without project: Community) and 5.1.3 (Scenario without project: Biodiversity).

The scenario with the development of the Jutaituba REDD+ Project, through activities focused on climate, biodiversity and socio local economy; would be positive from an environmental, social and economic point of view. The promotion of resilient practices of agricultural production associated with sustainable extraction and forest management with reduced impact is an important and adequate path for the conservation of forests on private properties and for the economy of the communities and families of the region, and the project seeks to monitor and improve the techniques of agricultural production, animal husbandry, forest management, extraction of non-timber products and moderation of production chains. For this, in the context of agriculture and livestock; agroecological production techniques with reduction of damage and impacts on natural resources, could stimulate increased productivity and increased income. Likewise, the sustainable and official extraction of non-timber forest products would provide the strengthening of production networks; providing socioeconomic improvements for the population of the region in line with the environment.

In this sense, the support and encouragement of education and training in the scenario with the REDD+ Project are crucial and extremely relevant, since access to courses, workshops and informative lectures should provide better conditions of employment and income, as well as awareness about the importance of maintaining forest cover and its ecological aspects, engagement, empowerment and territorial bond. In addition, stimuli for resilient practices of agricultural production and sustainable forest management of multiple use help reduce pressures on the forest.

At the same time, initiatives to articulate, develop and consolidate partnerships between stakeholders with local agents ensure effectiveness and continuous improvement in the implementation of the activities proposed by the project, taking into account the local reality and demands. This integration and engagement allows the constant and thorough evaluation of the project's actions, strategic decision-making, the involvement of all actors and the strengthening of teamwork.

Therefore, the REDD+ Project, through a set of technical, governance and management mechanisms; aims to ensure the preservation of the standing forest, thus providing benefits to the conservation of biodiversity, maintenance of ecosystem services, climate regulation and local socioeconomic development. Thus, remaining conserved forests are sent to anthropized and

degraded areas, through deforestation, in the scenario without the Project. Differently from the context with the implementation and execution of REDD+ Project activities, as previously demonstrated.

In view of the scenarios presented "with" and "without" REDD+ Project, and through the primary and secondary information raised and verified in the environmental and socioeconomic diagnoses, the importance of the implementation and development of the Project at Fazenda Jutaituba is clear. Therefore, considering that the impacts of the Jutaituba REDD+ Project are essentially due to avoided deforestation, improvements in production practices, extraction and forest management; monitoring of deforestation and biodiversity, environmental education, heritage surveillance, strengthening of governance and other activities carried out during its term, the main net benefits of the community project and biodiversity that would not occur in its absence are:

For Communities:

- Access to training and capacity building services on sustainable agricultural and extractive practices through partnerships;
- Improvement in land quality and agricultural productivity through the introduction of new production techniques;
- Strengthening human skills, knowledge and capacities on economic productivity and sustainable use of resources;
- Promotion and generation of new sustainable businesses, increase and diversification of income in the surrounding communities and integration with new markets;
- Environmental awareness and permanence of families on their lands;
- Establishment of partnerships, strengthened social organization, efficient communication and improvement in joint work.

For Biodiversity:

- Direct action against habitat loss and forest fragmentation;
- Promoting the conservation of the biodiversity of fauna and flora;
- Conservation of diagnosed species and high conservation value attributes (HCVAs), including those presenting some degree of threat;
- Reduction of extinction risks, ensuring genetic diversity;
- Stimulating, deepening and improving knowledge about local biodiversity through long-term studies and monitoring;
- Mapping of new areas of relevance for conservation and maintenance of connectivity in the landscape.

As described in Section 2.5.7, there are several laws, regulations and decrees (federal and state) that address issues related to the conservation of environmental and ecological heritage and respect for the rights of traditional peoples and communities. Among these regulations, we highlight, for example, Federal Laws 13.123 (2015) and 12.651 (2012). However, as described in the common practice scenario, these laws, in short, are not applied in practice. That is, there is a fragility and legal inefficiency regarding the access and use of land in Brazil and the protection of

natural ecosystems and their resources, as well as the protection of endangered species of fauna and flora; reinforcing that the existence of such regulations does not guarantee their effective length and execution.

In addition, the analysis of the scenario without the Project demonstrates the existence of several barriers to the implementation of activities that may have positive impacts, such as those mentioned above. Further details on the additionality of the Project to the community and biodiversity can be obtained and consulted in Sections 4.1.4 and 5.1.3.

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

As described in Section 2.2.3, additionality for the community and biodiversity has been fully demonstrated, but the benefits generated will not be used in other compensation programs. The Jutaituba REDD+ Project aims to produce only compensation related to Reduced Emissions while Avoiding Deforestation, as described in Section 3 - Climate. For this section, the same interpretation presented by other similar projects already validated by the VCS and CCB standards was used, such as "The Southern Cardamom REDD+ Project".

2.3 Stakeholder Engagement

2.3.1 Stakeholder Access to Project Documents (G3.1)

The communication of the Jutaituba REDD+ Project with stakeholders will be done by three main means: oral, written and face-to-face. The main objective is to ensure access to relevant documents and information regarding the Project by all stakeholders.

Virtual communication: the project design document and/or referral links to access it, as well as relevant information to interested parties, monitoring reports and other relevant documents, will be available by virtual means on the websites of Biofílica and Verra. News and news about the Project will also be published on social media (LinkedIn and Instagram).

Written communication: a printed version of the summary of the Project design document will be made available at the headquarters of Fazenda Jutaituba for consultation with all interested parties, as well as monitoring reports.

Face-to-face/oral communication: information, news and updates of the Project will be passed on through meetings, events and other face-to-face meetings.

In addition, the public consultation event in Verra will be widely disseminated to stakeholders who will have access to the draft Project Design Document**.**

2.3.2 Dissemination of Summary Project Documents (G3.1)

The documents related to the Jutaituba REDD+ Project will be made available and disclosed to all interested parties through a virtual medium on the official website of Biofílica Ambipar Environment and on the website of Verra's registration platform. In addition, a printed summary of the Project Design Document will be made available at the headquarters of Fazenda Jutaituba, as well as monitoring reports, for consultation by communities and other stakeholders.

As mentioned in the previous section, news and novelties will be made publicly available by social networks of Biofílica Ambipar Environment, in your LinkedIn and Instagram account. In addition, all information and news will be reported orally through meetings, lectures and other face-to-face meetings for communities, partners, proponents and other stakeholders.

2.3.3 Informational Meetings with Stakeholders (G3.1)

In order to implement social activities appropriate to the surrounding communities, a Participatory Rapid Rural Diagnosis (DRP) was carried out by the Project proponents together with the company Environmental Technical Solutions (STA), in which the presentation was carried out in an effective and accessible manner on the REDD+ Project, in addition to collecting information necessary for the construction of the Project. The approach used was through conversations, illustrations, drawings, diagrams and observations made in the field. The research was conducted with the communities already described in Section 2.1.9.

In the same diagnosis, interviews were conducted with workers from Fazenda Jutaituba and rural landowners, with the same approach used to communicate with communities, presenting the objectives and relevant information about the REDD+ Project.

Finally, between June 06 and 11, 2022, as part of the project validation process, the return to communities and other local stakeholders was carried out to bring DRP results, in addition to the next steps of the Project and validation of the proposed activities described in Section 2.1.11.

2.3.4 Community Costs, Risks, and Benefits (G3.2)

As stated above, a Participatory Rapid Rural Diagnostic Workshop (DRP) was held involving the communities selected for the Jutaituba REDD+ Project (details in Section 22.1.9 – Description of Actors). The activities carried out together with the communities allowed the analysis of the scenario of these communities through the application of interviews.

Among the strengths of the communities, it is important to highlight the production of non-timber forest products, mainly açaí, Brazil nuts, flowers, vines and straw, among other products and development of sustainable activities. In addition, social organizations representing the communities were identified, whether formal or not, which play an important role, and may be an opportunity to form potential partnerships for the project's actions, in addition to access to new markets.

Among the negative points, the difficulty of displacement and access to basic public services for some isolated communities was identified. In addition, not all communities have health posts, schools for all levels of education, and do not have access to effective technical assistance to improve the means of production. The main threats refer to predatory hunting and fishing, logging and other illegal activities.

The results obtained from the workshops were the basis for the preparation of the activity plan presented in the Jutaituba REDD+ Project, described in Section 2.1.11. In addition, the results were returned to the communities and the activities proposed by the Project were validated as described in Section 2.3.6.

In addition, throughout the project, more appropriate and relevant information on potential costs, risks and benefits to communities should be provided at Project meetings and consultation on activity development, and during follow-up meetings. In addition, it was initially clarified, and it

should be reinforced throughout the Project that participation is voluntary and the decision to participate, or not, is not definitive or results in some type of restriction.

2.3.5 Information to Stakeholders on Validation and Verification Process (G3.3)

The communities potentially participating in the Project and other stakeholders will be informed about the validation and verification CCB through the available media (Section 2.3.8), prior to the event, and workers of Fazenda Jutaituba during the period of field visits.

Virtual channels, such as Biofílica's website and newsletter through social media such as Instagram and LinkedIn and Martins Agropecuária's communication channels will also be used to inform other stakeholders and the general public.

In addition, as stated in the previous sections, information about the Project has already been disclosed during the performance of the Participatory and Returnable Rapid Rural Diagnosis (DRP) of the results raised and presentation of the proposed activities to interested parties.

2.3.6 Site Visit Information and Opportunities to Communicate with Auditor (G3.3)

The auditor's visit to the Project site will be informed to the communities, proponents, partners and other stakeholders participating in the Jutaituba REDD+ Project by the available media (Section 2.3.8), prior to the event. It will also be informed to the workers of Fazenda Jutaituba during the period of field visits.

In addition, in the return of the results of the DRP and validation of the activities proposed by the Project with the interested parties, the steps and next steps of the Project were also mentioned, as well as the audit event.

Communication between communities and other actors with the auditor, as well as the dissemination of information will be facilitated through the distribution of folders, virtual channels, at this time Biofílica's website and social networks, such as Instagram and LinkedIn.

2.3.7 Stakeholder Consultations (G3.4)

The articulation between the stakeholders of the REDD + Jutaituba Project began in 2020, with the beginning of the first negotiations through the sending of a proposal. The final proposal was presented on January 14, 2021, and the signing of the agreement between the proponents (Biofílica and Agricultural Martins) took place on February 11, 2021. After the agreement was formalized, the next step was to identify actors and partnerships to assist in the development of technical studies for the implementation of the project, such as consultancies. The process of defining partnerships for technical studies began in the first half of 2021. With the technical partners defined, the diagnoses were started in July 2021 and completed in February 2022. The kickoff workshop was held on July 13, 2021, and the preliminary results presentation workshop on November 26, 2021, both with the objective of sharing knowledge between the parties, aligning the main problems encountered and describing the scope of the activities and their casual relationships.

During the workshops, participants were divided into working groups in which technical and descriptive points were discussed on the certification standards and their requirements regarding fauna, flora, socioeconomic, physical environment, carbon inventory and baseline determination. These working groups defined, among the strategic actions of the Project, the Field Work Plan and a prior evaluation of the communities that would be selected to be directly involved in the first phase of the Project.

Subsequently, between August 09 and October 19, 2021, the first consultation was carried out with the communities initially selected for the Project, a process that gave rise to the report developed by the company STA, in which they gathered the results of the socioeconomic diagnosis carried out in the field (Section 2.1.6 for more details), which used "*in loco*" interviews to collect information, with the results of participatory workshops where strengths and weaknesses of stakeholders (communities, rural owners and workers of Fazenda Jutaituba) were listed, aligned and related to their potential and opportunities, resulted in the activities and actions proposed by the Project. The main results found in this research that were considered in the construction of the Project are described in Section 2.3.4.

The combination of this information gave rise to the main points included in the Project's activities regarding the direct and indirect impact on communities through the strengthening of governance, implementation, monitoring and evaluation of the activities developed, described in Section 2.1.11 and Table 7, with the main objective of stimulating sustainable economic development through the promotion of sustainable practices, non-timber forest management, promotion of environmental education for hunting and fishing, diversifying productivity, inserting new production techniques and technologies and improving the communication process and the quality of life of residents.

With the conclusion of the technical studies, the feedback was made with the communities and stakeholders from June 06 to 11, 2022. During the meetings, the participants were presented with the results of the socioeconomic diagnosis of the region and the proposed activities that will be conducted by Martins Agropecuária e Biofílica throughout the project. The contact with the communities was through the sending of inviting letters to the community leaders, and the presentation was made to the 26 communities that accepted the participation. We emphasize to everyone that participation was voluntary and the decision to participate, or not, is not definitive or results in some kind of restriction.

The purpose of the meetings was to present the Project and open a venue for participants to ask questions and suggestions about the design of the Project. During the events, all participants had the opportunity to express their ideas and opinions on the content presented, in order to improve the proposed activities. In addition, the communication channels proposed to be structured and used throughout the project were also presented.

Photos were taken, the attendance list and the application of a voluntary questionnaire to the participants to record the understanding of what was being passed, as well as to have a space to make criticisms and suggestions about the Project and the dynamics followed in the feedback. The documents were made available to the VBB team.

Participants did not make requests or suggestions for changes to the proposed Action Plan, only the commitment to monitor the progress of the Project and the willingness to engage in the future was demonstrated.

In addition, all participants received the Project poster to distribute in their respective communities. Another initiative carried out with the objective of increasing the dissemination of the Project to the public in the region was the dissemination of the poster in a virtual way, through WhatsApp.

In addition to this event, the expansion of stakeholder consultation was reinforced by sending letters to the relevant local institutions in the states of Pará, among others that have direct and indirect involvement in the forest conservation and environment sector, such as trade unions, non-governmental organizations (NGOs), the private sector, the State Public Prosecutor's Office and other governmental and federal agencies, where updated information on the status of the project,

the communication channels used and invitation to participate in the Public Consultation as described in Section 2.5.8. Most of the institutions confirmed the receipt of the information (available to the VVB team), but until the final preparation of the Project document, no comments were recorded.

2.3.8 Continued Consultation and Adaptive Management (G3.4)

From the communication plan created to continue communication and consultation between project proponents and community and other stakeholders, the following structure follows:

Communication channels: communication is carried out through the Project email and telephone with access to the WhatsApp messaging application, in addition to the box of suggestions in strategic places of the farm, in which doubts, suggestions and complaints can be registered by interested parties, and through meetings, lectures and other face-to-face events and visits to communities.

Social mobilization strategy: social mobilizations will be held to hold meetings, activities, lectures, training, among other meetings. The mobilizations will be made through mailing (email), telephone, WhatsApp and other means of communication that may be necessary. In each event, it will be defined which parts will be mobilized depending on the theme and negotiations.

Communication procedures: through a defined structure, the demands of the interested parties will be received by the described media, registered in a standard form, analyzed and forwarded to the responsible areas, if necessary and resolved in a predetermined time by the parties involved. Responsibility for the response depends on the complexity of the demand, and can be carried out by the person responsible for communicating the Project, by the specific areas or by the direction of Martins Agropecuária.

Conflict management: Conflict management will be based on the peaceful resolution of opposition of interests directly linked to the Jutaituba REDD+ Project, seeking all possible means of negotiation, and decision-making will harmoniously serve all parties involved, taking into account the well-being of everyone. Any means of communication mentioned above will be used through dialogues, and prioritizing the means that the parties feel most comfortable and with less resolution time.

The communication plan of the Jutaituba REDD+ Project may undergo adaptations over the life of the project as needed, aiming to improve communication between stakeholders and responses to demands.

2.3.9 Stakeholder Consultation Channels (G3.5)

The Project activities are outlined and implemented considering the wishes, characteristics and limitations of each community as defined and verified during the DRP Workshops and feedback meetings.

As described in Section 2.3.4, Workshops (DRP) and meetings between communities and Project proponents have already been held. This communication and accessibility for discussion on the progress of the Project activities between stakeholders and proponents will occur continuously throughout the duration of the Project through the available communication channels, as described in Section 2.3.8. In addition, the feedback to the communities was carried out, as described in Section 2.3.6, increasing the level of information sharing.

2.3.10 Stakeholder Participation in Decision-Making and Implementation (G3.6)

The processes related to decision making and implementation, as well as the various activities related to the Project, are open to the participation of the communities. Furthermore, the project will seek the equal participation of young people and women in the decision-making and implementation of the Project's activities. The involvement in the design, implementation, monitoring and evaluation of the Project takes place through the available communication channels (Section 2.3.8) and informative meetings, in which all interested communities have the opportunity to participate.

2.3.11 Anti-Discrimination Assurance (G3.7)

Martins Agropecuária has a solid policy related to human rights and social responsibility, with a Code of Ethics and Conduct, environmental policy and a policy on health and safety at work.

The Code of Ethics and Conduct serves as a guideline that should guide the conduct of company members in relation to contact with the internal and external public, providing the dissemination and sharing of values and stimulating the improvement of behaviors and attitudes.

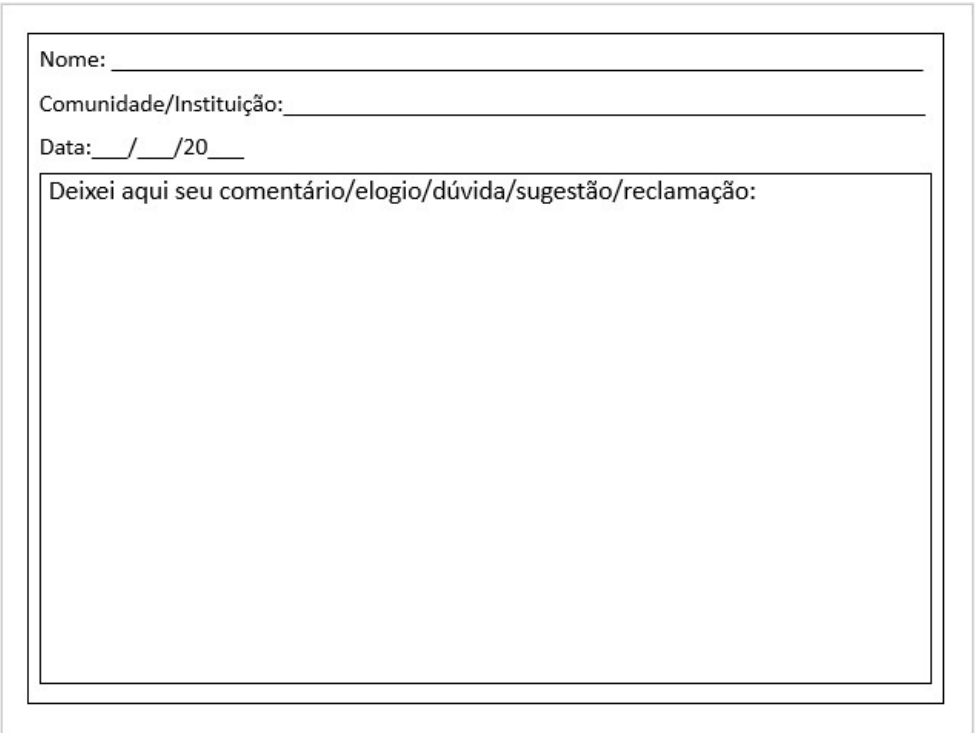
In addition, among the scopes of Martins Agropecuária's Code of Ethics and Conduct, it values the practice of values in all relationships, whether with internal or external audiences, not admitting attitudes of discrimination or prejudice of any nature (race, religion, age, sex, political conviction, origin, marital status, sexual orientation or physical condition), as well as abusive attitudes. The communication channels of the Jutaituba REDD+ Project (Section 2.3.8), will be available to report any attitude that goes against the values described by the Code.

Biofílica Ambipar Environment, belonging to the Ambipar Group, has a code of ethics and conduct that represents all companies in the Group. Thus, the document serves as a primary instrument to guide the conduct of all parties involved, in the adoption of good practices in relationships and in conducting business, guiding towards attitudes of respect for diversity, to combat any form of prejudice.

2.3.12 Accessibility of the Feedback and Grievance Redress Procedure (G3.8)

Martins Agropecuária together with Biofílica Ambipar Environment developed an accessible conflict resolution procedure, which describes the processes and means of communication, in addition to the conflict management and Feedback procedure (Communication Plan) (Section 2.3.8). In addition, the team of Martins Agropecuária e Biofílica Ambipar Environment verbally reviewed the communication plan and explained how any community or interested party can submit comments, suggestions, complaints, through the communication channels described in the Project, the forms (Figure 6 - Form for registering complaints, doubts, suggestions, and compliments to be completed and inserted in the suggestion box.and suggestion boxes distributed at strategic points and in the feedback channel, which works through email, telephone (with access to WhatsApp) and radio and through meetings and other face-to-face events.

We emphasize that the means of communication proposed for the project were presented and validated in the feedback event.


Nome: _____

Comunidade/Instituição:_____

Data:___/___/20___

Deixei aqui seu comentário/elogio/dúvida/sugestão/reclamação:

Figure 6 - Form for registering complaints, doubts, suggestions, and compliments to be completed and inserted in the suggestion box.

2.3.13 Worker Training (G3.9)

The qualification and empowerment of local actors are essential to ensure quality in the implementation of the actions proposed by the Project, as well as to ensure the permanence of positive results and impacts in the long term. It is understood that, to ensure effectiveness in the implementation of the Jutaituba REDD+ Project, it is essential to work on the generation of local human capital, mainly focused on the responsible management of natural resources. Thus, among the various actions proposed by the Project (as detailed in Table 7), one part involves training and engagement of local actors. The main proposals that aim to promote the training of local actors, income generation and direct and indirect jobs are described below.

- Improvement of patrimonial surveillance within the Farm: the activity must involve the training and qualification of employees who work in the patrimonial surveillance of Fazenda Jutaituba. The training and qualification aim to improve the patrimonial surveillance techniques that already occur within the Farm, also improving the working conditions and assisting in the containment of invasions and illegal activities;

- Strengthening of governance: involves the expansion of Martins Agropecuária's action in the region, attracting investments and partnerships. Through the formation of new partnerships, mainly for *on-site* operations, the project should also stimulate the creation of indirect jobs and attract investments to the region;

- Non-timber forest management at Fazenda Jutaituba: the activity involves the promotion of training within the potential lines of extraction of non-timber products mapped by the Project, promoting sustainable development. In addition, the Project proposes to map the main

opportunities and implement partnerships for the development of activities, increasing investments and improving the income of families that depend on these activities;

- Promotion of sustainable practices: the activity involves the promotion of training within the lines mapped by the Project, which may be related to the demands of the communities, in addition to mapping stakeholders with the potential to adhere to actions to promote sustainable practices and implement partnerships aimed from funders to technical development. In addition, the activity promotes the improvement of practices developed by communities, promoting sustainable development, with environmental education actions in scenarios that are synergized with the actions implemented;

- Promotion of environmental education for hunting and fishing: the activity proposes to seek solutions and environmental education actions to be implemented in synergy with the cultural and practical elements used by the community, maintaining the source of income of families that practice hunting and fishing, improving the practice for sustainable development, and mapping and implementing partnerships for the development of environmental education actions, thus improving activities and practices;

- *In situ* biodiversity monitoring: the biodiversity monitoring activity involves the engagement and participation of stakeholders, mainly community and farm workers, promoting the technical development of these people, in addition to strengthening management and promoting biodiversity conservation.

In order to ensure the efficiency and permanence of these actions listed above, proponents should seek the best techniques and procedures to conduct training for the people involved in the activities, always seeking to ensure a successful qualification for the team to work with the communities and meet the project goals. These processes will follow all relevant laws and regulations related to workers' rights, as described in Section 2.3.16, bringing team involvement to meet the project schedule and goals, with the aim of optimizing investments and preventing loss of human capital due to staff turnover. Other measures adopted to avoid the loss of acquired capacity will be the registration and constant report of procedures and monitoring of the results obtained, since, in case of staff turnover, the procedures can be easily reproduced, mitigating impacts on the implementation of the project plan.

In addition, the Project intends to seek partnerships with qualified institutions for the development of the proposed activities.

All activities are open to the participation of all residents of the communities surrounding the Fazenda Jutaituba. The participation of women, young people and marginalized people is stimulated by the proponents. In addition, the process of hiring farm workers involves all people residing in the communities (Section 2.3.15).

2.3.14 Community Employment Opportunities (G3.10)

The employment opportunities offered by Martins Agropecuária are equal to the surrounding communities, encompassing management positions, if the requirements for the vacancy are met. All work positions generated locally by the Project follow the Recruitment and Selection process, belonging to Martins Agropecuária, which performs the entire process according to the need and availability of vacancies.

No criteria of race, gender, sexual orientation, color, religion, age, ethnic origin, physical or mental disability or social class are adopted. All stages of the selection processes, as well as the hiring of the professional, will be based on the criteria established in the description of the positions offered and a minimum qualification is desirable.

It should be noted that the project proponents already have teams composed mainly of community members from the Fazenda Jutaituba region, which highlights that the project will only reinforce the actions already taken in this regard. Currently, about 90% of Martins Agropecuária's staff is composed of riverside and quilombola people and are considered criteria such as logistics and experience of working with forests. Thus, most of the hires are residents of the surroundings or who reside within the Farm itself. In addition, the hiring may come either in the interest of the community members who seek Martins Agropecuária, or indications of employees who already work at the Farm.

2.3.15 Relevant Laws and Regulations Related to Worker's Rights (G3.11)

It is ensured that all employees belonging to Martins, Biofílica, and service providers are legally hired in compliance with Brazilian labor legislation. In addition, the international agreements ratified by Brazil and issues related to the well-being of workers are respected.

Annually, there is compliance with the labor standards and laws applied by Biofílica by an audit, this is due to the fact that it is a S.A. company. Its financial statements are published on the website of Jus Brasil, the largest open and legal community in Latin America.

After hiring and before the beginning of the worker's activities, there are training and qualification on the technical procedures and empowerment is promoted regarding their rights and applicable laws. In addition, employees are advised to join the institution responsible for defending their rights, the respective unions to the work area.

Through an Integrated System, Martins respects the laws, rules and regulations applied in the conduct of its business. The company has policies and procedures that include a code of conduct, ethics, risk management and transparency in communications, in order to guide the responsible positioning of the public with whom it relates, both internal and external.

Below are the relevant laws and regulations that protect workers' rights in Brazil, as well as the international agreements ratified by Brazil on labor issues.

Federal laws and regulations

- Decree-Law No. 5.452, as of May 01, 1943: Approves the Consolidation of Labor Laws.

- Law No. 6.514, as of December 22, 1977: Amends Chapter V of Title II of the Consolidation of Labor Laws, relating to occupational safety and medicine and other measures.

International agreements ratified by Brazil

- Convention of the International Labor Organization No. 29 of 1930, ratified by Brazil on 04/25/1957: It provides for the abolition of forced labour.

- International Labour Organization Convention No. 87 of 1940: Provides for freedom of association.

- Convention of the International Labor Organization No. 97 of 1949, ratified by Brazil on 06/18/1965: Provides for migrant workers.

- Convention of the International Labor Organization No. 98 of 1949, ratified by Brazil on 11/18/1952: Provides for the right to unionization and collective bargaining.

- Convention of the International Labor Organization No. 100 of 1951, ratified by Brazil on 04/25/1957: It provides for equal pay for men and women.

- Convention of the International Labor Organization No. 105, ratified by Brazil on 06/18/1965: It provides for the abolition of forced labour.

- Convention of the International Labor Organization No. 111 of 1958, ratified by Brazil on 03/01/1965: It provides for discrimination in respect of employment and occupation.

- Convention of the International Labor Organization No. 131 of 1970, ratified by Brazil on 05/04/1983: It provides for the setting of minimum wages, especially in developing countries.

- Convention of the International Labor Organization No. 138 of 1973, ratified by Brazil on 06/28/2001: Provides for the minimum age for admission.

- Convention of the International Labor Organization No. 142 of 1975, ratified by Brazil on 11/24/1981: Provides for the development of human resources.

- International Labour Organization Convention No. 143 of 1975: It provides for immigration under unfair conditions and the promotion of equal opportunities for migrant workers.

- Convention of the International Labor Organization No. 155 of 1981, ratified by Brazil on 05/18/1992: Provides for the safety and health of workers.

- Convention of the International Labor Organization No. 169 of 1989, ratified by Brazil on 07/25/2002: Provides for indigenous and tribal rights.

- Convention of the International Labor Organization No. 182, ratified by Brazil on 02/02/2000: It provides for the prohibition of the worst forms of child labor and immediate action to eliminate it.

2.3.16 Occupational Safety Assessment (G3.12)

An important component of the Project involves the strict and effective care for the safety of workers, considering the internal regulations and official rules established by the federal and state governments. In this context, the Martins Group has two complexes, didactic and mandatory Programs aimed at the Environmental Risk Prevention Plan (ERPP) and Occupational Health and Medical Surveillance Program (OHMSP), in which all activities carried out by the company are described through operational procedures, work instructions, environmental procedures, control and prevention of damage and diseases; and disclosure and communication of information in accordance with Regulatory Standards No. 7 and 9 of the Department of Occupational Safety and Health, of the Ministry of Labor. These Programs and their provisions are reviewed and updated annually, in accordance with the requirements of labor legislation. In addition to these documents, the Martins Group also has the Martins Integrated System (SIM), which guides and makes public all laws, rules and regulations of the company for its employees, suppliers and service providers. According to these documents, the activities related to Sustainable Forest Management and Livestock are likely to provide some risk to the health and safety of operating employees.

Considering these tasks, the Occupational Safety and Health procedures associated with the Martins Integrated System aim to inform internal employees and third parties who are attending the premises of the property and carrying out any activities within their duties; with regard to compliance with standards related to labor laws and the internal rules of the company regarding aspects of

occupational, operational and environmental safety. In general, employees, suppliers and service providers are responsible for the correct identification and clothing; the use of Personal Protective Equipment (PPE) indicated in the ERPP according to the function to be performed; the preparation and use of tools in good condition; the storage of tools, machinery and equipment in appropriate places; the maintenance of hygiene and the organization of the work environment; the appropriate final destination of chemicals; the proper signaling of the workplace; the communication of potential risk factors or situations to the direct manager; and the reporting of accidents. Employers, on the other hand, are responsible for offering training on Occupational Safety and Health; supervising the execution of activities; meeting legal labor requirements; providing, training and supervising the use of PPE; and interrupting any type of activity that exposes workers to conditions of serious risk and imminent risk to their health and safety.

It is worth mentioning that the Martins Integrated System has a particular procedure for servicing the work of service providers. To which they are subject to specific conditions before and during work, in addition to those obligations mentioned above; for example, preparation of a Preliminary Risk Analysis (PRA); proof of training, certification and qualification of their employees; and submission to the company's Safety Integration Training.

In this context, a frequency of training aimed at the preparation of own employees and third parties working in sustainable forest management activities and other work at Fazenda Jutaituba are offered; such as: use of gloves; plug-type earplugs; respirators; health noise effects; agricultural machinery and equipment; general occupational safety and hygiene standards; and safety and maintenance measures.

Through internal rules and improvements in occupational health and safety practices, all positions and situations that could provide some type of occupational risk were deeply avoided and mitigated. Other relevant tools are reported in the Martins Integrated System Code of Ethics and Conduct.

2.4 Management Capacity

2.4.1 Project Governance Structures (G4.1)

The management of the Project will be the responsibility of Biofílica Ambipar Environment and Martins Agropecuária. The obligations and commitment of the parties are described below:

Responsibilities of the Biofílica: general coordination of socioeconomic and environmental diagnostics (DSEA), baseline and carbon stock studies; construction of the PDD (Project Design Description); remote monitoring of forest cover and implementation/coordination of additional actions aimed at reducing/mitigating greenhouse gases (GHG) emissions; conduction of validation/verification audits; disclosure of the Project; commercialization of credits and co-management of the Project throughout its duration.

Responsibilities of Martins Agropecuária: Investments necessary for the implementation and validation of the Project (Capex); co-management of the project, as well as development of all related activities in the environmental and social scopes, and support in infrastructure and logistics for Biofílica and other professionals involved in the Project. In addition, it must provide all necessary support for the audit processes, construction of disclosure materials and other commercial processes.

During the development of the project other organizations (mentioned in Section 2.1.4) were involved to carry out the diagnostic studies. Thus, the responsibilities are described below:

Casa da Floresta Ambiental: development of environmental studies, such as characterization of the physical environment and biodiversity of the region (flora and fauna).

Technical Solutions and Environmental Engineering Services – STA: development of the study of carbon stock estimation and socioeconomic diagnosis of the Jutaituba REDD+ Project.

Piatam Institute: collaboration in the elaboration of the Project baseline through the definition of spatial and temporal limits, as well as in the elaboration of the baseline model.

As presented, the Jutaituba REDD+ Project is supported by human resources that assisted in its development and implementation.

2.4.2 Required Technical Skills (G4.2)

The main technical skills required for the implementation of the REDD+ Jutaituba Project are knowledge about the development and management of forest conservation projects in the Amazon biome, experience in the implementation, development and assistance of programs for agroextractive communities and implementation of effective land security and heritage surveillance. All proponents involved in the project have the necessary technical skills for the successful completion of the Jutaituba REDD+ Project.

Biofílica Ambipar Environment is a Brazilian company that promotes the management of forest areas in the Amazon biome. The company has a specialized team and is a reference in the development of forest conservation projects, ensuring the quality and effectiveness of the REDD+ activities developed. The company aims to reduce deforestation and carbon emissions into the atmosphere, conserve biodiversity and water resources and promote social inclusion and development of communities living in the Amazon biome through the sale of credits for environmental services, development and financing of scientific research activities and the development of sustainable business chains. Biofílica aims to make environmental conservation an economically interesting activity for forest owners, communities and investors.

Martins Agropecuária is a Brazilian company that emerged after the purchase of Fazenda Jutaituba in 1978 by the Martins System in order to expand and diversify the company's business. Martins is a leader in the wholesale segment, founded in 1953 and has become a reference in wholesale distribution, reaching the mark of more than 1 billion revenues. Today, the Martins System has the largest marketplace for online sales, in addition to offering technological, educational and financial solutions.

Fazenda Jutaituba consists of an Amazonian reserve, with 93.6% of native forest, which corresponds to about 151 thousand hectares of forests. Martins Agropecuária leases the farm for Sustainable Forest Management activities, with a view to the continuous production of certified wood. In addition to forest activities, the fauna and flora of the property are continuously monitored by specialists in order to ensure the biodiversity associated with sustainable management. At the same time, since its acquisition, Fazenda Jutaituba is part of a great local responsibility to generate jobs for residents of the region, through the commercialization of legalized and certified timber, in addition to having a school, which works to assist residents. Also, Martins Agropecuária develops on the Fazenda Jutaituba a small management of beef cattle for sale.

In this sense, the owners of Fazenda Jutaituba wish to develop conservation projects and environmental services to ensure the long-term conservation of carbon stocks and local biodiversity and add value to forest assets.

2.4.3 Management Team Experience (G4.2)

Below is the experience of the members of the project management team:

Proponent: Biofílica Ambipar Environment

Plínio Ribeiro – Executive Director

Plínio Ribeiro holds a degree in Business Administration from Instituto de Ensino e Pesquisa - INSPER and a master's degree in Public Administration and Environment from Columbia University and the Earth Institute (USA). He participated in several conservation projects of the lower Rio Negro, through the Institute of Ecological Research – IPÊ since 2005, and was one of the producers of the documentary "Return to the Amazon", by Jean Michel Cousteau. He has worked at Biofílica since 2008, where he has led Projects, Operations and Business Management. Currently, he is Executive Director and shareholder of the company.

Team:

Cláudio Padua – Scientific Director

Cláudio Pádua holds a degree in Business Administration and Biology, a master's degree in Latin American Studies and a doctorate in Ecology from the University of Florida at Gainsville (USA). A retired professor at the University of Brasília, Padua is currently dean of the School of Conservation and Sustainability and vice-president of the Institute for Ecological Research (IPÊ). He is also a Senior Associate Research Fellow at the Center for Environment and Conservation Studies at Columbia University (USA) and Director of International Conservation at the Wildlife Trust Alliance, as well as a consultant to the Brazilian Biodiversity Fund (FUNBIO) and WWF Brazil. Padua represents Brazil before the International Advisory Group (IAG) of the G7 Pilot Program. In 2003, along with his wife, Suzana Pádua, he was named "Hero of the Planet" by Time magazine for his activities in favor of biodiversity conservation. Between 1997 and 2007, it won six conservation awards, three national and three international. Padua has published two books and more than 30 articles in national and international scientific journals. Since 2008 he directs the involvement and scientific production of Biofílica as Scientific Director and advisor.

Paula Conde – Financial and Administrative Manager

Paula Conde holds a degree in Business Administration from PUC of São Luís and a postgraduate degree in Accounting and Financial Administration from FAAP. She has extensive experience, mostly in one of the largest media and education groups in Latin America – Editora Abril, where she worked with Financial Control and Reporting, Treasury, Accounting and Financial Reconciliation, Accounts Payable and Receivable and Royalties. At Biofílica, she is responsible for administrative and financial activities, logistical support to the team and projects.

Caio Gallego – Chief Operating Officer

Caio Gallego is a Forest Engineer graduated from the University of São Paulo (USP/ESALQ). Specialist in geoprocessing and remote sensing focused on the area of environmental conservation, mapping and analysis of changes in land use. He has knowledge focused on Sustainable Forest Management, environmental modeling and use of alternative GIS for forestry and agribusiness. He has advanced knowledge in the use of GIS software and analysis of changes in land use and coverage such as ArcGIS, QuantumGIS and DynamicsEGO.

Luana Cordeiro – Project Coordinator

Luana Cordeiro is a Forest Engineer graduated from the University of São Paulo (USP/ESALQ) and Technician in Environment from the São Paulo State Technical School. During her graduation, she was coordinator of the Environmental Adequacy Group of the Piracicaba campus in the planning, implementation and monitoring of restored areas, and coordinator of the Enactus social entrepreneurship group, developing social projects in Piracicaba (SP). In her project, she developed a Solid Waste Management Plan Model for Sawmills of Native Species, focusing on the sustainable production of the timber sector in the Amazon.

Luana Geraldini – Project Coordinator

Luana Geraldini is a Forest Engineer, graduated from Universidade Estadual Paulista (Botucatu Campus) and Postgraduate in Project Management from USP/ESALQ. During her undergraduate studies, she worked with environmental education and research projects on forest restoration. She has extensive experience in the area of environment as an environmental analyst in environmental licensing and geoprocessing projects.

Aline Ribeiro - Project Coordinator

Aline Ribeiro is an Environmental Engineer, graduated from the University of São Paulo (Poli-USP). She has experience in the area of Conservation, with emphasis on Economic Valuation of Ecosystem Services, Remote Sensing and Geoprocessing. She also developed research projects in the area of greenhouse gas emissions and erosion control.

Shaxahmary de M. C. dos Santos – Project Coordinator

Shaxahmary dos Santos is a Forest Engineer, graduated from the University of São Paulo (USP/ESALQ). She is currently an expert in Project Management. In her last professional experiences and during her undergraduate studies, she worked on topics such as conservation of natural resources, climate change, payments for environmental services, geoprocessing, restoration and forest hydrology.

Ieda Januário – Legal Support

Ieda Januário is a lawyer, a member of the Guedes Nunes Oliveira and Roquim law firm. Graduated from Universidade Presbiteriana Mackenzie, specialist in Real Estate Law from Fundação Getúlio Vargas (FGV-SP) and monthly columnist for Globo Rural magazine. She has extensive experience in advisory and litigation cases involving real estate and agrarian law, land regularization and land disputes, incorporation of real estate developments and regularization of subdivisions.

Márcio Sales – Statistical Modeling Specialist

Márcio Sales is a statistician, graduated from the Federal University of Pará, Master in Geography from the University of California, Santa Barbara and PhD student in Ecology of Production and Conservation of Resources from the University of Wageningen, in the Netherlands. She specializes in data analysis and conducts research in geostatistical modeling of processes distributed in space and time. It operates in Biofílica in the production of projections of GHG emissions by future deforestation for the baselines of the projects and in the monitoring of satellite deforestation.

Nathanael de Campos – Project Analyst

Nathanael Campos is a Forest Engineer and graduated in Agricultural Sciences from the University of São Paulo (USP/ESALQ). During graduation he worked with public policies for family farming

and inventory of greenhouse gas emissions. He also has experience with GIS tools and remote sensing, with an emphasis on environmental analysis.

Taísi Sorrini – Project Analyst

Taísi Sorrini is an Agronomist, graduated from the University of São Paulo (USP/ESALQ) and has a Master's degree in Sciences from the same institution. She has experience in the conservation and recovery of forest ecosystems, focusing on the management of ecological restoration projects, and corporate consulting in sustainability and environmental management.

Marco Antonio Martins – Geoprocessing Analyst

Marco Antonio Martins is a Geographer, graduated from the University of São Paulo (FFLCH-USP). During his graduation, he worked with geoprocessing and remote sensing projects applied to forest monitoring, territorial planning, coastal habitat mappings and areas restored in conservation units.

Franciane Almeida - Geoprocessing Analyst

Franciane Almeida is a Forest Engineer, graduated from the Federal University of Lavras (UFLA). She has experience in the area of geoprocessing and remote sensing applied to the areas of forestry planning and harvesting, recovery of degraded areas and land regularization.

Proponent: Martins Group

Renato Fernandes Martins – Shareholder and Director

Renato is a shareholder and board member of the company Martins Comércio e Serviços de Distribuição S.A. and since 2020 Chief Executive Officer of Martins Agropecuária.

Rubens Batista Júnior – Administrative and Financial Director and Retail Director

Rubens is an accountant, with a degree in Accounting Sciences and a master's degree in Management Accounting both from the Federal University of Uberlândia. Administrative and Financial Director and Retail Director of Martins Wholesale Distributor. He built his career in distribution, both in food retail (hypermarkets, self-service wholesale and supermarkets) and specialized (electronics), as well as in the distribution of pharmaceutical products. At Makro Atacadista he held the positions of Chief Financial and Investor Relations Officer, Vice President for South America and President, while at Carrefour he held various positions in the financial and operations areas. Subsequently, as an operating partner in consulting specialized in interim management, he worked on restructuring and growth projects in retail companies. He is currently also Chairman of the Fiscal Council at Bradesco Multipensions and member of the Board of Directors of IBEF-SP (Instituto Brasileiro de Executivos de Finanças de São Paulo).

Staff

Pauliran Gomes e Silva – Legal Advisor

Pauliran is a tax lawyer; legal advisor to Grupo Martins; director of ABRADT – Brazilian Association of Tax Law; member of the Tax Committee of FECOMÉRCIO-MG; former judge member of the Taxpayers Council of the City of Uberlândia; bachelor's degree in law from UFU in 1995; master's degree in public law from UNIFRAN in 2003; MBA in Business Management from Fundação Dom Cabral in 2009 and Post-MBA in Business Negotiation from FGV in 2015.

Mayara Tayrine Lima Santos Mineiro – Lawyer

Mayara holds a bachelor's degree in Law from the Federal University of Uberlândia, with a specialization in Contractual Advocacy and Civil Liability for Ebradi and Civil and Consumer Law from Faculdade Damásio. The Martins Group operates in the area of contracts, participating in all projects of the company, collaborating with various areas and activities. She worked in one of the largest telecommunication companies in the region also in the area of contracts and civil advisory, among others.

Proponent: Martins Agropecuária S/A (member of the Martins Group)

Staff

Fernando Borges Alvares - Operations Manager

Fernando holds a degree in Social Studies from UNIT. He started his career at Grupo Martins in the commercial area. In 2004, he took on the role of Risk Manager at Martins Agropecuária, where he led the farm's Asset Surveillance area. Currently, he is the Operations Manager, responsible for livestock operations, management of sustainable forest management and surveillance of the entire extension of the Fazenda Jutaituba.

Nathalya Santos – Financial Administrative Analyst

Nathalya is an Environmental Engineer graduated from the Federal University of Uberlândia and has an MBA in Leadership, Innovation and Management from PUC – Rio Grande do Sul. He is a Financial Administrative Analyst at Martins Agropecuária where he coordinates the company's administrative activities. Worked with environmental consulting in the Environmental Landscape, focusing on environmental licensing. And worked in the area of planning and performance at Ambev S/A.

Fabrício Andrade da Silva – Operations Assistant

Fabrício has worked at Martins Agropecuária since 2008, where he started as a General Service Assistant in the area of Sustainable Forest Management, being promoted to Meter and Classifier and later to Office Assistant. He is currently an Operations Assistant, responsible for executing operations on the farm. It has the course of Forest Management of Reduced Impact by IFT.

2.4.4 Project Management Partnerships/Team Development (G4.2)

The Jutaituba REDD+ Project has all the necessary partnerships for the construction and implementation of forest asset conservation activities. Currently, the partner institutions, mentioned in the Section 2.1.4, are responsible for the preparation of the Socioeconomic and Environmental Diagnoses, Carbon Stock and Baseline, which make up the Project Design Document, through service supply contracts.

When other initiatives throughout the development of the Project require new technical knowledge and partners, the proponents of the Jutaituba REDD+ Project will articulate an association with governmental, non-governmental and private sector organizations in order to enable the generation of net positive impacts on society and biodiversity

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

Biofílica Ambipar is a Brazilian company with 15 years of experience in the environmental services market in Brazil, through the generation and commercialization of carbon credits from nature-based

solutions (NBS), having a diversified line of business and investors that support the company's business.

The Martins System has been expanding its area of activity in all regions of the country as a leader in the wholesale-distributor segment, assuming a role as an integrator of the consumption chain. As a strategy for diversifying this System, actions were developed, and some companies were created for synergistic action that optimized the solutions necessary for retailers. These include Banco Tribanco, to offer financial solutions; the corporate university (IAMAR), to bring management and technology solutions; a (UNIQUE) card company, to credit retailers' consumers/customers; an insurance broker (tribanco seguro), to protect assets and assets; a retail network (smart) to promote efficiency in marketing and operations to affiliates; an e-commerce portal (efácil), to bring customers closer together.

In addition, the purchase of Fazenda Jutaituba in 1978 was carried out with the objective of expanding and diversifying the System's business and being part of a biological and environmental heritage to be preserved, recognizing its importance for future generations. In addition, Martins Agropecuária develops certified Forest Management and small-scale beef cattle management activities.

Documents proving the financial health of both institutions are classified as commercially sensitive information and were shared with the audit team on a confidential basis

2.4.6 Avoidance of Corruption and Other Unethical Behavior (G4.3)

The Biofílica Ambipar Environment supports annual financial audit processes by ensuring that its resources are allocated responsibly and free of corruption. The financial statements and minutes of meetings relating to the company are published on the website of JusBrasil, the largest open and legal community in Latin America.

As well as Biofílica, Martins Agropecuária does not corroborate any practice of bribery or corruption, actively encouraging the denunciation and collaboration in investigations, through official communication channels structured and defined in internal policies, such as an Internal Ombudsman. Complaints and complaints are forwarded and correctly resolved by those responsible. It should be noted that the channel is confidential and operates free of charge by electronic and telephone means. The company also has the "Martins Integrated System (SIM)", which includes the Codes of Ethics and Conduct, which defines guidelines based on the conduct of all members of the company, in a transparent, respectful and consistent manner.

2.4.7 Commercially Sensitive Information (*Rules* 3.5.13 – 3.5.14)

Some information required by VCS and/or CCB standards is considered confidential or commercially sensitive and may not be publicly disclosed by Project proponents. This information was completely provided to the audit team during the validation process attached to this document, but was not included in the public version. Below is a list of information that was made available:

- Land Documents and Legal Status;

- Financial Statements of Martins Agropecuária;

- Financial Statements of Biofílica Ambipar;

- Project Financial Performance Worksheet (budget) and other related documents;

- Agreements and contracts signed between the parties involved;

- Diagnostic Inventories.

2.5 Legal Status and Property Rights

2.5.1 Statutory and Customary Property Rights (G5.1)

Martins Agropecuária S.A., belonging to the Martins Group, is the legitimate owner of the property Gleba Joana Perez I, sectors C, D and E, called Fazenda Jutaituba, where the Jutaituba REDD+ Project is located. Martins Agropecuária's properties cover the cities of Bagre, Baião, Oeiras do Pará and Portel, in the State of Pará, and were acquired through a public deed of purchase and sale, a document in which it guarantees the ownership of the properties. In addition to the deeds, the registrations, which present the registration of ownership and the descriptive memorial of the properties, are attached to the DCP. Other official documents such as the Rural Property Registration Certificate (CCIR) and the definitive titles of the lots that make up the farm will also be presented. These documents are intended to attest to the process of buying and selling the properties, the ownership and location of the notaries where they were registered, proving the legitimacy of the property.

The demonstration of the right to use the Project area is respected according to the criteria of VCS Standard v4.2 (page 24):

1) Right of use resulting from or granted under a statute, regulation or decree by a competent authority;

2) Right of use arising from the law;

4) Right of use arising from statutory, patrimonial or contractual law on land, vegetation or conservation process, or management that generates reductions and/or removals of GHG emissions (where this right includes the right to use such reductions or removals and the project proponent has not been stripped of such right of use).

Gleba Joana Perez I consists of 44 properties certified and registered in a real estate registry office. All have descriptive memorial and georeferencing in accordance with Law 10.267/01[40]. In addition, these properties are approved to carry out the Sustainable Forest Management Plan certified by the FSC.

The following is the Table 12 information regarding the batches of Martins Agropecuária registered in the land information system of INCRA - SIGEF.

Table 12 - Lots that make up all or part of the Project Area

Denomination	Registration of the property	Area (ha)	SIGEF link
Fazenda Jutaituba - Lot 3 Sector C	1,566	2584.63	https://sigef.incra.gov.br/geo/parcela/detalhe/734c651e-8764-435f-8017-7337876aa4ff/
Fazenda Jutaituba - Lot 4 Sector C	5,516	2160.52	https://sigef.incra.gov.br/geo/parcela/detalhe/6f2caa77-51ec-4f8a-85ab-037ef6f67de1/

[40]http://www.planalto.gov.br/ccivil_03/leis/leis_2001/l10267.htm

Denomination	Registration of the property	Area (ha)	SIGEF link
Fazenda Jutaituba - Lot 5 Sector C	1,567	2845.97	https://sigef.incra.gov.br/geo/parcela/detalhe/5d7c0aeb-4a04-4a1d-978f-903863983908/
Fazenda Jutaituba - Lot 8 e 10 Sector C	1,563	5751.50	https://sigef.incra.gov.br/geo/parcela/detalhe/4723d26d-e624-4828-b1d5-728de6b0c518/
Fazenda Jutaituba - Lot 9 Sector C	1,568	2964.08	https://sigef.incra.gov.br/geo/parcela/detalhe/2a865465-fca6-4db6-ac39-1df44f5fa922/
Fazenda Jutaituba - Lot 12, 13, 14, 17, 18 and 20 Sector C	314	17905.45	https://sigef.incra.gov.br/geo/parcela/detalhe/9ebb6db3-9c15-4710-8a40-98ca8ee4be79/
Fazenda Jutaituba - Lot 21, 23, 24 Sector C / Lot 7 Sector D	315	9089.48	https://sigef.incra.gov.br/geo/parcela/detalhe/e4bf3295-9e5d-4540-a06d-84a6f74a25ab/
Fazenda Jutaituba - Lot 26 Sector C	1,564	1954.72	https://sigef.incra.gov.br/geo/parcela/detalhe/cdd0f429-d3e5-498c-ba69-5b45ae7e0f03/
Fazenda Jutaituba - Lot 27 Sector C	1,571	1621.69	https://sigef.incra.gov.br/geo/parcela/detalhe/659f9138-1af0-4433-8330-acd4848cfe67/
Fazenda Jutaituba - Lot 29 Sector C	1,574	2338.27	https://sigef.incra.gov.br/geo/parcela/detalhe/897d652a-b9cf-482f-a2ce-c951608fbf78/
Fazenda Jutaituba - Lot 33 Sector C	1,572	1808.83	https://sigef.incra.gov.br/geo/parcela/detalhe/3e5e34b7-5cbd-4a83-b737-523979fbf9b2/
Fazenda Jutaituba - Lot 1 Sector D	L. 2-E F. 056 M.1.562	1519.97	https://sigef.incra.gov.br/geo/parcela/detalhe/f14f1442-6e2e-497c-9789-c9b3a3676ae5/
Fazenda Uberlândia - Lot 3 Sector D	5,531	2524.33	https://sigef.incra.gov.br/geo/parcela/detalhe/201f6910-c1b5-4980-94f3-03a46d596fc5/
Fazenda Jutaituba - Lot 4 Sector D	5,529	3114.59	https://sigef.incra.gov.br/geo/parcela/detalhe/a08818b6-f3f6-4ff5-bae5-0377fd923fe6/
Fazenda Cajueiro - Lot 6 Sector D	275	2373.20	https://sigef.incra.gov.br/geo/parcela/detalhe/5c273315-2d30-4a02-816c-853d338ce2f1/
Fazenda Jutaituba - Lot 8 Sector D	5,534	2493.05	https://sigef.incra.gov.br/geo/parcela/detalhe/ce7cd4fa-99db-47e8-9e70-5b566d23e5cb/
Fazenda Jutaituba - Lot 9 Sector D	5,533	2914.08	https://sigef.incra.gov.br/geo/parcela/detalhe/c34714b2-6e56-4019-a21b-3a3d1063729c/
Fazenda Jutaituba - Lot 10 Sector D	5,535	2650.05	https://sigef.incra.gov.br/geo/parcela/detalhe/8951cd63-8459-4094-ab77-48543e5fa70f/
Fazenda Jutaituba - Lot 11 Sector D	5,532	2627.77	https://sigef.incra.gov.br/geo/parcela/detalhe/3aefc61f-9a27-400c-931e-b9586a94fb48/
Fazenda Uberlândia - Lot 12 Sector D	5,530	2627.77	https://sigef.incra.gov.br/geo/parcela/detalhe/4a6360b8-f91f-465f-8c96-b0503fb2e177/
Fazenda Jutaituba - Lot 14 Sector D	5,528	2485.57	https://sigef.incra.gov.br/geo/parcela/detalhe/6f2d0c2c-d6da-4069-a34b-722a0e43ffc8/
Fazenda Jutaituba - Lot 16 Sector D	5899 / 5900 / 5901	3030.15	https://sigef.incra.gov.br/geo/parcela/detalhe/fe51dc20-d34c-4a16-9172-b16fb07349e4/
Fazenda Jutaituba - Lot 1 Sector E	Book 2-W Fls. 165. M. 5.514	2990.97	https://sigef.incra.gov.br/geo/parcela/detalhe/5faed698-b51b-414e-91e9-d963cfc71ffc/

Denomination	Registration of the property	Area (ha)	SIGEF link
Fazenda Jutaituba - Lot 2 Sector E	617	2989.67	https://sigef.incra.gov.br/geo/parcela/detalhe/f6b20543-2da5-41fe-8c0c-b6204156cba0/
Fazenda Jutaituba - Lot 5 Sector E	618	2995.19	https://sigef.incra.gov.br/geo/parcela/detalhe/188d2364-f563-4d8f-b558-7053aa4a616d/
Fazenda Uberlândia - Lot 6 Sector E	624	3000.82	https://sigef.incra.gov.br/geo/parcela/detalhe/bcc16993-8115-4398-b956-cfd8eff719fe/
Fazenda Jutaituba - Lot 7 Sector E	5,523	2999.22	https://sigef.incra.gov.br/geo/parcela/detalhe/1cec8c41-0310-444e-8e9c-022483db281d/
Fazenda Jutaituba - Lot 9 Sector E	5,519	2997.67	https://sigef.incra.gov.br/geo/parcela/detalhe/28028901-0e36-4d6e-9ce2-defa2b5de2cf/
Fazenda Jutaituba - Lot 10 Sector E	5,522	3000.98	https://sigef.incra.gov.br/geo/parcela/detalhe/17bf703c-ac89-4e99-a16f-c04a71fda2f0/
Fazenda Jutaituba – Lot 11 Sector E	621	2985.72	https://sigef.incra.gov.br/geo/parcela/detalhe/ceb2702e-feca-4c68-8fb4-672f322c692f/
Fazenda Uberlândia – Lot 12 Sector E	616	2996.29	https://sigef.incra.gov.br/geo/parcela/detalhe/8f8c678a-c31d-4c37-9ceb-52c9119673eb/
Fazenda Jutaituba – Lot 13 Sector E	5,527	1564.00	https://sigef.incra.gov.br/geo/parcela/detalhe/d7061054-5933-407b-9817-397d9f28570b/
Fazenda Jutaituba - Lot 14 Sector E	622	2995.47	https://sigef.incra.gov.br/geo/parcela/detalhe/98779c9b-7188-49d7-8831-4e4c7f2b06d9/
Fazenda Jutaituba - Lot 15 Sector E	619	2996.42	https://sigef.incra.gov.br/geo/parcela/detalhe/95cbeae1-7a4e-437b-86b5-575f437a4739/
Fazenda Jutaituba - Lot 16 Sector E	5,521	2983.00	https://sigef.incra.gov.br/geo/parcela/detalhe/20b487b8-f77f-4c24-90b9-d45543e565b4/
Fazenda Jutaituba - Lot 17 Sector E	5,525	2990.59	https://sigef.incra.gov.br/geo/parcela/detalhe/d349b56c-1fdb-468d-bc8a-e434122b366f/
Fazenda Jutaituba - Lot 18 Sector E	5,518	2993.64	https://sigef.incra.gov.br/geo/parcela/detalhe/13686fca-86c5-4770-8e6a-37f17592c189/
Fazenda Jutaituba - Lot 19 Sector E	623	2989.24	https://sigef.incra.gov.br/geo/parcela/detalhe/4a5001d1-5df7-4333-b595-342e20831a71/
Fazenda Jutaituba - Lot 20 Sector E	5,524	3044.34	https://sigef.incra.gov.br/geo/parcela/detalhe/f2d19b33-8965-47a5-9728-feeb981265bc/
Fazenda Jutaituba - Lot 21 Sector E	620	2986.86	https://sigef.incra.gov.br/geo/parcela/detalhe/7a7464bb-ba5f-4639-b2a2-8b26465b67d1/
Fazenda Jutaituba - Lot 22 Sector E	5,526	2994.96	https://sigef.incra.gov.br/geo/parcela/detalhe/c488cb0d-7362-4c12-8e7f-730a67e405ed/
Fazenda Jutaituba - Lot 23 Sector E	956	2991.03	https://sigef.incra.gov.br/geo/parcela/detalhe/fd7ae3e2-da7f-4522-a087-7b63265ac337/

Currently, the registration of 09 lots (2E, 5E, 6E, 11E, 12E, 14E, 15E, 19E and 21E) of Oieras do Pará/PA are in the process of administrative adjustment. The lots were acquired while the Federal Constitution of 1969 was in force, which authorized the direct sale of public properties of up to 3,000 hectares. However, the issuance of definitive purchase certificates occurred only in 1989, when the Federal Constitution of 1988 was in force, which determined that the purchase of a public lot without legislative authorization should not exceed an area of 2,500 hectares (Art. 49, X VII

CRFB/8841). In this sense, Martins Agropecuária began the process of regularizing the 500 hectares surplus of each lot mentioned (totaling 4,500 hectares) through a process of exchange with other areas of the property, specifically lots 4E in its entirety and lot 8E partially. Thus, because they are in process, lots 4E, 8E and the surplus of 4500 hectares of the 09 lots mentioned were removed from the Jutaituba REDD+ Project Area.

In addition, Lots 24C, 26C, 27C and 33C are part of the Project Area, but undergo legal proceedings that are in the process of being resolved. Legal proceedings will be described in detail in Section 2.5.6.

2.5.2 Recognition of Property Rights (G5.1)

The Jutaituba REDD+ Project recognizes and respects all property rights, complying with significant statutory and regular requirements, as well as having the necessary approvals from local authorities. The Project recognizes and supports the rights to land, territories and resources, including the statutory and traditional rights of indigenous peoples, communities and other actors.

Project proponents act as mediators of potential conflicts, in addition to valuing a good relationship with neighboring communities. Accordingly, the following aspects are described in detail:

- Martins Agropecuária, under the terms of the Federal Constitution of Brazil and the Civil Code, is the owner of the rights of use and economic exploitation of the properties, as well as obtaining the right of access to the natural resources in them, by virtue of being the owner of the properties where the Jutaituba REDD+ Project will be carried out

2.5.3 Free, Prior and Informed Consent (G5.2)

Free, Prior and Informed Consent will be carried out throughout the life cycle of the Project, always with an approach of dialogue and consent between the parties involved. In addition, the Project does not aim to develop any activity on private properties of others, traditional and indigenous communities or the government. In relation to social and biodiversity activities, it is ensured that no activity will be carried out without the free, prior and informed consent of the parties involved.

No activity related to the Project will cause the relocation of activities that are important to the culture or livelihoods of the Owners of Property Rights, nor will it aim at the relocation or involuntary removal of their lands or territories. Any proposed need for removal or relocation is made only after obtaining the Free, Prior and Informed Consent of the appropriate Ownership Rights Holders.

In addition, all actors that could be impacted in some way by the Jutaituba REDD+ Project were consulted. In the communities surrounding the Project, workshops were held in order to pass on information regarding the Project, as well as consultations regarding the opinions of the communities regarding the Project as described in Section 2.3.6. These consultations will continue to be carried out throughout the life cycle of the Project. In addition, all information about the Jutaituba REDD+ Project can be acquired on the virtual channels, such as Biofílica's website and newsletter and social media.

[41] http://www.planalto.gov.br/ccivil_03/constituicao/constituicao.htm

2.5.4 Property Rights Protection (G5.3)

The implementation and development of the Jutaituba REDD+ Project shall not lead to the involuntary removal or relocation of any party, and activities important to the livelihoods of communities residing in the Project Zone shall be respected and supported by the Project. Thus, the Project proposes social activities that seek to promote sustainable practices, strengthen and improve existing economic activities, such as the exploitation of non-timber forest products. These initiatives seek to discourage the practice of illegal activities, but without disregarding the cultural and traditional aspects of the impacted communities.

Also, the land regularization of the area is supported by Martins Agropecuária and supported by the responsible public institutions. As previously mentioned, possible legal inconsistencies are resolved following all procedures established by the local jurisdiction.

2.5.5 Illegal Activity Identification (G5.4)

Deforestation is the main illegal activity that can negatively impact the development of the Jutaituba REDD+ Project, as well as the hunting and predatory exploitation of fauna and flora. It was identified as the main causes of this illegal deforestation, family farmers, medium and large landowners, sawmills, loggers and local charcoal factories. Between 2008 and 2020, approximately 262,174 hectares were deforested in the Reference Region, which corresponds to a 14% reduction in the existing forest in 2008. For the next 10 years, a loss of 269,828 hectares of native forest is expected in a scenario of absence from the project, of which 6,685 hectares are expected to be deforested in the Project Area.

The Project seeks to control and combat these illegal activities commonly found in the Project region through mitigating and preventive measures such as the strengthening of land and property inspection, in addition to encouraging the involvement of other actors and stakeholders, social inclusion and regional socioeconomic development through the generation of economic alternatives to deforestation and discouragement to hunting and predatory fishing.

With the implementation of these measures, it is expected to improve the well-being of communities without generating burdens for native forest and local biodiversity. Heritage surveillance aims to curb illegal practices of deforestation, extraction of plant species and hunting and capture of wild animals by third parties. The mechanisms and procedures for land inspection and mitigation and prevention of illegal activities are summarized in the Table 13.

Table 13 - Mechanisms and procedures for asset surveillance of the Project Area.

Strengthening the Asset Surveillance of the Project Area	
Purpose	Determine the conditions of inspection on the land owned by Martins Agropecuária and actions to mitigate or prevent illegal activities

General terms and conditions	- Carry out regular patrols in order to ensure the protection of the land assets of Martins Agropecuária; - Avoid deforestation, forest fires or other acts of aggression to the environment; - Prevent illegal logging and trade in timber; - Maintain a good relationship with communities and other stakeholders; - Perform the control of entry and exit of Fazenda Jutaituba; - Promote environmental education in communities that practice hunting and predatory fishing and encourage the practice of sustainable activities; - Request support from police and supervisory authorities, when necessary; Method of operation: - Displacement of a surveillance team to the place of occurrence to investigate the fact and the application of appropriate measures; - Activation of the legal sector for measures; - Record of occurrences involving invasion of property, damage to property and illegal extraction of forest products; - Occurrences involving aggression to the environment must be registered with the responsible agencies (IBAMA, Environmental Police, etc.); - In all situations involving land conflicts, it is necessary to avoid confrontation between the parties, respecting the laws in force in the country.
Specific conditions	<u>Monthly Surveillance Program</u> - When the occurrence of illegal activities is detected by surveillance, the team must take appropriate measures, as well as collect the geographical coordinates for internal registration; <u>Forest Fire Surveillance</u> - The patrols take into account the openings of plantations in the limits of the Farm that can cause risks of forest fire, and the person responsible must be warned of the risks and the necessary measures to be taken as a precaution. <u>Ecological Corridors</u> - The areas of ecological importance for the passage of fauna are monitored during the inspection.

Records	- Report of occurrences; - Photographic record of occurrences; - Monthly monitoring program; - Report on property security activities.
Surveillance Intelligence Strategies	- Monitoring through high resolution satellite images, allowing the generation of monthly and annual reports of altered areas; - Acquisition of support equipment for the patrol team; - Additional financial support for vehicle logistics and maintenance costs.

2.5.6 Ongoing Disputes (G5.5)

Among the 44 properties that make up the Project Area, the lots called 24C, 26C, 27C and 33C have areas that undergo legal proceedings that are in the process of being resolved. The lawsuits occurred due to the dispute for misappropriation and repossession and account for less than 5% of the Project Area. However, Martins Agropecuária guarantees all documentary means proving the possession and use of these areas, which allows these occasional conflicts to be resolved in a legal, transparent and secure manner. The legal opinion on the procedural situation was made available to the audit body.

Also, as mentioned in the Section 2.5.1, the areas that are in judicial proceedings that cannot yet be considered as resolved or resolved were disregarded in the composition of the Project Area.

2.5.7 National and Local Laws (G5.6)

Compliance with Laws, Statutes and other significant regulatory bodies for the Jutaituba REDD+ Project is related to forest management activity. In the State of Pará, the activities of the enterprise are being licensed by the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA), thus applying federal legislation. Subordinated to federal legislation, the legislation applies at the state level.

Regarding REDD+ activities, a history of initiatives in spite of the construction and negotiation of this concept can be noted through agreements and meetings in the United Nations Framework Convention on Climate Change (UNFCCC). In December 2015, the National Strategy for REDD+ of Brazil (ENREDD+) was established by MMA Ordinance No. 370, being a document that formalizes to Brazilian society and to the signatory countries of the UNFCCC how the Brazilian government has structured its efforts and intends to improve them by 2020, contributing to the mitigation of climate change through the control of deforestation and forest degradation, promotion of forest recovery and the promotion of sustainable development. In this context, in Brazil, Decree No. 10.144 (of 11/28/2019) established the National Commission for REDD+ (CONAREDD+) in order to coordinate, monitor, monitor and revise the National Strategy for REDD+ and guide the elaboration of the requirements for access to payments for results of REDD+ policies and actions

in the country. The following year, CONAREDD+ 's internal regulations were published, through an Ordinance (No. 544, of 10/26/2020).

At the same time, of a broadly relevant nature, so far, Bill No. 572/2020 is under analysis, which "Establishes the national system for reducing emissions from deforestation and degradation, conservation, sustainable forest management, maintenance and increase of forest carbon stocks (REDD+) and other measures". The text is being processed in the Chamber of Deputies.

As for the carbon market, there is a Bill (Bill No. 528 of 2021) underway in the Chamber of Deputies that aims to establish the Brazilian Emission Reduction Market (MBRE) and regulate the purchase and sale of carbon credits in the country arising from Emissions Reduction activities from Deforestation and Forest Degradation, for example. The promotion of this voluntary carbon market is provided for in the Law that instituted the National Climate Change Policy (Law No. 12.187, of 12/29/2009).

After years of discussion and stagnation of Bill No. 528 of 2021 in the National Congress, more recently, Decree No. 11.075 of 05/19/2022 was promulgated, which addresses the implementation of a regulated carbon credit market in Brazil through the creation of the National Greenhouse Gas Emission Reduction System (Sinare) and establishes procedures for the preparation of Sectoral Plans for Climate Change Mitigation. In addition to these measures, the document also brings unpublished concepts related to methane credit, record of the carbon footprint of processes and activities, native vegetation carbon, soil carbon and blue carbon.

Below, the main laws and regulations relevant to federal and state levels are listed and detailed. In addition, there was a brief analysis of international climate agreements that have been directing the creation and development of REDD+ initiatives around the world.

Federal Legislation

- Law No. 14.119, as of 01/13/2021: Institutes the National Policy on Payment for Environmental Services; and amends Laws No. 8.212, of July 24, 1991, 8.629, of February 25, 1993, and 6,015, of December 31, 1973, to adapt them to the new policy.

- Law No. 12.727, as of 12/17/2012: Provides for the protection of native vegetation; amends Laws No. 6.938, of August 31, 1981, 9.393, of December 19, 1996, and 11.428 of December 22, 2006; and repeals Laws No. 4.771, of September 15, 1965, and 7.754, of April 14, 1989, Provisional Measure No. 2.166-67, of August 24, 2001, item 22 of item II of art. 167 of Law No. 6.015, of December 31, 1973, and § 2 of art. 4 of Law No. 12.651, of May 25, 2012.

- Law No. 12.651, as of 05/25/2012: Provides for the protection of native vegetation; amends Laws No. 6.938, of August 31, 1981, 9,393, of December 19, 1996, and 11.428, of December 22, 2006; repeals Laws No. 4,771, of September 15, 1965, and 7.754, of April 14, 1989, and Provisional Measure No. 2.166-67, of August 24, 2001; and makes other provisions.

- Law No. 12.187, as of 12/29/2009: Establishes the National Policy on Climate Change – PNMC and other measures.

- Decree No. 11.075, as of 05/19/2022: Establishes the procedures for the preparation of Sectoral Plans for Climate Change Mitigation, establishes the National Greenhouse Gas Emission Reduction System and amends Decree No. 11.003, of March 21, 2022.

- Decree No. 10.144, as of 11/28/2019: Establishes the National Commission for the Reduction of Greenhouse Gas Emissions from Deforestation and Forest Degradation, Conservation of Forest Carbon Stocks, Sustainable Forest Management and Increase of Forest Carbon Stocks – REDD+.

- Decree No. 58.054, as of 03/23/1966: It promulgates the Convention for the protection of the flora, fauna and scenic beauties of the countries of America.

- Decree No. 2.661, as of 07/08/1998: Regulates the sole paragraph of art. 27 of Law No. 4.771, of September 15, 1965 (Forest Code), by establishing precautionary rules regarding the use of fire in agropastoral and forestry practices, and makes other provisions.

- Decree No. 5.975, as of 11/30/2006: Regulates art. 12, final part, 15, 16, 19, 20 and 21 of Law No. 4.771, of September 15, 1965, art. 4, item III, of Law No. 6.938, of August 31, 1981, art. 2 of Law No. 10.650, of April 16, 2003, amends and adds provisions to Decrees No. 6.514/08 and 3.420/00, and makes other provisions.

- CONAMA Resolution No. 16, as of 12/07/1989: Establishes the Integrated Program for Environmental Assessment and Control of the Legal Amazon.

- CONAMA Resolution No. 378, as of 10/19/2006: Defines the projects potentially causing national or regional environmental impact for the purposes of the provisions of item III, § 1, art. 19 of Law No. 4.771, of September 15, 1965, and other measures.

- CONAMA Resolution No. 379, as of 10/19/2006: Creates and regulates data and information system on forest management under the National Environmental System - SISNAMA.

- IBAMA Ordinance No. 218, as of 05/04/1989: Provides for the felling and exploitation of native forests and successor forest formations native to the Atlantic Forest, and makes other arrangements.

- IBAMA Ordinance No. 438, as of 08/09/1989: Amends the wording of Article 4 of Ordinance No. 218, of May 04, 1989.

- MMA Ordinance No. 103, as of 04/05/2006: Provides for the implementation of the Document of Forest Origin - DOF, and other measures.

- MMA Ordinance No. 253, as of 08/18/2006: Institutes, as of September 1, 2006, within the scope of the Brazilian Institute of Environment and Renewable Natural Resources - IBAMA, the Document of Forest Origin – DOF to replace the Authorization for Transportation of Forest Products - ATPF.

- Ordinance No. 1.896, of 12/09/2013: Amends Regulatory Standard No. 31.

- MMA Normative Instruction No. 1, as of 09/05/1996: Provides for the Mandatory Forest Replacement and the Integrated Forest Plan.

- MMA Normative Instruction No. 07, as of 04/27/1999: Provides for the authorization for deforestation in the States of the Legal Amazon.

- MMA Normative Instruction No. 02, as of 05/10/2001: Provides for the economic exploitation of forests, in rural properties located in the Legal Amazon, including the Legal Reserve areas and excepting those of permanent preservation established in the current legislation, which will be carried out through sustainable forest management practices of multiple use.

- MMA Normative Instruction No. 06, as of 12/15/2006: Provides for forest replacement and consumption of forest raw material, and other measures.

- IBAMA Normative Instruction No. 178, as of 06/23/2008: Defines the guidelines and procedures, by IBAMA, for the assessment and consent related to the issuance of authorizations for the suppression of forests and other forms of native vegetation in an area greater than two thousand hectares in rural properties located in the Legal Amazon and one thousand hectares in rural properties located in other regions of the country.

- Regulatory Standard No. 31, of 03/03/2005: Approves the Regulatory Standard for Occupational Safety and Health in Agriculture, Livestock, Forestry, Forest Exploration and Aquaculture.

State Legislation

- State Law No. 9.048, as of 05/04/2020: Establishes the State Policy on Climate Change of Pará (PEMC/PA), and other measures.

- State Law No. 7.389, as of 03/31/2010: Defines the activities of local environmental impact in the State of Pará and other measures.

- State Law No. 7.381, as of 03/16/2010: Provides for the restoration of vegetation cover, riparian forests of the State of Pará.

- State Law No. 6.745, as of 05/06/2005: Establishes the Ecological-Economic Macrozoning of the State of Pará and other measures.

- State Law No. 6.671, as of 07/27/2004: Amends art. 122 of State Law No. 5.887, of May 9, 1995.

- State Law No. 6.506 of 12/02/2002: Establishes the basic guidelines for the realization of the Ecological-Economic Zoning (EEZ) in the State of Pará and other measures.

- State Law No. 6.462, as of 07/04/2002: Provides for the State Forest Policy and other forms of vegetation.

- State Law No. 5.977, as of 07/10/1996: Provides for the protection of wildlife in the State of Pará.

- State Law No. 5.887, as of 05/09/1995: Provides for the State Environmental Policy and other measures.

- State Decree No. 941, as of 08/03/2020: Establishes the Amazônia Agora State Plan (PEAA), creates the Scientific Committee of the Plan and the Permanent Monitoring Center of the Plan and other measures.

- State Decree No. 254, as of 08/08/2019: Establishes the Paraense Forum for Climate Change and Adaptation (FPMAC).

- State Decree No. 518, as of 09/05/2012: Establishes the Paraense Forum of Climate Change and other measures.

- State Decree No. 216, as of 09/22/2011: Provides for the environmental licensing of agrosilvopastoral activities carried out in altered and/or underutilized areas outside the legal reserve area and permanent preservation area in rural properties in the State of Pará.

- State Decree No. 2.436, of 08/10/2010: Regulates actions related, directly or indirectly, to agrosilvopastoral activities, performed within areas of alternative land use, considered to be of low environmental impact.

- State Decree No. 2.099, as of 01/25/2010: Provides for the maintenance, recomposition, conduction of natural regeneration, compensation and composition of the Legal Reserve area of rural properties in the State of Pará and other measures.

- State Decree No. 1.697, as of 06/05/2009: Establishes the Plan for Prevention, Control and Alternatives to Deforestation of the State of Pará and other measures.

- State Decree No. 1.148, as of 07/17/2008: Provisions on the Rural Environmental Registry – CAR-PA, Legal Reserve area and other measures.

- State Decree No. 2.592, as of 11/27/2006: Establishes the Register of Explorers and Consumers of Forest Products of the State of Pará – CEPROF-PA and the System of Marketing and Transport of Forest Products of the State of Pará SISFLORA-PA and its operational documents and other measures.

- State Decree No. 2.141, of 06/31/2006: Regulates provisions of Law No. 6.462, of July 4, 2002, which provides for the State Forest Policy and other forms of vegetation.

- State Decree No. 2.141, as of 03/31/2006: Regulates provisions of State Law No. 6.462 of July 4, 2002, which provides for the State Policy on Forests and other Forms of Vegetation and other measures, aiming to encourage the recovery of altered and/or degraded areas and the recomposition of legal reserve, for energy, timber, fruit, industrial or other purposes, through forest and agroforestry repopulation with native and exotic species and other measures.

- State Decree No. 1.523, as of 07/25/1996: Approves the Regulation of the State Environment Fund - FEMA, created by Law No. 5.887, of May 9, 1995.

- Resolution No. 54, of 10/24/2007 (ANNEX 1): It approves the list of threatened flora and fauna species in the State of Pará.

International Agreements

- FCCC/CP/2005/Misc.1: Reducing emissions from deforestation developing countries: approaches to stimulate action. Submission from Parties. (Translation: Reducing deforestation emissions in developing countries: approach to stimulate action. Submission from parties. COP 11, Montreal, 2005.)

- FCCC/CP/2007/6/add.1: Report of the Conference of the Parties on its thirteenth session, held in Bali from December 3 to 15, 2007. Addendum. Part two: Action taken by the Conference of the Parties at its thirteenth session. (Translation: Report of the Conference of the Parties on its thirteenth session, held in Bali from December 3 to 5, 2007. Addendum. Part Two: Action taken by the Conference of the Parties at its thirteenth session or “Action Bali Plan”. COP 13, Bali, 2007.)

- FCCC/CP/2009/Add.1: Report of the Conference of the Parties on its fifteenth session, held in Copenhagen from December 7 to 19, 2009. Addendum. Part Two: Action taken by the Conference of the Parties at its fifteenth session. (Translation: Report of the Conference of the Parties on its fifteenth session, held in Copenhagen from December 7 to 19, 2009. Addendum. Part Two: Action taken by the Conference of the Parties at its fifteenth session or “Copenhagen Accord”. COP 15, Copenhagen, 2009.)

- FCCC/CP/2010/7/Add. 1: Report of the Conference of the Parties on its sixteenth session, held in Cancun from November 29 to December 10, 2010. Addendum. Part Two: Action taken by the Conference of the Parties at its sixth session. (Translation: Report of the Conference of the Parties

on its sixteenth session, held in Cancun from November 19 to December 10, 2010. Addendum. Part Two: Action taken by the Conference of the Parties at its sixteenth session or "Cancun Agreement". COP 16, Cancun, 2010.)

- FCCC/CP/2011/9/Add. 1: Report of the Conference of the Parties on its seventeenth session, held in Durban from November 28 to December 11, 2011. Addendum. Part Two: Action taken by the Conference of the Parties at its seventeenth session. (Translation: Report of the Conference of the Parties on its Seventeenth Session, held in Durban from November 28, to December 11, 2011. Addendum. Part Two: Action taken by the Conference of the Parties at its seventeenth session. COP 17, Durban, 2011.)

- FCCC/CP/2012/8/Add.1: Report of the Conference of the Parties on its eighteenth session, held in Doha from November 26 to December 8, 2012. Addendum. Part two: Action taken by the Conference of the Parties at its eighteenth session. (Translation: Conference of the Parties report on its eighteenth session, held in Doha from November 26 to December 8. Addendum. Part Two: Action taken by the Conference of the Parties at its eighteenth session.)

- FCCC/CP/2013/Add.1: Warsaw Framework for REDD-plus, held in Warsaw, Poland, from November 11 to 22, 2013 Warsaw Package for REDD+, which took place in Warsaw, Poland, from November 11 to 22, 2013), in particular the following decisions:

- Decision9/CP.19: Work program on results-based finance to progress the full implementation of the activities referred to in decision 1/CP. 16, paragraph 70. (Translation: Work program on results-based funding for the progress of the full implementation of the activities referred to in Decision 1/CP. 16, paragraph 70.)

- Decision10/CP.19: Coordination of support for the implementation of activities in relation to mitigation actions in the forest sector by developing countries, including institutional arrangements. (Translation: Coordination of support for the implementation of activities related to forest sector mitigation actions by developing countries, including institutional arrangements.)

- Decision12/CP.19: The timing and frequency of presentations of the summary of information on how all the safeguards referred to in decision1/CP.16, appendix I, are being addressed and respected. (Translation: The time and frequency at which summary information is presented on how all safeguards referred to in decision/CP.16 Appendix I are being addressed and respected.)

- Decision13/CP.19: Guidelines and procedures for the technical assessment of submissions from Parties on proposed forest reference emission levels and/or forest reference levels. (Translation: Guide and procedures for technical evaluation of Parties' submissions to proposals for forest emission reference levels and/or forest reference levels.)

- Decision14/CP.19: Modalities for measuring, reporting and verifying. (Translation: Modalities for measuring, reporting and checking.)

- Decision15/CP.19: Addressing the drivers of deforestation and forest degradation. (Approach to deforestation and forest degradation vectors.)

- FCCC/CP/2015/Add.1: Report of the Conference of the Parties on its twenty-first session, held in Paris from November 30 to December 13, 2015. Addendum. Part two: Action taken by the Conference of the Parties at its twenty-first session. (Translation: Conference of the Parties report on its twenty-first session, held in Paris from November 30 to December 13. Addendum. Part Two: Action taken by the Conference of the Parties at its twenty-first session).

- FCCC/CP/2015 Paris Agreement: Global, legally binding agreement that sets out a global framework to avoid dangerous climate change by limiting global warming to well below 2°C and pursuing efforts to limit it to 1.5°C. Entry into force on November 4, 2016.

- FCCC/CP/2016 Decisions adopted by the Conference of the Parties (COP): Especially decisions 1 (preparation into force of the Paris Agreement), 3 (Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts), 6 (National adaptation plans) and 7 (Long-term climate finance).

- FCCC/CP/2017, FCCC/CP/2018, FCCC/CP/2019 Decisions adopted by the COP: Especially decision 1 reporting on developments in the implementation of the Paris Agreement.

- Nationally Determined Contribution – Brazilian NDC forwarded in September 2015 to the United Nations Framework Convention on Climate Change for mitigation, adaptation and means of implementation, in a manner consistent with the purpose of the contributions to achieve the ultimate objective of the Convention, pursuant to decision 1/CP.20, paragraph 9.

- CITES, of 03/03/1973: "Convention on International Trade in Endangered Species of Wild Fauna and Flora", signed in Washington D.C. on March 03, 1973, amended in Bonn on June 22, 1979.

- Article 6 of the Paris Agreement (2021): Decision 1/CP.21 mandated the SBSTA to operationalize the provisions of this Article through recommending a set of decisions to the COP serving as the meeting of the Parties to the Paris Agreement at its first session. At COP26, the Parties to the Paris Agreement at its third session (CMA 3) adopted three main decisions related to Article 6: decision 2 (on Article 6.2), decision 3 (on Article 6.4) and decision 4 (on Article 6.8).

- Glasgow Leaders' Declaration on Forests and Land Use (2021): Signatories (including Brazil) promise to reverse and end deforestation by 2030.

- Brazilian Nationally Determined Contribution (NDC): First Brazilian NDC submitted in September 2015 to the UN Framework Convention on Climate Change for mitigation, adaptation and means of implementation, in a manner consistent with the purpose of contributions to achieve the ultimate objective of the Convention, pursuant to Decision 1/CP.20, paragraph 9. The updated Brazilian NDC was presented at the COP26 on December 8th, 2022.

2.5.8 Approvals (G5.7)

Project proponents have achieved recognition and approval on the implementation of the REDD+ Jutaituba Project with stakeholders through face-to-face meetings, lectures and meetings with the communities, partners, proponents and authorities mentioned in Section 2.3.

The event to present the project and publicly consult the communities on the Action Plan was held between June 06, 2022, and June 11, 2022, and took place through a broad community involvement, facilitated by an efficient dissemination via folders. In this feedback, the participants were able to understand and collaborate with the design and development of the project as described in Section 2.3.6.

In addition to these meetings and participation meetings of the community members and other stakeholders described above, the project will go through the public consultation event on the Verra registration platform for comments, suggestions and clarification of doubts about the Jutaituba REDD+ Project, which should take place from July 25, 2022, to August 19, 2022. The importance

of the engagement and collaboration of these stakeholders in this process was reinforced by sending formal invitations to those directly and indirectly involved in the forest conservation sector; such as community associations, non-governmental organizations (NGOs), educational institutions and private companies. This invitation was made via mailing, with project information and invitation to participate in the public consultation.

In addition, official letters were sent to the relevant local institutions in the state of Pará; including the State Public Prosecutor's Office and other governmental and federal agencies, containing information about the public consultation, the context of the project and the communication channels used.

The participation of surrounding community members and farm workers in the public consultation was also stimulated by sending an invitation to participate via Whatsapp, a vehicle of interaction most used by these stakeholders, from the attendance list obtained in the return process.

It is worth mentioning that despite the advances of the National Strategy for REDD+ of Brazil (ENREDD+), the processing of Bill No. 572/2020 and the resumption of the Paraense Forum on Climate Change and Adaptation (FPMAC), demonstrated in section 2.5.6 - National and Local Laws, there are still no policies at the official national or jurisdictional level of REDD+. However, the proponents of the Project are always attentive to new information, always present in discussion forums of federal and state governments in order to contribute to the formulation of these policies and regulations, being readily available to adapt the Project to the new officially established rules.

2.5.9 Project Ownership (G5.8)

Martins Agropecuária is the legitimate owner of the properties where the Jutaituba REDD+ Project is being implemented and developed, as detailed in Section 2.5.1. For the establishment of responsibility and rights over the Project, as well as the percentage of carbon credits allocated to each party, a contract was signed between the Project proponents.

2.5.10 Management of Double Counting Risk (G5.9)

The Jutaituba REDD+ Project generates benefits for climate, communities and biodiversity, but only net greenhouse gas reductions and removals will be marketed after being properly recorded on a market platform.

2.5.11 Emissions Trading Programs and Other Binding Limits

Not applicable.

2.5.12 Other Forms of Environmental Credit

The Jutaituba REDD+ Project does not intend to generate any other form of environmental credits related to the reductions and removals of GHG emissions claimed within the VCS (Verified Carbon Standard) program.

2.5.13 Participation under Other GHG Programs

The Jutaituba REDD+ Project did not receive or seek to be registered in any other GHG program, in addition to submitting the Project for validation and verification in the VCS (Verified Carbon Standard) and CCBS (Climate, Community and Biodiversity Standard) standards.

2.5.14 Projects Rejected by Other GHG Programs

The Jutaituba REDD+ Project has not been submitted to the validation/verification of any other GHG program and is therefore not rejected by any other GHG program.

2.5.15 Double Counting (G5.9)

The Government of the State of Pará brings the issue of REDD+ to debate from the beginning of the discussions on the subject in the context of international climate conferences. In 2009, the Paraense Forum for Climate Change and Adaptation (FPMCA) was created, and in 2019 it was reactivated through a Decree of Law signed by the governor of the state of Pará[42]. The FPMCA, among its objectives, guides and subsidizes the elaboration and implementation of the State Climate Change Policy Law of Pará (PEMC/PA). One year after the reactivation of the FPMCA, the Law establishing the PEMC/PA was published.[43] This law provides for the planning and execution of plans, actions and programs related to climate change, through policies, actions, research and technical studies aimed at environmental service actions and Reduction of Emissions from Deforestation and Forest Degradation (REDD+)[44].

Regarding REDD+, the FPMCA proposed the creation of a State REDD+ Strategy, aiming to organize and prioritize actions in the areas of deforestation and forest degradation, conservation and forest management. In this sense, in December 2021, the FPMCA approved the creation of the Technical Chamber of Bioeconomy, to compose the State Council of Climate Change; which among several strategies, includes the regulation of the jurisdictional system of REDD+ in Pará, training on REDD+ and carbon market and actions for eligibility in carbon certification[45].

In this context, in February 2022, the 1st Seminar on Payments for Environmental Services (PSA) and Reduction of Emissions from Deforestation and Degradation (REDD+) was held in Pará, promoted by the Secretariat of Environment and Sustainability (Semas) and the Amazon Environmental Research Institute (Ipam). The central objective of this event was to discuss the jurisdictional system REDD+ of Pará, taking into account the challenges and possible solutions in the themes of REDD+, payments for Environmental Services (PSA) and carbon market in the state of Pará[46].

However, despite the initiatives, to date, the State of Pará does not have a State REDD+ Strategy defined.

Thus, it is the understanding of the proponents that there is no risk of double counting, since the Government of Pará does not have a structured legal program or any type of state regulation for Climate Change and REDD+ and does not carry out market operations, voluntary or unregulated.

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[42] FEDERATIVE REPUBLIC OF BRAZIL. Official Gazette No. 33948, of August 9, 2019. Belém-PA. Available at: http://www.ioepa.com.br/pages/2019/2019.08.09.DOE.pdf

[43] GOVERNMENT OF THE STATE OF PARÁ. Lei nº 9048, de 29 de abril de 2020. Available at: https://www.semas.pa.gov.br/legislacao/files/pdf/4093.pdf

[44] PARÁ AGENCY. **Pará Forum on Climate Change and Adaptation discusses advances with society**. Available at: https://agenciapara.com.br/noticia/24012/.

[45] SMAS - SECRETARIAT FOR THE ENVIRONMENT AND SUSTAINABILITY OF THE STATE OF PARÁ. **State climate change forum creates Technical Chamber of Bioeconomy**. Available at: https://www.semas.pa.gov.br/2021/12/17/forum-estadual-de-mudancas-climaticas-cria-camara-tecnica-de-bioeconomia/.

[46] PARÁ AGENCY. **Semas and Ipam discuss in seminar REDD+ jurisdictional system and carbon market**. Available at: https://agenciapara.com.br/noticia/35041/..

3 CLIMATE

3.1 Application of Methodology

3.1.1 Title and Reference of Methodology

Verified Carbon Standard (VCS) Approved Methodology VM0015 – Methodology for Avoided Unplanned Deforestation, version 1.1.

3.1.2 Applicability of Methodology

For the Jutaituba REDD+ Project, the methodology approved by the VCS, code VM0015, was used, and is applicable according to the applicability criteria specified in Table 14 - Criteria for the applicability of the methodology for the Jutaituba REDD+ Project

Table 14 - Criteria for the applicability of the methodology for the Jutaituba REDD+ Project

Applicability Criteria	Description of how the project meets these criteria
(a) baseline activities may include planned or unplanned logging, firewood gathering, charcoal production, agricultural and grazing activities, provided the category is unplanned deforestation, according to the latest version of the VCS AFOLU Requirements.	Baseline project activities include unplanned deforestation as a result of agricultural and livestock activities, according to the recent version of the VCS AFOLU Requirements document.
(b) Project activities may be included in a category, or a combination thereof defined in the description of the scope of the methodology.	Project activities include the protection of the forest with wood extraction, in accordance with the description of the scope "D" of the methodology used (page 12, Table 1 and Figure 2-D in VCS document VM0015).
(c) The Project area may include different types of forests, including but not limited to primary forests, degraded forests, secondary forests, planted forests and agroforestry systems, complying with the definition of “forest”.	The project area has different types of forests, mainly mature forests that fall under the national definition of “forest”.
(d) At the commencement of the Project, the Project area shall include only areas qualified as “forest” for a minimum of 10 years prior to the commencement date of the Project.	The project area includes only areas classified as “forest” for a minimum period of 10 years prior to the project start date.
(e) The Project area may include floodplain areas (such as lowland forests, floodplain forests, mangroves) as long as they do not develop into peat. Peat should be defined as organic soils with at least 65% organic matter and a minimum thickness of 50 cm. If the	The forest types found in the project area do not include wet forests in wetlands or in common peatswamp forests.

Applicability Criteria	Description of how the project meets these criteria
Project area includes floodplain forests that develop in peat (e.g., peat forests), this methodology is not applicable.	

3.1.3 Project Boundary

VM0015 Step 1 -Definition of boundaries

VM0015 Step 1.1 – Spatial Boundaries

Reference Region

According to the VCS VM0015 methodology, the reference region is the spatial boundary that contains the project area, the leakage belt, leakage management areas and other relevant geographical areas to determine the project baseline (Figure 7). The main criteria used to define the spatial limits of the reference region, and thus demonstrate the compatibility conditions in the probability of future deforestation, were:

a) Probable area of action and influence of deforestation agents and drivers;

b) Landscape configurations and ecological conditions;

c) Socioeconomic and cultural conditions

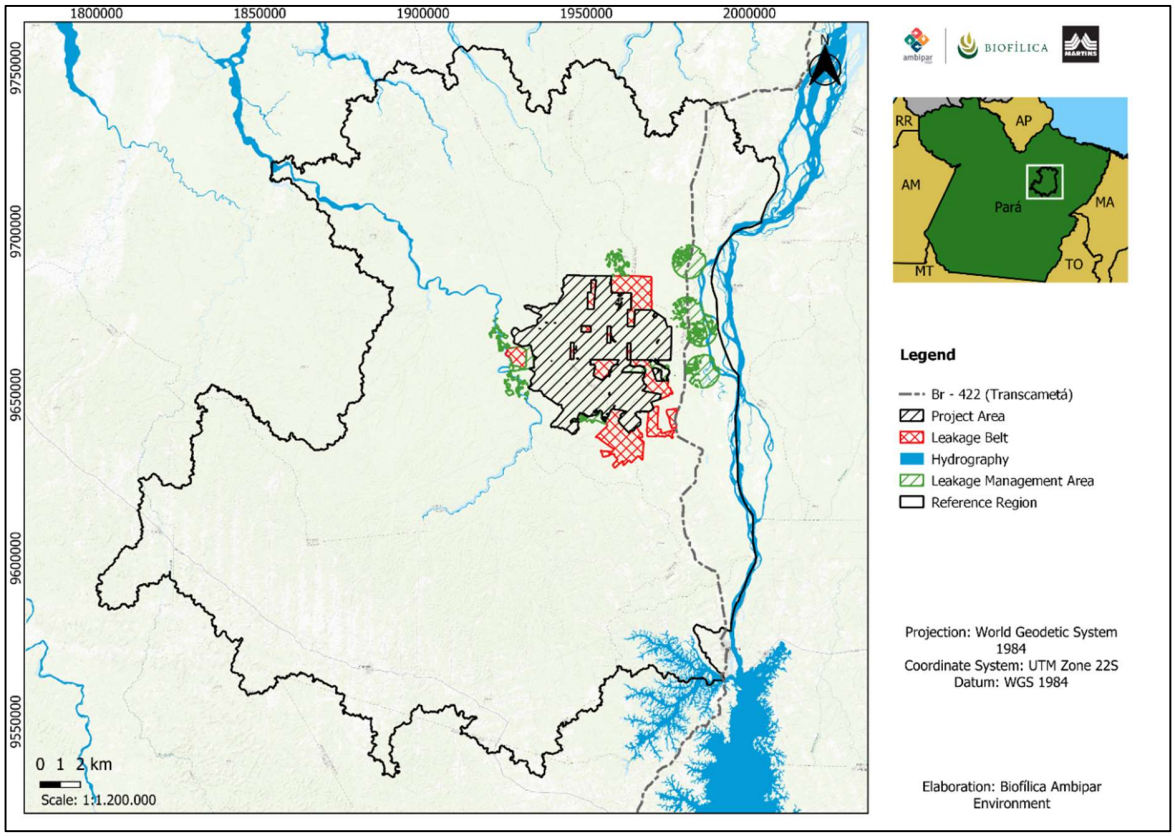


Figure 7 - Limits of the Reference Region, Project Area, Leakage Belt and Leakage Management of the Jutaituba REDD+ Project

Thus, the proposed reference region corresponds to an area of 2,581,612 hectares, equivalent to 19.9 times the Project Area. To determine the reference region, a set of sub-basins located in[47] the interfluvial region of the Tocantins (eastern boundary) and Anapú (western boundary) rivers was considered, near the BR-230 (southern boundary) and BR-422 (eastern boundary) highways. The sub-basins that determine the northern limit of the reference region were selected due to the proximity of the PA-156 highway and the drainage area of the upper course of the Jacundá river. Thus, the hydrographic context, proximity to federal highways and unofficial roads (extensions), together with the land situation of the areas surrounding the Fazenda Jutaituba (private properties) were the main elements used to determine the geographical limit of the Reference Region. It is also noteworthy that in this region we observe the dynamics of deforestation typical of the deforestation arc in the Brazilian Amazon: areas with forest exploitation, forest degradation with removal of commercially valuable wood, followed by deforestation for land tenure and creation of pasture with low productivity[48]. The Reference region has only one stratum to analyze the performance of deforestation agents and drivers and changes in land use and land cover.

In addition to the context described above, the following criteria established by VM0015 (pages 18 and 19 of the methodology) were analyzed, listed below:

a) **Infrastructure drivers**: no infrastructure such as highways and hydroelectric power plants are expected to be deployed near the project area.

b) **Landscape configuration and ecological conditions:** 100% of the Project Area has the same classes of vegetation found throughout the reference region (described in Section 2.1.5) 100% of the project area is within the elevation range of the reference region; 100% of the slope of the Project area is within the slope variation of the Reference Region; the project area has average annual precipitation within the same precipitation range of the reference region. The values obtained in the analysis of these criteria are presented in Table 13 and the spatial data used are shared with the audit team.

Table 15 - Spatial attributes of landscape configuration and ecological conditions in the Reference Region and Project Area

Landscape Element	Source	Reference Region	Project Area
Dense Ombrophilous Lowland Forest Emerging Canopy	IBGE	Yes	Yes
Elevation (m)	SRTM	0 - 271	0 - 90
Slope (degrees)	SRTM	0 - 89	0 - 86
Average annual rainfall (mm)	CHIRPS V.2	2110 - 3009	2531 - 2730

[47]Amazon GIS-Based River Basin Framework database. Available at https://doi.org/10.5194/essd-8-651-2016
[48]NATIONAL INSTITUTE FOR SPACE RESEARCH – INPE. Methodology Used in PRODES and DETER Projects (Revised in 2019). Available at: http://www.obt.inpe.br/OBT/assuntos/programas/amazonia/prodes/pdfs/Metodologia_Prodes_Deter_revisada.pdf. Accessed on August 14, 2021

c) **Socioeconomic and cultural conditions**: the legal status of the Project Area land in the baseline scenario can be observed in several locations in the reference region. The land situation of the Project area (private property) occurs in 91% of the reference region. The current and projected land use and land cover types classes in the Project Area are the same over the entire reference region. They are: a) Forest and b) Anthropized Vegetation in Balance. The Project Area is governed by the same laws and regulations applied throughout the Reference Region.

- **Project Area**

The Jutaituba REDD+ Project has an area of 129.417 hectares and its delimitation is presented in Figure 7. The limits of the project area were defined considering the existing forest area inside the Fazenda Jutaituba owned by Martins Agropecuária S.A. The description of ownership, property rights, and land documents were dealt with in Section 2.1.5.

The forest cover estimate for Fazenda Jutaituba, in the year of the beginning of the REDD+ project, was based on PRODES/INPE data. Areas planned for the implementation of the Project infrastructure should be excluded and the estimates presented in the certification process.

- **Leakage Belt**

The Jutaituba REDD+ Project is not located within a jurisdictional project, thus the VM0015 methodology recommends that defined an area called Leakage Belt. The Leakage Belt is the area surrounding or adjacent to the Project Area in which baseline activities could be displaced due the project activities.

The multi-criteria approach applied to delimit the leakage belt used as a basis the deforestation projection map and private property maps (Farms) located near the project area.

The following criteria that facilitate and restrict the accessibility of deforestation agents have been applied:

a) areas at higher risk of deforestation have greater accessibility of deforestation agents (higher risk areas indicate greater accessibility of the deforestation agent).

b) Rural properties with controlled access and that have environmental characteristics similar to those observed in the project area (these properties have a certain level of access control to the interior of the forest, thus greater restriction of the deforestation agent).

The selection of farms in this initial analysis took into account the following cartographic bases:

- Limits of rural lots of Martins Agropecuária
- Limits of rural properties georeferenced by INCRA (Sigef Brasil)
- Jutaituba REDD+ Project Area 2022

- **Leakage Management Areas**

The Leakage Management areas are non-forest areas where the project intends to develop activities to reduce the risk of deforestation in the Project Area and in the Leakage Belt (Figure 7). The choice of these areas was made according to the following criteria:

a) Areas already deforested and non-forest outside the project area and outside the leakage belt up to 5km from all communities within a radius of up to 10km from the farm and up to 10km from the transcametá highway (BR-422);

b) Non-forest areas outside the project area and outside the leakage belt up to 5km from the Igarapezinho community, to include a conglomerate of communities northwest of the Project Area.

These criteria were adopted because the surrounding communities were identified by the socioeconomic diagnosis as one of the drivers of deforestation. The total area of the Leakage Management Areas is 29,461 ha.

- **Forest**

The Forest area was identified based on the results of the Project for Monitoring Deforestation in the Legal Amazon by Satellite (PRODES) of the National Institute for Space Research (INPE). The forest area identified by PRODES in the Reference Region was 1,566,045 ha in 2021 (beginning of the project). The definition of forest adopted by PRODES is in accordance with the definition of forest in Appendix I of VM0015 v1.1 (pg 124). The Figure 8 shows the areas covered by forests in the Reference Region in 2021.

- **Temporal Boundaries**

a) Start and end date of the Historical Reference Period: 2008 and 2020. These dates were defined mainly considering the availability of PRODES data, used to generate land cover maps and meet the requirements of the VM0015 methodology.

b) Start and end date of the first fixed period of the baseline: the fixed period of the baseline is 6 years as updated in version 4.2 of the VCS Standard. In the approved methodology VM0015 version 1.1 the baseline period is also 10 years, the Project proponents understand that it will be updated according to the new limit defined by the VCS Standard document version 4.2.

c) Monitoring Period: The monitoring period of land use change and land use will start from the Project start date, contemplating the requirement to be at least 1 year

Start date of project activities and accreditation period are described in Sections 2.1.14 and 2.1.15.

Step 1.3 of VM0015 – Carbon Pools

The carbon pools analyzed in the Jutaituba REDD+ project are shown in Table 1614. For the Jutaituba REDD+ Project, the methodology approved by the VCS, code VM0015, was used, and is applicable according to the applicability criteria specified in Table 14 - Criteria for the applicability of the methodology for the Jutaituba REDD+ Project

Table 14. Methodological details of the estimation of the carbon pools considered can be found in the document Forest Carbon Stock Estimate in the project area, made available to the validator/verifier body.

Sources of GHG, Sinks and pools in the Baseline Scenario

Table 16 - Carbon pools considered in the Jutaituba REDD+ Project (Table 3 of the VM0015 methodology, page 27).

Carbon Pools	Included/Excluded	Justification/Explanation
Above ground	Arboreal: Included	Changes in the carbon stock of this pool is always significant
	Non-arboreal: Excluded	Palm trees and vines were excluded from sampling as they are not significant components of the carbon stock (allowed by the VM0015 methodology)
Below ground	Included	Significant pool for the forest typology of the Project Area, representing 17.7% of the total carbon stock (>10%)
Dead wood	Included	Significant pool for the forest typology of the Project Area, representing 17.5% of the total carbon stock (>10%)
Wood Products	Excluded	Omitted due to conservatism, pool present only in the scenario with Project
Litter	Excluded	Excluded according to "VCS AFOLU *requirements*, v3.2"
Soil Organic Carbon	Excluded	Excluded when ground cover is pasture in baseline scenario, according to "VCS AFOLU *Requirements*, v3.2"

Table 17 - GHG sources included or excluded within the limits of the Jutaituba REDD+ Project Area (Table 4 of methodology VM0015, page 28).

Sources		Gas	Included/Excluded	Justification/Explanation
Baseline	Biomass burning	CO_2	Excluded	Counted as changes in carbon stocks
		CH_4	Excluded	Not significant
		N_2O	Excluded	Considered insignificant according to "VCS AFOLU *requirements*, v3.2"
	Livestock emissions	CO_2	Excluded	Not a significant source
		CH_4	Excluded	Does not apply to the Project. The Project does not have livestock activities, so it is conservative to exclude these emissions since they are present in the baseline scenario
		N_2O	Excluded	Does not apply to the Project. The Project does not have livestock activities, so it is conservative to exclude these emissions

Sources		Gas	Included/Excluded	Justification/Explanation
				since they are present in the baseline scenario

3.1.4 Baseline Scenario

Step 2 of VM0015 – Analysis of historical land-use and land-cover changes

- **Collection of appropriate data sources**

For the mapping of land use and land cover classes, data from the PRODES program, provided by the National Institute for Space Research, were used (PRODES 2005). The PRODES program uses images from the Landsat satellite series and others to map annual clear-cut deforestation and monitor forest remnants. PRODES data in raster format provided by the Terra Brasilis system[49] were analyzed in the following thematic classes: forest, non-forest vegetation, hydrography and anthropized vegetation (deforestation). The images cover the period from 2009 to 2020 and correspond to orbits/points 224-62; 225-62; 224-63; 225-63 (Table 186). The maps produced by PRODES have a methodology and estimate of the accuracy of class mapping recognized by the national[50] and international scientific community[51].

Table 18 - Data used for historical LU/LC change analysis (Table 5 of VM0015).

Vector (Satellite or airplane)	Sensor	Resolution		Coverage	Acquisition date	Scene identifier	
		Spatial (m)	Spectral	(km^2)	(DD/MM/YY)	Path/ Latitude	Row/ Longitude
Landsat	TM	30	0.45 – 2.35 µm	34.225	21/08/2008	224	62
Landsat	TM	30	0.45 – 2.35 µm	34.225	09/09/2009	224	62
Landsat	TM	30	0.45 – 2.35 µm	34.225	26/07/2010	224	62
Landsat	TM	30	0.45 – 2.35 µm	34.225	29/07/2011	224	62
UK-DMC2	SLIM6	22	0.52 – 9.00 µm	6.400	03/08/2012	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34.225	18/07/2013	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34.225	22/08/2014	224	62

[49]Terra Brasilis – National Institute for Space Research (INPE). Available at: http://terrabrasilis.dpi.inpe.br/download/dataset/legal-amz-prodes/raster/PDigital2000_2021_AMZ_raster_v20211118.zip

[50]MAURANO, L.E.P.; ESCADA, M.I.S.; RENNO, C.D. Spatial patterns of deforestation and the estimation of the accuracy of PRODES maps for the Brazilian Legal Amazon. Ciência Florestal, Santa Maria, v. 29, no. 4, pp. 1763-1775

[51]KINTISCH, Eli. Improved monitoring of rainforests helps pierce haze of deforestation. Science (2007)

Vector (Satellite or airplane)	Sensor	Resolution		Coverage	Acquisition date	Scene identifier	
		Spatial (m)	Spectral	(km^2)	(DD/MM/YY)	Path/ Latitude	Row/ Longitude
Landsat	OLI	30	0.45 – 2.35 µm	34.225	15/07/2015	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34.225	10/09/2015	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34.225	29/11/2015	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34.225	26/07/2016	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34.225	27/08/2016	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34.225	29/07/2017	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34.225	16/07/2018	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34.225	01/08/2018	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34.225	22/08/2018	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34.225	20/08/2019	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34.225	06/08/2020	224	62
Landsat	TM	30	0.45 – 2.35 µm	34.225	29/08/2008	225	62
Landsat	TM	30	0.45 – 2.35 µm	34.225	30/09/2009	225	62
Landsat	TM	30	0.45 – 2.35 µm	34.225	21/10/2010	225	62
Landsat	TM	30	0.45 – 2.35 µm	34.225	04/07/2011	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34.225	11/09/2013	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34.225	28/07/2014	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34.225	23/08/2015	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34.225	01/09/2015	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34.225	10/09/2015	225	62

Vector (Satellite or airplane)	Sensor	Resolution		Coverage	Acquisition date	Scene identifier	
		Spatial (m)	Spectral	(km^2)	(DD/MM/YY)	Path/ Latitude	Row/ Longitude
Landsat	OLI	30	0.45 – 2.35 µm	34.225	24/02/2016	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34.225	17/07/2016	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34.225	20/07/2017	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34.225	22/08/2018	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34.225	24/08/2018	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34.225	11/08/2019	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34.225	06/08/2020	225	62
Landsat	TM	30	0.45 – 2.35 µm	34.225	13/08/2008	225	63
Landsat	OLI	30	0.45 – 2.35 µm	34.225	17/07/2016	225	63
Landsat	OLI	30	0.45 – 2.35 µm	34.225	20/07/2017	225	63
Landsat	OLI	30	0.45 – 2.35 µm	34.225	23/07/2018	225	63
Landsat	OLI	30	0.45 – 2.35 µm	34.225	11/08/2019	225	63
Landsat	OLI	30	0.45 – 2.35 µm	34.225	28/07/2020	225	63
Landsat	TM	30	0.45 – 2.35 µm	34.225	21/08/2008	224	63
Landsat	TM	30	0.45 – 2.35 µm	34.225	08/08/2009	224	63
Landsat	TM	30	0.45 – 2.35 µm	34.225	26/07/2010	224	63
Landsat	TM	30	0.45 – 2.35 µm	34.225	29/07/2011	224	63
Landsat	OLI	30	0.45 – 2.35 µm	34.225	03/08/2013	224	63
Landsat	OLI	30	0.45 – 2.35 µm	34.225	05/07/2014	224	63
Landsat	OLI	30	0.45 – 2.35 µm	34.225	15/07/2015	224	63

Vector (Satellite or airplane)	Sensor	Resolution		Coverage	Acquisition date	Scene identifier	
		Spatial (m)	Spectral	(km^2)	(DD/MM/YY)	Path/ Latitude	Row/ Longitude
Landsat	OLI	30	0.45 – 2.35 µm	34.225	10/09/2015	224	63
Landsat	OLI	30	0.45 – 2.35 µm	34.225	26/09/2015	224	63
Landsat	OLI	30	0.45 – 2.35 µm	34.225	21/04/2016	224	63
Landsat	OLI	30	0.45 – 2.35 µm	34.225	26/07/2016	224	63
Landsat	OLI	30	0.45 – 2.35 µm	34.225	16/07/2018	224	63
Landsat	OLI	30	0.45 – 2.35 µm	34.225	01/08/2018	224	63
Landsat	OLI	30	0.45 – 2.35 µm	34.225	20/08/2019	224	63
Landsat	OLI	30	0.45 – 2.35 µm	34.225	06/08/2020	224	63
Planet	Multiespectral	3,7	0,45 - 0,86 µm	Mosaico de imagens de julho-outubro de 2020			

- **Definition of classes of land use and land cover**

The land cover classes present in the Reference Region on the project start date are: Forest; Non-Forest Vegetation; Hydrography and Anthropized Vegetation in Balance (Table 197). The description of each class and its existing area before the beginning of the project (2020) is presented below:

• Forest (ND[52] = 1 with 1,566,045 ha): area of forest remnant belonging to different phytophysiognomies of the Ombrophilous Forest.

• Hydrography (ND = 2 with 30,036 ha): water bodies (rivers, lakes, streams, among others).

• Non-forest vegetation (ND = 3 with 56,546 ha): areas consisting of natural vegetation with a different physiognomy from forest, regionally known as Campinarana, Savana or Cerrado.

• Anthropized Vegetation in Balance (ND = 4 with 928,985 ha): areas of deforested forests converted to other land uses (mosaic of different types of vegetation that includes pastures, gardens, plantations and secondary vegetation).

Table 19 - Classes of land use and land cover existing in the Reference Region (table 6 of VM0015).

[52]ND = digital number of the raster file "lulc2020.tiff" in the folder "...\VM0015\lulc".

Class Identification		Trend in Carbon Stock	Present in[1]	Baseline Activity[2]			Description
ID_{cl}	Name			LG	FW	CP	
1	Anthropized Vegetation, Equilibrium	Constant	RR, LM.	No	No	No	Forest areas deforested by shallow cutting and with a different type of vegetation from the Ombrophilous Forest.
2	Forest	Descending	RR, PA, LK.	Yes	Yes	Yes	Remaining forest.
3	Hydrography	-	RR	No	No	No	Bodies of water.
4	Non-Forest Vegetation	Constant	RR	No	No	No	Natural vegetation cover with non-forest phytophysiognomy.

1 - RR: Reference Region; PA: Project Area; LK: Leakage Belt; LM: Leakage Management Areas.

2 - LG: Logging. FW = Fuel-wood collection; CP = Charcoal Production (yes/no).

- **Definition of classes of land use and land cover change**

In the spatial modeling of future deforestation, the changes from areas with Forest (Class I1) to areas with Anthropic Vegetation in Balance (Class F1) within the Project Area and in the Leakage Belt (Table 208) were considered.

Table 20 - Definition of land use and land cover change categories (Table 7.b of VM0015).

IDcl	Name	Trend in carbon stock	Present in	Activity in the case of baseline			Name	Trend in carbon stock	Present in	Activity in case of project		
				LG	FW	CP				LG	FW	CP
I1/F1	Forest	Descending	PA	Yes	Yes	Yes	Vegetation anthropized in balance.	Constant	RR. LM	No	No	No
I1/F1	Forest	Descending	LK	Yes	Yes	Yes	Vegetation anthropized in balance.	Constant	RR. LM	No	No	No

1 - RR: Reference Region; PA: Project Area; LK: Leakage Belt; LM: Leakage Management Areas.

2 - LG: Logging. FW = Fuel-wood collection; CP = Charcoal Production (yes/no).

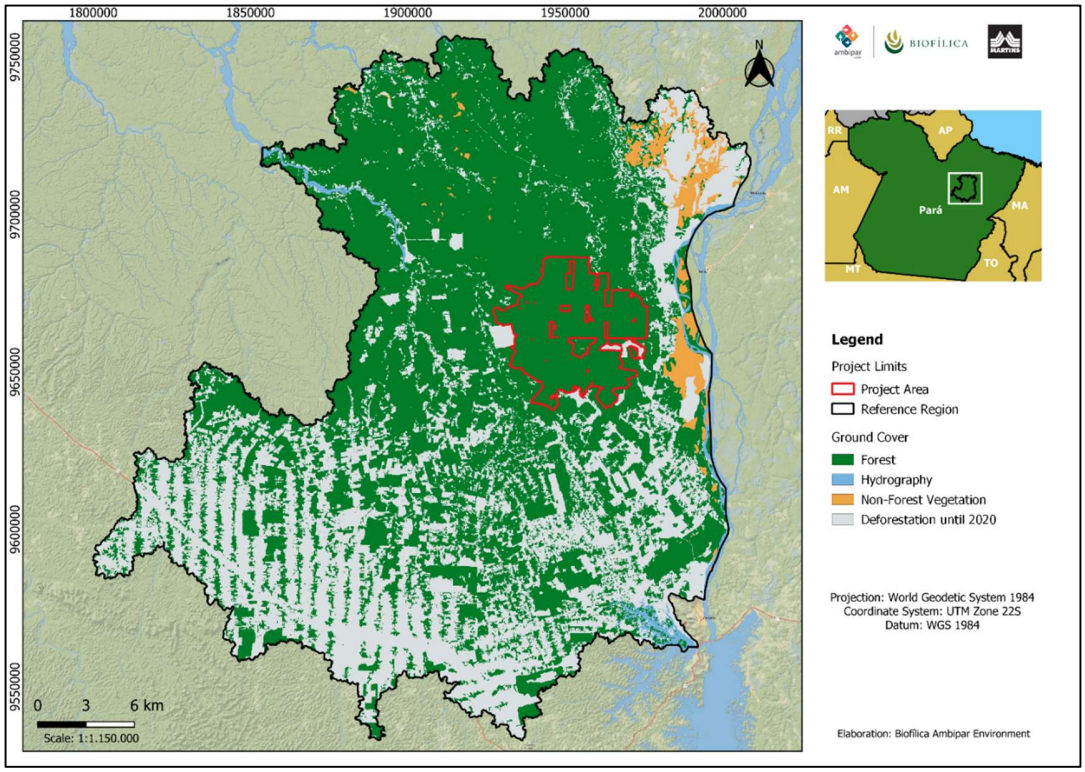


Figure 8 - Spatial distribution of deforestation in the reference region. The project area is highlighted by the red colored polygon.

- **Analysis of the historical land use and land cover change**

Data provided by PRODES were used to analyze the history of land use changes. The main activities carried out by PRODES to map deforestation in the Brazilian Amazon are detailed below:

a) **Preprocessing**: the main image preprocessing procedures performed by PRODES (Câmara, Valeriano, and Soares 2006) consist of the image selection stages with the lowest cloud coverage, with the acquisition date closest to the dry season in the Amazon and with adequate radiometric quality; georeferencing of the images with spatial resolution of 30 meters with topographic maps in the 1:100,000 scale and images in the MrSID format orthorectified by NASA. The present baseline study evaluated the geometric quality of the images and the results showed RMS lower than 01 pixel.

b) **Interpretation and Classification**: the satellite image classification method used by PRODES follows four steps: i) a spectral mixing model is generated by identifying the vegetation, soil and shadow components in the images. This technique is known as linear spectral mixing model (MLME), which aims to estimate the percentage of vegetation, soil and shadow components for each cell (pixel) of the image; ii) application of the segmentation technique, which identifies spatially adjacent regions (segments) with similar spectral characteristics in the satellite image; iii) automatic classification of segments individually to identify forest classes, non-forest vegetation, hydrography and deforestation (anthropized vegetation); iv) visual interpretation process directly on the computer screen using the TerraAmazon geographic information system.

c) **Mapping Accuracy Assessment**: the evaluation of the mapping available by PRODES was carried out by comparing each class of the most recent land use and coverage map (2021) with a set of points randomly distributed over the reference region. The reference data used in this stage come from the visual interpretation of a mosaic of high spatial resolution images Planetscope (July-October 2020). Using the land use and land cover reference points and map of 2021, it was possible to evaluate the mapping performance by analyzing the error matrix (Table 21). The overall accuracy of PRODES mapping in the Reference Region was 90%, with user and producer accuracy equal to 83% and 98% for forest and 100% and 90% for deforestation, respectively. The results are in accordance with the published global accuracy of PRODES maps for the Brazilian Legal Amazon, of 93%[53].

Table 21 - PRODES 2020 data evaluation error matrix.

		Reference				Total	User accuracy	Commission Error
		Forest	Deforestation	Water	Non-Forest			
Classified	Florest	39	3	0	5	47	83%	17%
	Deforestation	0	27	0	0	27	100%	0%
	Water	0	0	10	0	10	100%	0%
	Non-Forest	1	0	0	15	16	94%	6%
Total		40	30	10	20	100		
Producer accuracy		98%	90%	100%	75%			
Omission Error		3%	10%	0%	25%			
Map Accuracy								91%

- **Results in change history analysis in land use and land cover**

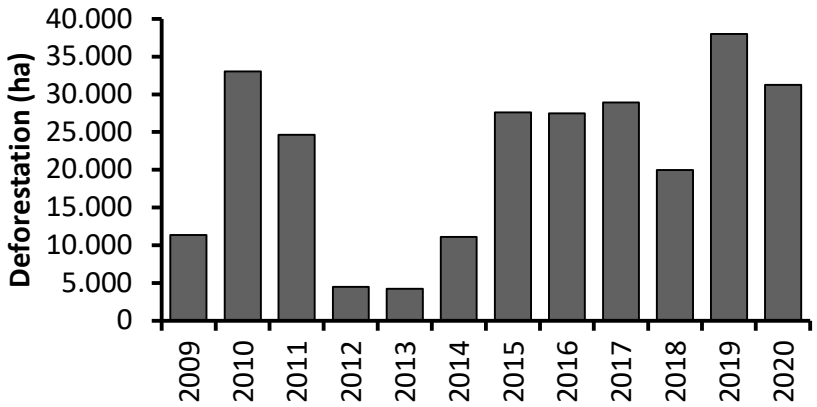
The results of the analysis of the history of deforestation that occurred between 2008 and 2020 in the reference region are presented in Table 220. By calculating the area in the land cover maps, 262,174 hectares of deforested land were estimated, which corresponds to a 14% reduction in the existing forest in 2008.

[53] MAURANO, L. E. P.; ESCADA, M. I. S.; RENNO, C. D. Spatial patterns of deforestation and estimation of the accuracy of PRODES maps for the Brazilian Legal Amazon. Forest Science, Santa Maria, v. 29, n. 4, pp. 1763-1775

Table 22 - Matrix of land use change in the reference region between 2008 and 2020 (Table 7.a of the VM0015 methodology).

ID_{cl}		Name	Initial LU/LC Class (2008)				Total (ha)
			Forest	Non-forest vegetation	Hydrography	Deforestation	
			I2	I4	I3	I1	
Final LU/LC class (2020)	F2	Forest	1.566.045		0	0	1.566.045
	F4	Non-forest vegetation	0	56.546	0	0	56.546
	F3	Hydrography	0	0	30.036	0	30.036
	F1	Deforestation (Vegetação antropizada em equilíbrio)	262.174	0	0	666.811	928.985
Total (ha)			1.828.219	56.546	30.036	666.811	2.581.612

During 2009 and 2020, an average deforestation rate of 21,848 hectares per year (1.29% per year) was observed. The Figure 9 presents a temporal variation of deforestation on an annual basis for the reference region, state of Pará and the Legal Amazon between 2009 and 2020.



(A)

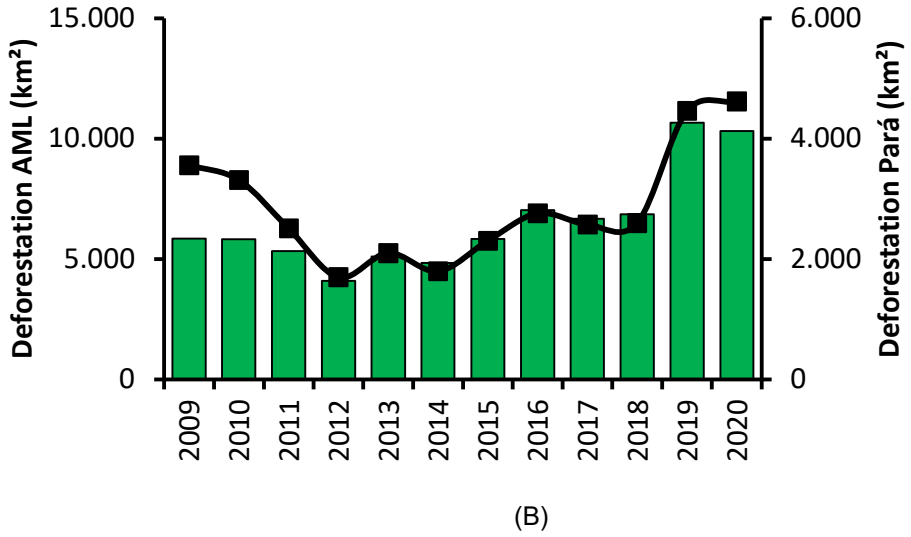


Figure 9 - Evolution of deforestation in the reference region (A), state of Pará and the Legal Amazon (B).

In the period analyzed, it is observed that the deforested area does not show a clear trend, with values below the average in 2009, 2012, 2013, 2014 and 2018. From 2015 onwards, annual deforestation of more than 20,000 hectares prevailed in the reference region (Figure 9A). With the exception of 2018, the behavior of the deforestation rate in the reference region was similar to that observed in the deforestation rate of the state of Pará and in the Legal Amazon (Figure 9B).

This scenario observed since 2015 reflects the current context of lack of command and control of the government in avoiding unplanned deforestation throughout the Brazilian Amazon, started from the political and economic instabilities of 2016[54]. Regarding the spatial distribution of recent deforestation in the reference region (occurred from 2011), its concentration to the southwest of Fazenda Jutaituba (*Figure 10*) is noted. This region of concentration of recent records can indicate how the agents and drivers of deforestation work, especially within the Sustainable Development Freedom Project, a settlement created by INCRA in 2005 with a total area of 450,000 hectares and capacity for 3,500 families, however, whose performance of land grabbers and loggers is intense[55].

Step 3 of VM0015 – Analysis of agents, drivers and underlying causes of deforestation and their likely future development

- **Identification of agents of deforestation**

a) Deforestation agents in the reference region: the main group of deforestation agents are family farmers, medium and large landowners, and local sawmills, loggers and charcoal plants.

[54] LEÃO PEREIRA, Eder Johnson de Area; SILVEIRA FERREIRA, Paulo Jorge; DE SANTANA RIBEIRO, Luiz Carlos; SABADINI CARVALHO, Terciane; DE BARROS PEREIRA, Hernane Borges. Policy in Brazil (2016–2019) threaten conservation of the Amazon rainforest. Environmental Science & Policy, vol. 100, p. 8–12, Oct. 2019. DOI 10.1016/j.envsci.2019.06.001. Available at: https://linkinghub.elsevier.com/retrieve/pii/S1462901119303818

[55] TORRES, Mauricio. The ghost settlements and the metaphysics of agrarian reform: analysis of the relationship between Incra in western Pará, illegal logging and the numbers of the II PNRA. GEOgraphia, v. 18, n. 37, p. 205-232, 2016.

b) Relative importance of the amount of historical deforestation attributed to each agent or group: family farmers, medium and large landowners, and local sawmills, loggers and charcoal plants identified are responsible for 100% of the unplanned deforestation observed in the reference region.

c) Brief description: family farmers are agents of deforestation insofar as they carry out their productive cultivation activities with the traditional cutting and burning technique, gradually deforesting areas over the years. Rural communities and small farmers, which are the majority of the surrounding Fazenda Jutaituba, apply this conventional mode of production. Mainly the quilombolas and riverside, have collective areas of forest reserve in their territories, suffering from the gradual population increase of families, which leads to the advance of agriculture in forest reserve areas, and with the visibility of illegal loggers and sawmills, which attract families in a situation of vulnerability to the selective cutting of wood species of commercial interest. Rural communities without forest reserves, on the other hand, acquire their resources in forest areas of Fazenda Jutaituba, as well as in reserve areas of other rural communities and rural landowners. These communities, mostly, are composed of families from other states, with no belonging to the territory or local culture, resulting in the sale of lots and parceling of the land of these communities to third parties or larger rural owners. The most isolated riverside and extractive communities, which live on the extraction of Brazil nuts, are located in areas of difficult access and displacement, due to poor road conditions. The rural exodus, over the years, can lead to the abandonment of land and the sale of land, leaving the areas, previously productive, abandoned and susceptible to new occupations and settlements of migrants, in addition to predatory exploitation of natural resources, still remaining in these communities. The medium and large landowners concentrate the largest portions in the area surrounding the Fazenda Jutaituba, which are mainly destined to beef cattle. These rural producers are motivated to deforest and expand their productive areas due to the suitability of the local soil, and there is even the possibility of converting production to the cultivation of grains of commercial interest, especially soybeans, depending on market demand. As well, they promote this expansion of areas, through the illegal clearing of native conserved forests, supported by the slowed environmental legislation in Brazil, due to the current political scenario of the country. Finally, sawmills, lumber mills and charcoal plants are historical deforestation agents in the Amazon, and in the project region, it is no different. The practice of illegal logging in logs by sawmills and loggers located on the BR-422 highway is recorded through various complaints, investigations and operations, such as "Transcametá Operation".

d) Brief assessment of the most likely population development of deforestation agent groups in the Reference Region, Project Area and Leakage Belt:

The context evidenced in the reference region, which should follow the same trend in the Project area and in the leakage belt (in the baseline scenario), demonstrates that there are growth trends of agents identified as family farmers, medium and large rural landowners, and local sawmills, loggers and charcoal plants.

The analysis of the most likely future deforestation trend within the reference region and in the project area is still a continuation of the current pattern, where there has been an increase in deforestation in recent years at different rates according to the related agents. Despite the trend of increasing deforestation for the coming years, Conservation Units and traditional quilombola territories can function as physical barriers to this process. However, there is pressure from loggers on private areas and even on areas of rural communities for the practice of logging. With the continuation of the same pattern of landslide and burning by farmers, and the maintenance of

population growth, there is a natural wear of the soils and the need to advance on new areas of forest reserves with the potential to increase the deforestation rate even higher in the region.

e) Historical deforestation statistics assigned to each agent in the reference region:

The deforestation process, at different intensities, occurs all around the Fazenda Jutaituba. In the southern and western areas, it occurs more intensely while in the north and east, more moderately, at slower rhythms, over the analyzed period. Public areas, especially Conservation Units (CUs), act over time as a barrier to the advance of deforestation, with areas deforested annually significantly smaller, with 223.27 hectares in 2012 and 327 hectares in 2020 (Table 23). In the quilombola territories, the increase in deforestation was the second smallest among the deforested areas, behind the UCs, with 161%. These values demonstrate that this deforestation occurs with slower growth over the years, compared to private areas (small, medium and large properties). These openings occur due to the expansion of the families that reside there, mainly for the cultivation of agriculture for subsistence and/or destined to the local market. The private properties have more open areas over the analyzed period. A large outstanding property, next to Fazenda Jutaituba, belonging to the Algar ABC group, has the highest forest opening values among private areas, with 1,976 ha in 2012 and 4,520 ha in 2020, but with the lowest increase between the two periods, 228.7%. These openings mainly refer to logging, including the construction of infrastructure. Broadly speaking, considering the total area of this property of 145,680 hectares, it can be said that the forest structure has been maintained, demonstrating that the forest management developed in the area, as well as investments in heritage security has had an effect on the conservation of the area. Finally, the areas of small and medium-sized properties show to be the main agents of deforestation, with increases of 400.3 and 339.0%, respectively, between 2012 and 2020, where the main interest is the extraction of commercial woods to meet the demands of local sawmills, located along Transcametá. With the interest in the wood product, there is a stimulus to speculation of areas, increasing the appreciation and accelerating the opening of new areas also intended for livestock and agriculture.

When considering the hot spots in the area surrounding the Fazenda Jutaituba, the community areas, quilombola territories, have similar risks to private areas, given the quantitative presence of these spots. Represented by the practice of overturning and burning for the opening of areas for the swidden, predominant activity in almost the entire Amazon region, where there is cultivation of family and/or community swiddens.

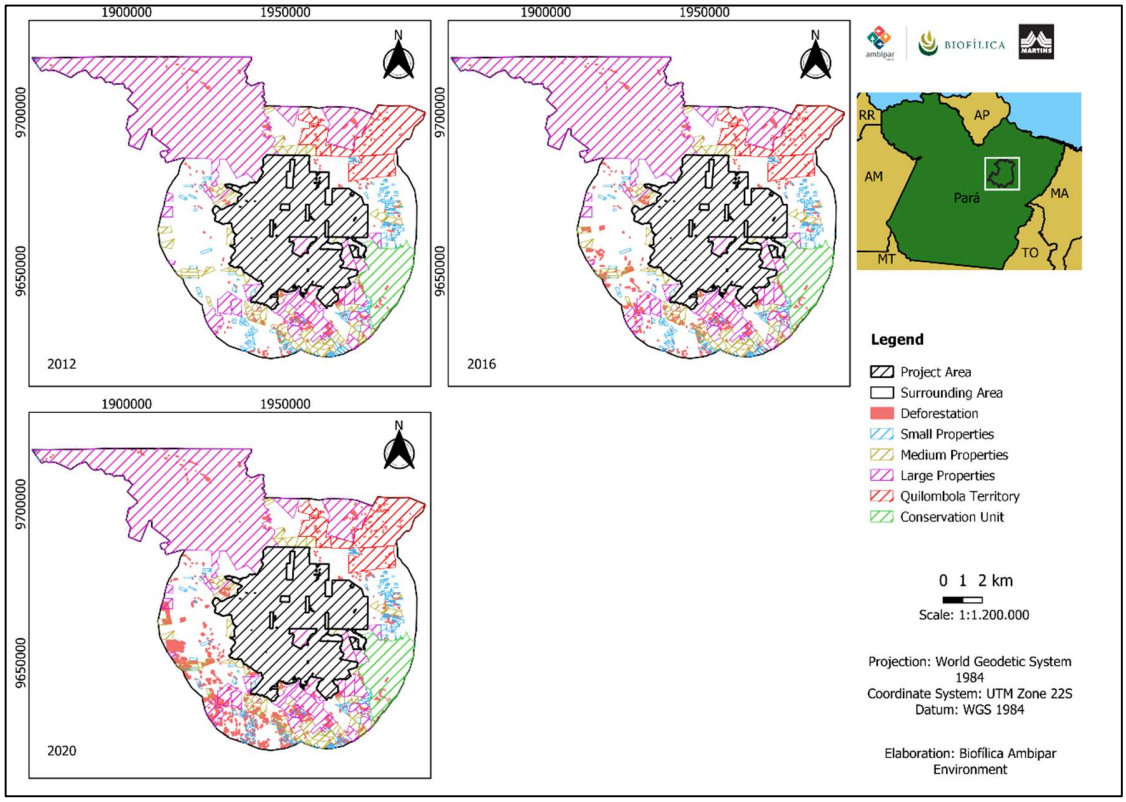


Figure 10 - Dynamics of deforestation in the years 2012, 2016 and 2020 around the Fazenda Jutaituba.

Table 23 - Deforestation in the vicinity of Fazenda Jutaituba in a 35 km radius in 2012, 2016 and 2020

Agents	Total area	Number	2012		2016		2020		Increment
			ha	%	ha	%	ha	%	(%)
Quilombola territory	40790.18	29	521.70	1.28	690.02	1.69	839.90	2.06	161.00
Conservation Unit	27824.27	1	223.27	0.80	270.42	0.97	327.05	1.18	146.50
Small Property	13879.71	1	466.60	3.36	864.93	6.23	1867.66	13.46	400.30
Medium Property	37040.77	6	983.11	2.65	2196.26	5.93	3341.22	9.02	339.90
Large Property	197766.46	11	1976.43	1.00	2681.37	1.36	4520.47	2.29	228.70
Other	295887.79	SI	1840.87	0.62	4313.08	1.46	10736.37	3.63	583.20
Total	613189.19		6011.98	9.72	11016.09	17.64	21632.68	31.63	-

Sources: SICAR[56], PRODES, ITERPA[57], MMA

- **Identification of deforestation drivers**

[56] Sistema Nacional de Cadastro Ambiental Rural: https://www.car.gov.br/#/
[57] INSTITUTO DE TERRAS DO PARÁ: http://portal.iterpa.pa.gov.br/

a) Variables explaining the amount (hectares) of deforestation

a) Cultural aspects and population growth;

b) Demand for new areas for agriculture and pasture;

c) Demand for wood for sawmills, lumber mills and local charcoal mills.

- **Cultural aspects and population growth:**

a) **Brief Description**: The custom of family farmers to traditionally produce by cutting and burning technique, causes the gradual wear of agricultural land, leading to the need to open new areas and advance on remnants of native forests. This process of territorial expansion is enhanced by the population increase in this region. Quilombolas and riverside dwellers, especially those in situations of social vulnerability, who share a forest reserve in their territories, suffer from the performance and grooming of sawmills and illegal charcoal for the exploitation of wood of commercial interest for income generation. At the same time, rural communities without forest reserves, which are composed of families from other regions and states, feel obliged to enter forest areas of third parties, such as Fazenda Jutaituba, in order to acquire resources for their subsistence (hunting, fishing, extractivism and product collection). This difficulty, coupled with the absence of identification with the territory, leads to the abandonment and sale of lots to third parties, leveraging the problem of population growth and environmental degradation. Finally, the isolation of riverside communities and extractive families, due to the precarious conditions of the roads, especially BR-422 (Transcametá) and the difficult river access, leads to the rural exodus of this population, housing new migrants who speculate land and exploit natural resources in a predatory way.

b) **Impact on the Behavior of agents:** the population increase of families of family farmers can lead to deforestation to advance agriculture, based on the practice of cutting and burning, in forest reserve areas, as well as it can intensify illegal logging to meet the demands of sawmills and charcoal plants. At the same time, the absence of territorial and cultural belonging, associated with isolation and displacement difficulties, may make it impossible for families to remain in their territories, leaving areas vulnerable to new occupations and predatory exploitation of natural resources.

c) **Development forecast:** provided that alternative production techniques are not adopted by family farmers in the region, the trend towards the implementation of subsistence agriculture based on the conventional mode of cultivation is imminent. This mode of production, which wears out the soil and forces small producers to expand their areas, associated with other determining factors such as population growth, resource scarcity, geographic isolation, rural exodus, land speculation, migrant fixation, soybean and livestock advancement, and constant demand for commercially valuable timber, accelerate and stimulate deforestation in forest reserves conserved in the region where Fazenda Jutaituba is located. It is worth mentioning that the installation of the Private Use Port Terminal (TUP-Abaetetuba/PA), an enterprise of the company Cargill Agrícola S.A., planned for the coming years, can generate a "boom" in soybean production, resulting in the invasion of territories, economic crisis for family farmers, attraction of migrants and population growth, real estate speculation and, finally, pressure on areas with remnants of native vegetation.

d) **Measures to be implemented**: the actions planned to be implemented during the project management plan will have as their main objective the promotion of socioeconomic development in the field, offering alternatives for families to diversify and increase their production sustainably. Through the provision of technical assistance and organizational support, the project aims to reduce

the need for families to open new forest areas, develop responsible agricultural practices and reduce the predatory exploitation of natural resources, in addition to providing improvements in infrastructure, such as road maintenance, along with initiatives to motivate the settlement of man in the countryside, preventing lands near forest reserves from being sold and/or occupied by agents that cause environmental degradation. At the same time, the project may assist in the social and political mobilization of the region in decision-making on the implementation of the Cargill Port.

- **Demand for new areas for agriculture and pasture:**

a. **Brief Description:** Landlords, who concentrate their land on beef cattle, are motivated to expand their land through unplanned deforestation - depending on the level of agricultural aptitude and soil quality on their properties - according to market demand. Due to the growing dynamics of grain production in the region surrounding the Fazenda Jutaituba, associated with the possibility of the implementation of the Cargill Port, facilitating the flow of the product without relying solely on BR-422, medium and large landowners strongly consider converting their areas to the cultivation of commodities, especially soybeans. Low land prices and high fiscal and financial incentives create favorable conditions for the activity. To expand this agricultural frontier, whether for extensive livestock and/or grain, landowners take advantage of the weaknesses of Brazilian environmental policy, which has declined in the last five years, unevenly pressuring and overturning remaining forest reserves, as well as intimidating small farmers.

b. **Impact on the Behavior of Agents**: Brazil's current environmental legislation and relaxation in deforestation surveillance, associated with soil quality in the region and global demand for commodities, can drive these rural producers to expand their areas and grow in terms of production in livestock and grain implantation, suppressing forest reserve areas.

c. **Development forecast**: the recent environmental policy of the Brazilian federal government has leveraged deforestation in the Amazon region, mainly for the expansion of soybean cultivation in areas of conservation units and traditional communities. There was a relaxation in the inspection of environmental laws that restricted uses and ensured greater safety and protection, both to the environment and to the traditional populations of the region. It is estimated that the feeling of impunity for environmental crimes has grown in recent years. Thus, the underlying causes, linked to environmental policy, soil quality in the region and the installation of drainage infrastructure, such as the Cargill Port, can boost the agent in opening new areas for livestock and grain cultivation, succumbing to areas of forest reserves.

d. **Measures to be implemented**: the actions planned to be implemented during the project management plan will have as their main objective the promotion of socioeconomic development in the field so that rural producers can increase their production, without the need to expand the agricultural frontier. Through the provision of technical assistance and rural extension, the project aims to reduce the advance of grain and pasture cultivation on the forest and develop responsible and efficient agricultural practices, in addition to promoting articulation with the public agencies to maintain an effective and restrictive environmental policy.

- **Demand for timber for sawmills, lumber mills and local charcoal plants:**

a. **Brief Description:** The search for noble species, of high value in the market, presses protected, private and community areas with remaining forests. At the same time, due to the high price of cooking gas, illegal logging has also been leveraged by the increasing demand of charcoal plants for charcoal production, enabling an alternative energy source for vulnerable families in rural areas. In addition to this context, the local conditions of physical infrastructure and low capacity of

public agents to carry out inspection and control favor the illegal action of these deforestation agents.

b. **Impact on the Behavior of the agents**: the profitability associated with the exploitation of noble wood in loggers and sawmills and the growing demand for charcoal in the reference region of the project; associated with the precarious conditions of trafficability of the BR-422 highway, the regression in environmental policies with the federal government's access to the maintenance of illegality and the inefficiency on the part of public agencies in combating illegal deforestation; favor the advance of environmental degradation in the region.

c. **Development forecast**: deforestation linked to the exploitation of illegal wood in the reference region, both for sawmills and loggers and for charcoal plants, tends to increase to the extent that it is still possible to remove the wood with market value in the areas of forest remnants, as well as there is market demand. The poor conditions of the BR-422 highway, which provide isolation and distance from the government, increase the feeling of impunity for environmental crimes. Relatedly, the lack of government commitment to the inspection and strengthening of environmental issues tends to move a scenario of continued degradation of forest remnants.

d. **Measures to be implemented**: the actions planned to be implemented during the project management plan will have as main objective the promotion of socioeconomic development in the field, offering alternatives for the mentioned agents to diversify and develop sustainable activities. Through the provision of technical assistance and organizational support, the project aims to encourage forest management practices of reduced impact, the exploitation of non-timber products, diversified agricultural activities of high yield, reducing the predatory exploitation of natural resources, in addition to encouraging and strengthening associations of rural producers. Concomitantly, the project aims to monitor changes in forest cover and articulate effective and restrictive environmental policies with the competent public agencies.

- **Controlling variables that explain the location of deforestation**

Six spatial variables were analyzed to identify the drivers that may represent the greatest influence on the location of deforestation in the reference region.

The relative importance of the deforestation drivers was estimated using the Evidence Weights method[58], implemented in the Dynamic EGO software[59]. In the reference region of the Jutaituba REDD+ Project, the results of the analysis of the weights of evidence (WoE) indicated values ranging from +0.91 to -4.28[60], where positive and negative values represent, respectively, a greater or lesser influence of the vector on the occurrence of deforestation in a given location.

The spatial variables that represent the deforestation pattern in the calibration period of the model were: i) distance from old deforestation; ii) distance from roads; iii); distance from localities; iv) distance from rivers; v) elevation; vi) land situation. The results of the WoE analysis are presented in Figure 11, where the highest and lowest values indicate areas with greater or lesser probability of deforestation, respectively.

The description of the variables analyzed to explain the occurrence of deforestation in the historical reference period is presented below:

[58]BONHAM-CARTER, G. Geographic information systens for geoscientists: modeling with GIS. New York: Pergamon, 1994. pp. 398
[59] https://www.csr.ufmg.br/dinamica/dokuwiki/doku.php?id=determine_weights_of_evidence_ranges
[60]Values can be found in the "WoE" tab of the "Jutaituba_baseline_final" spreadsheet.

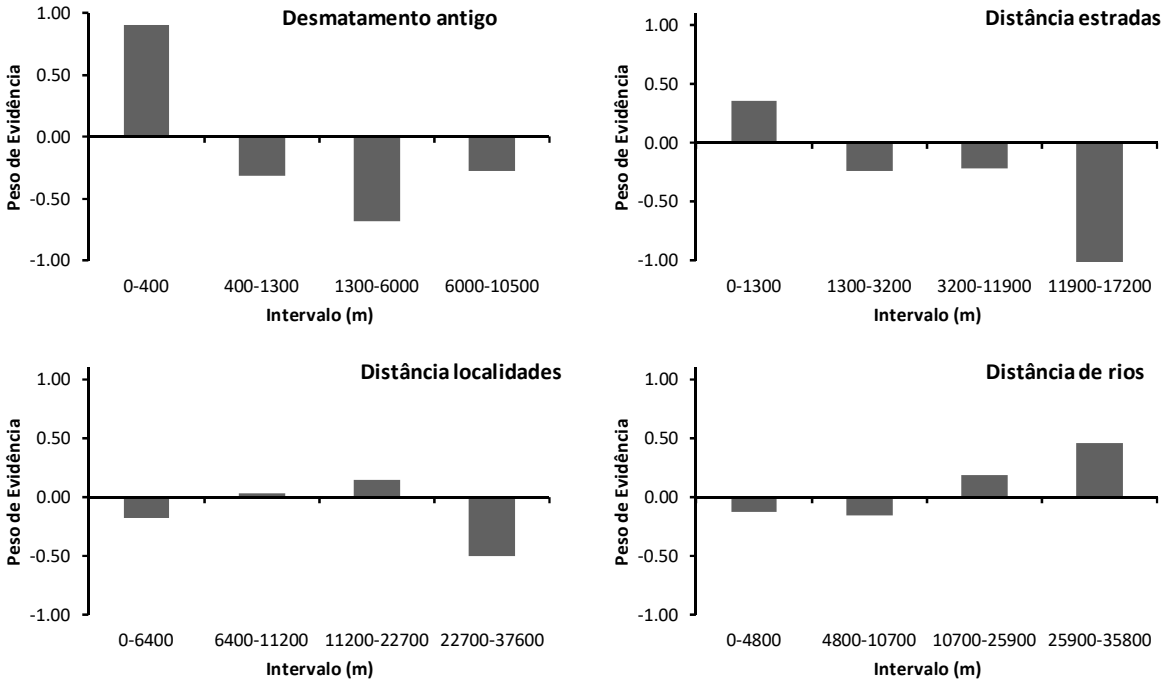
a) **Old deforestation distance**: areas of forest edges that represent the initial access of deforestation agents and drivers observed in the reference region during the 2009-2020 period.

b) **Distance from roads and branches**: forests close to this type of road are more accessible and thus become more susceptible to deforestation.

c) **Distance from localities**: in the reference region there are several localities with concentrated human occupation (villages, towns, communities, cities, etc.), and proximity to the forest contributes to the greater risk of new deforestation.

d) **Distance from rivers**: the rivers Pacajá, Tocantins and Anapú are used as alternative ways to access more isolated forest areas in the reference region, and with this, these forest areas become more susceptible to deforestation.

e) **Land situation:** in the reference region there are areas with dedicated use for the traditional population (conservation units, quilombos and indigenous lands) and private rural properties (sites, lots and farms) where deforestation agents and drivers operate. Analysis by Yanai et al.(2020)[61] highlight the influence of deforestation agents in the land concentration process in lots of settlement projects and their relationship with the local dynamics of deforestation. Thus, the influence of the land situation on the historical deforestation observed in the region was evaluated.



[61]YANAI, A. M. et al. Deforestation dynamics in Brazil's Amazonian settlements: Effects of land-tenure concentration. Journal of environmental management, v. 268, p. 110555, 2020

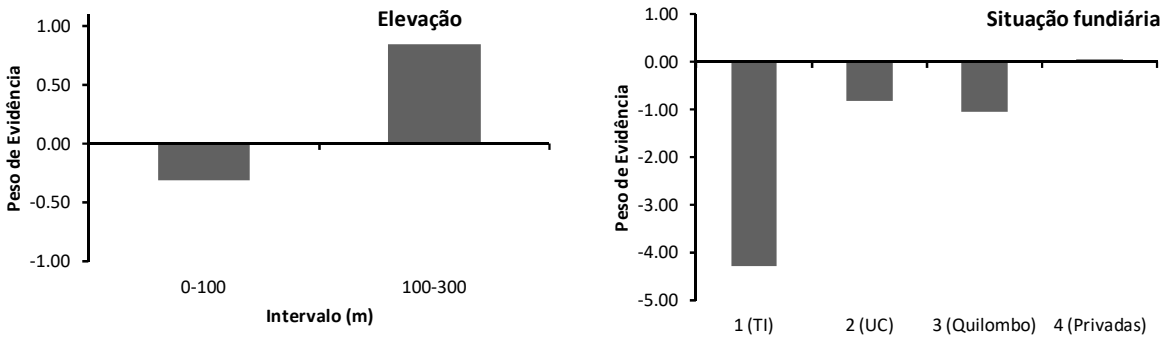


Figure 11 - Spatial drivers analyzed and their respective values of influence on deforestation (Weights of evidence).

- **Identification of underlying causes of deforestation**

a) **Short Description:** The conditions of the land market; the sale of lots and parceling of land from community to third parties or larger rural owners, environmental policy, the installed model of inspection of the competent bodies, soil quality in the region, popular awareness about environmental issues, anthropogenic pressure on natural resources, market demand for forest products are the main underlying causes of deforestation in the reference region of the project. The implementation of infrastructure projects, such as BR-422 (Transcametá) and Cargill Port Terminal, and agricultural activities are directly related to the degradation rates in the area surrounding Fazenda Jutaituba and the underlying causes mentioned above. The expansion of access routes, often without authorization from the government, enables the extraction of natural resources, facilitates the disposal of products and raw materials, induces the opening of agricultural fronts (livestock, commodities and monoculture of black pepper), and promotes real estate speculation; in previously inaccessible areas. This scenario is enhanced by the inefficiency, absence, or even connivance of the government in the region, culminating in the encouragement of deforestation and illegal activities.

b) **Impact on the decision of the group of agents to deforest:** considering this scenario, the opening of roads followed by the consolidation of infrastructure, are the main stages of deforestation in the reference region. As new access routes are implemented, and travel and flow logistics are facilitated, different agents can be attracted in search of natural resources such as wood, enhancing real estate speculation. At the same time, the maintenance of the process of advancing the agricultural frontier and the expansion of the latifundia, aggravated by the low level of productivity of small farmers and the attractiveness generated by the financial gain of logging, tends to take the region to a degrading environmental context.

c) **Probable future development:** consolidated infrastructure projects, the paving of a section of the BR-422, and the installation of the Cargill Port, represent great potential influence on deforestation, causing, in addition to social impacts, great pressure on the remaining forests and their resources. Additionally, the context of fragility, or in some cases, lack of governance of federal and state governments can aggravate these problems, resulting in impunity for most illegal practices and potentially causing a significant increase in deforestation in the region.

d) **Measures that will be implemented:** the proposed activities are linked to the responsible exploitation of natural resources, low-carbon agriculture, and actions to strengthen the

management and governance of local actors. Thus, the project intends to act directly in promoting a "green economy" that values the forest and its resources in a sustainable way and provides alternatives for socioeconomic development, as opposed to the trend of continuity of activities carried out in the business as usual scenario.

- **Analysis of chain of events leading to deforestation**

The chain of events that leads to deforestation in the project region is complex, since local agents have different motivations and do not necessarily act in the same sequence of events, since there are numerous underlying causes that influence environmental degradation in the vicinity of Fazenda Jutaituba.

The common and historical practice of implementing agricultural crops based on the opening of gardens by means of fires, in addition to generating environmental impact, leads to the decline of soil fertility, requiring the opening of new areas in forest reserves for the continuity of production. Both family farmers and rural communities without forest reserves and isolated riverside and extractive communities are at the mercy of the scarcity of subsistence resources. This situation is aggravated by the trend of population growth of local families, putting even more pressure on areas with native vegetation cover.

A reflection of this situation is the abandonment of previously occupied areas, which sets precedents for real estate speculation, parceling of lots and sale to larger producers; attracting mostly migrants, landowners and sawmills and charcoal plants. Which may, over the period, develop illegal activities, such as logging, hunting and predatory fishing.

This process is also aggravated by medium and large landowners, who, depending on market demand and the logistical capacity of flow, convert their soils to more intensive uses. Thus, extensive livestock and the constant use of fertilizers, causes a depletion of the system, culminating in the expansion of the agricultural frontier in forest reserve areas.

The maintenance of the road infrastructure, especially the paving of BR-442 (Transcametá), associated with the possibility of installing the Cargill Port Terminal; enhances the conversion of land use in the region to commodities of commercial interest and causes an increase in the migration flow. It also creates precedents for the opening of parallel access roads for the transport and disposal of irregular products coming from the forest, mainly, noble wood of interest to the market. Thus, strengthening the action of loggers, sawmills and irregular charcoal plants.

Finally, the deforestation identified in the project region within the historical reference period presents a great influence of the fragile environmental policy that fails to fulfill its role of inspector and repressor of irregular practices. Therefore, the action of agents and the action of deforestation drivers result in the growth of illegal activities, the decharacterization of forests, and the disorderly occupation of the territory.

The Figure 12 illustrates the chain of relationships identified between agents and drivers of deforestation observed in the Reference Region.

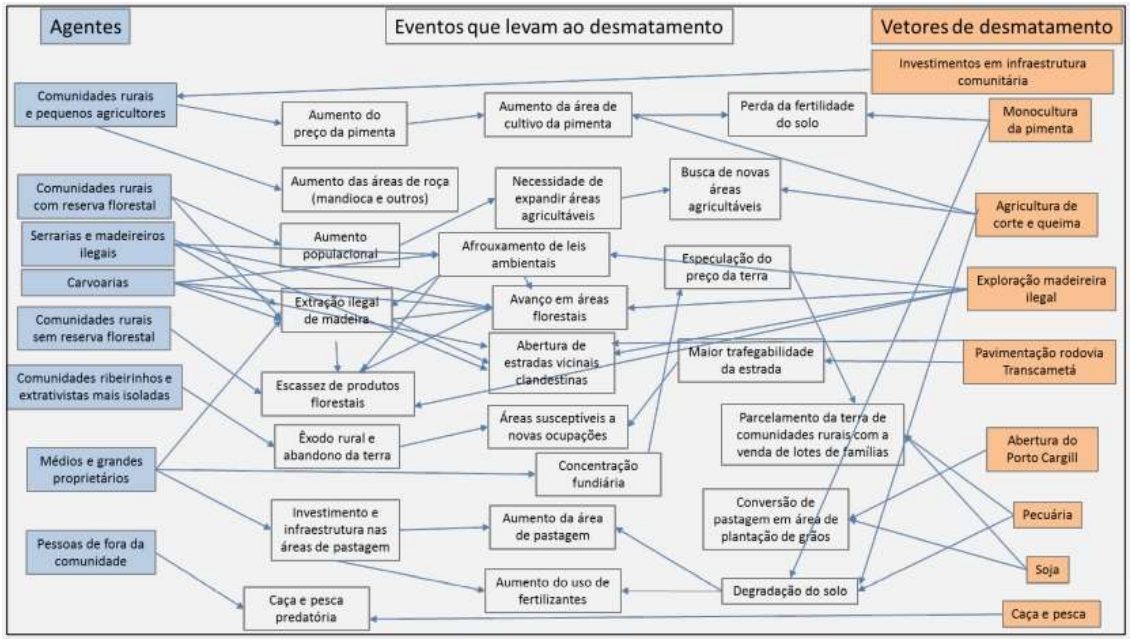


Figure 12 - Event chain of deforestation

- **Conclusion**

From the data and information presented in the socioeconomic diagnoses carried out by the Project[62] (STA, 2022), deforestation data[63]) and consultations with local experts, it was possible to find conclusive evidence that explains the relationships between agents, drivers, underlying causes and the pressure of deforestation in the reference region. Thus, we conclude that the relationships between demographic variations, the advance of agriculture and livestock, the growth of soybean monoculture in latifundia, real estate speculation, and the constant demand for wood of commercial interest, added to the influence of infrastructure projects and inefficiency of the Government in the inspection and restraint of illegal activities, contribute to the deforestation scenario observed during the period analyzed. Considering this evidence, the trend towards the future baseline is to maintain the influence of agents, causes and drivers evidenced during the historical period analyzed in the Reference Region.

Step 4 of VM0015 – Projection of Future Deforestation

- **Projection of the quantity of future deforestation**

The Reference Region was not stratified, since the characteristics of the agents, drivers and causes of deforestation are the same in all their extent.

[62]Final Report of the Carbon Inventory of the REDD+ Jutaituba Project Area, 2021. Available for audit.
[63]Assis, L. F. F. G.; Ferreira, K. R.; Vinhas, L.; Maurano, L.; Almeida, C.; Carvalho, A.; Rodrigues, J.; Maciel, A.; Camargo, C. TerraBrasilis: A Spatial Data Analytics Infrastructure for Large-Scale Thematic Mapping. ISPRS International Journal of Geo-Information. 8, 513, 2019. DOI: 10.3390/ijgi8110513

- **Baseline methodology selection**

The VM0015 methodology suggests three methods of projecting the amount of future deforestation: (a) the historical average of deforestation; (b) deforestation as a function of time and c) modeling the deforestation rate. We opted for approach "b" (time function) of sub-step 4.1.1 of the VM0015 methodology to design the deforestation baseline. In this approach, annual baseline deforestation in year *t* for the reference region was calculated by extrapolating the historical trend of the reduction in forest cover observed in the reference region. The deforestation rate projections were calculated by double exponential smoothing on the annual forest cover data in the reference region, using the "holt" function of the "forecast" package[64] in the R programming environment[65]. This approach was chosen due to the ability to adjust for the presence or absence of a trend in annual deforestation.

- **Quantitative projection of future deforestation**

As mentioned in the previous item, we used method "b" (deforestation as a function of time) to estimate future deforestation that will be allocated annually to the baseline of the Reference Region. We adjusted a double exponential smoothing model, using the automatic parameter adjustment feature, activating the trend damping, in R. The adjusted parameters were: α (autocorrelation) = 0.9999, β (trend) = 0.4198 and ϕ (trend damping) = 0.98. The mean absolute error (Mae) was 9,306 ha and the results of the projections can be visualized Table 24. The estimates were converted to annual rates by computing the relative differences between the forest cover estimates between two consecutive years. The deforestation projected for the 10-year period (2021-2030) in the reference region was calculated using Equation1 the VM0015 methodology:

Equation1

$$ABSLRR_{i,t} = ARR_{i,t-1} * RBSLRR_{i,t}$$

Where:

$ABSLRR_{i,t}$: annual area of baseline deforestation in stratum i, year t, in the Reference Region (ha/year);

$ARR_{i,t-1}$: area with forest cover in stratum i, year t-1, in the Reference Region (ha);

$RBSLRR_{i,t}$: deforestation rate applicable to stratum I within the Reference Region in year t (%);

t: 1, 2, 3 ... 30, years of the proposed credit period (dimensionless);

i=1, stratum of the Reference Region (dimensionless).

The projected deforestation for the 10-year period (2021-2030) in the Reference Region was 272,890 hectares (Figure 13).

[64]Hyndman, Rob J., and Yeasmin Khandakar. 2008. "Automatic Time Series Forecasting: The Forecast Package for R". Journal of Statistical Software 27 (July): 1–22. https://doi.org/10.18637/jss.v027.i03.
[65]R Core Team. 2018. "R: The R Project for Statistical Computing". 2018. https://www.r-project.org/.

Table 24 - Projected annual deforestation rate for the first 10 years of the project.

Year of the Project	Deforestation rate
2021	1.85%
2022	1.86%
2023	1.86%
2024	1.87%
2025	1.87%
2026	1.87%
2027	1.88%
2028	1.88%
2029	1.89%
2030	1.89%

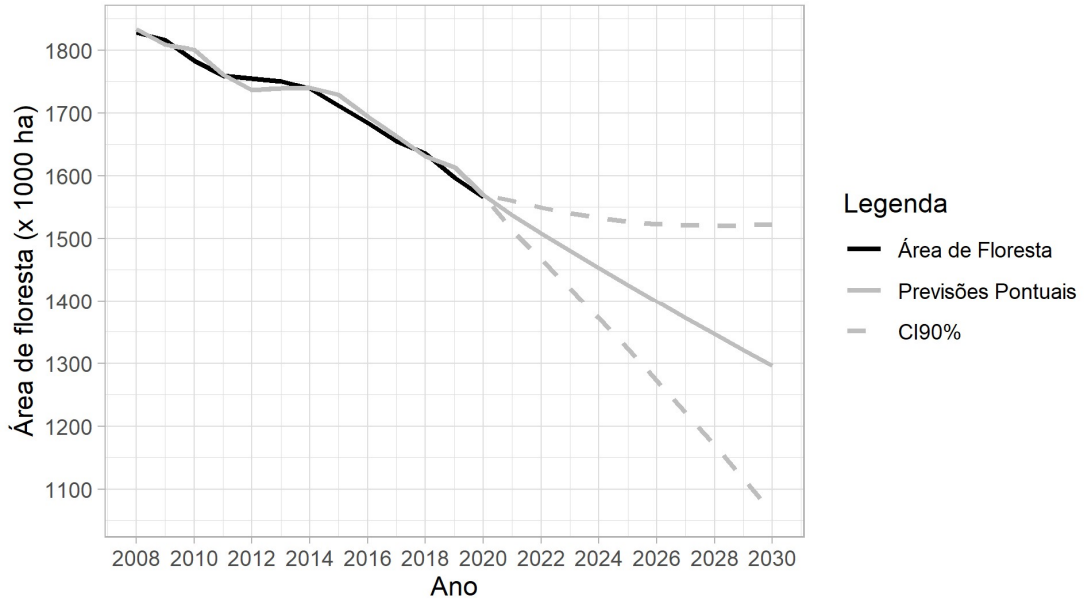


Figure 13 - Historical series and forest area projections in the Reference Region.

- **Projection of annual areas of baseline deforestation in the Project Area and Leakage Belt**

Annual projected deforestation has been projected spatially throughout the Reference Region (next section). Baseline deforestation in the Project Area and Leakage Belt corresponds to baseline deforestation allocated in these regions

Summary of the quantitative projection of future deforestation

The projected deforestation values for the period from 2021 to 2030 in the Reference Region (Table 25), Project Area (Table 26) and Leakage Belt (Table 27) are presented. The total deforestation projected for the Project Area in the accreditation period was 6,685 ha, with an annual average of 668.5 ha.

Table 25 - Deforestation projected for the Reference Region (Table 9a of the VM0015 methodology).

Project year *t*	Stratum *i* in the reference region	Total	
	1	annual	cumulative
	$ABSLRR_{i,t}$	$ABSLRR_t$	ABSLRR
	ha	ha	ha
2021	29.043	29.043	29.043
2022	28.563	28.563	57.606
2023	28.093	28.093	85.699
2024	27.630	27.630	113.329
2025	27.175	27.175	140.504
2026	26.728	26.728	167.232
2027	26.288	26.288	193.520
2028	25.856	25.856	219.376
2029	25.431	25.431	244.807
2030	25.013	25.013	269.820

Table 26 - Deforestation projected for the Project Area (Table 9b of the VM0015 methodology).

Project year *t*	Stratum i of the reference region in the project area 1 $ABSLPA_{i,t}$ ha	Total	
		annual $ABSLPA_t$ ha	cumulative ABSLPA ha
2021	514	514	514
2022	708	708	1.222
2023	547	547	1.769
2024	348	348	2.117
2025	557	557	2.674
2026	699	699	3.373
2027	802	802	4.175
2028	683	683	4.858
2029	986	986	5.844
2030	841	841	6.685

Table 27 - Deforestation designed for the Leakage Belt (Table 9c of the VM0015 methodology).

Project year *t*	Stratum i of the reference region in leakage belt 1 $ABSLLK_{i,t}$ ha	Total	
		annual $ABSLLK_t$ ha	cumulative ABSLLK ha
2021	762	762	762
2022	824	824	1.586
2023	787	787	2.373
2024	860	860	3.233
2025	765	765	3.998
2026	909	909	4.907
2027	631	631	5.538
2028	965	965	6.503
2029	785	785	7.288
2030	660	660	7.948

- **Projection of the Location of Future Deforestation**

The Dynamic EGO software was used to project the location of future deforestation. This software is indicated by the VM0015 methodology as appropriate for baseline modeling of REDD+ projects to prevent unplanned deforestation (AUD). The use of Dynamics EGO is justified by the following reasons: a) it is a model available in scientific publications[66]; b) it has a transparent process for input and output of data and parameters processed with a graphical interface that is easy to understand; c) it incorporates the use of appropriate data to explain the location of deforestation; d) it has an appropriate tool for assessing uncertainties[67].

The main steps taken in this step were:

1. Organization of georeferenced maps of land use and land cover, and georeferenced maps with the explanatory factors of deforestation;
2. Calibration of the model by determining the weights of evidence (WoE presented in Figure 4) and analysis of the correlation between variables;
3. Evaluation of the accuracy of the model (Figure of Merit - FOM);
4. Development of deforestation baseline scenarios.

- **Preparation of factor maps**

To perform this step, the empirical approach was used to create the factor maps (spatial variables that explain the location of deforestation). Studies on deforestation in the Amazon show that maps of distances of spatial attributes (roads, localities, etc.) and ecological aspects of the landscape (relief, soils and vegetation, etc.) have a high correlation with the location of new deforestation[68].

To elaborate the risk map and calibrate the projection model of future deforestation, the Dynamic EGO software requires that the spatial input variables be independent before using them. Six independent spatial variables were used to produce the deforestation risk map (Table 28), described above (variables that explain the location of the occurrence of deforestation, Page 6). In Dynamic EGO, spatial data were processed with pixel size of 100 x 100 meters (01 hectare), GeoTiff format (Datum WGS84, UTM Zone 19S) and dimensions of 2188 rows per 2028 columns.

Table 28 - List of maps, variables and factor maps (Table 10 VM0015).

Factor Maps		Source	Variable represented		Meaning of categories or pixel values		Maps used to create		Algorithm or equation used
ID	File name		Unit	Description	Range	Meaning	ID	File name[69]	
1	distance_to_4	INPE[70]	Meters	Continuous data		Old deforestation distance.	1	lulc2008.tif	Euclidean distance (Dynamic EGO 3)

[66]SOARES-FILHO, B. et al. Modeling conservation in the Amazon Basin. Nature 440, pp.520-523, 2006
[67]Hagen, Alex. 2003. Fuzzy set approach to assessing similarity of categorical maps. International Journal of Geographical Information Science 17 (3): 235–49. https://doi.org/10.1080/13658810210157822.
[68]BARRETO, P., BRANDÃO Jr., A., MARTINS, H., SILVA, D., SOUZA Jr., C., SALES, M., & FEITOSA, T. 2011. Risk of Deforestation Associated with the Belo Monte Hydroelectric Power Plant (p. 98). Belém: Imazon
[69]Consult raster files (.tiff) in the "...\baseline\1_variables" folder.
[70]http://terrabrasilis.dpi.inpe.br/download/dataset/legal-amz-prodes/raster/PDigital2000_2021_AMZ_raster_v20211118.zip

2	d_road	RAISG[71]	Meters	Continuous data		Distance from highways, roads, extensions and navigable rivers.	2	vias2020.shp	Euclidean distance (ArcGIS 10.1)
3	d_local	IBGE[72]	Meters	Continuous data		Distance from localities (cities, towns, villages, communities).	3	localidades2.tiff	Euclidean distance (ArcGIS 10.1)
4	d_rios	IBGE[73]	Meters	Continuous data		Distance from large rivers	4	d_hydro.tiff	Euclidean distance (ArcGIS 10.1
5	elevation	SRTM[74]	Meters	Continuous data		Elevation of the terrain	5	elevation.tiff	-
6	landlord	MMA, INCRA and FUNAI[75]	Categories	Land classes		Land situation	2	landstatus1.tiff	-

- **Preparation of the deforestation risk maps**

Deforestation risk maps show the regions with the highest (risk close to or equal to 1) or lowest conditions for deforestation to occur (risk close to or equal to 0). In this baseline study the risk map was produced using the method of evidence weights (Bonham-Carter, 1994) available in Dynamics EGO. This method calculates the probability of transitioning from forest to deforested area at each pixel in the reference region, based on the sum of all evidence weights that overlap at a given pixel, and dependent on combinations of all static and dynamic maps[76].

The result of the application of the weight of evidence method in Dynamics EGO is a map of deforestation risk that identifies areas with higher (1.0) and lower (0.0) probability of deforestation (Figure 14). The spatial variables presented in Table 9**Erro! Fonte de referência não encontrada.**, together with the deforestation risk map, are the starting point for production of future deforestation baseline scenarios.

[71]https://www.amazoniasocioambiental.org/download/estradas/
[72]https://geoftp.ibge.gov.br/organizacao_do_territorio/estrutura_territorial/localidades/Shapefile_SHP/BR_Localidades_2010_v1.shp
[73]https://geoftp.ibge.gov.br/cartas_e_mapas/bases_cartograficas_continuas/bc250/versao2021/shapefile/bc250_shapefile_2021_11_18.zip
[74]http://www.dpi.inpe.br/Ambdata/download.php
[75]http://mapas.mma.gov.br/i3geo/datadownload.htm
[76] SOARES-FILHO, B. et al. Modeling conservation in the Amazon Basin. Nature 440, pp.520-523, 2006.

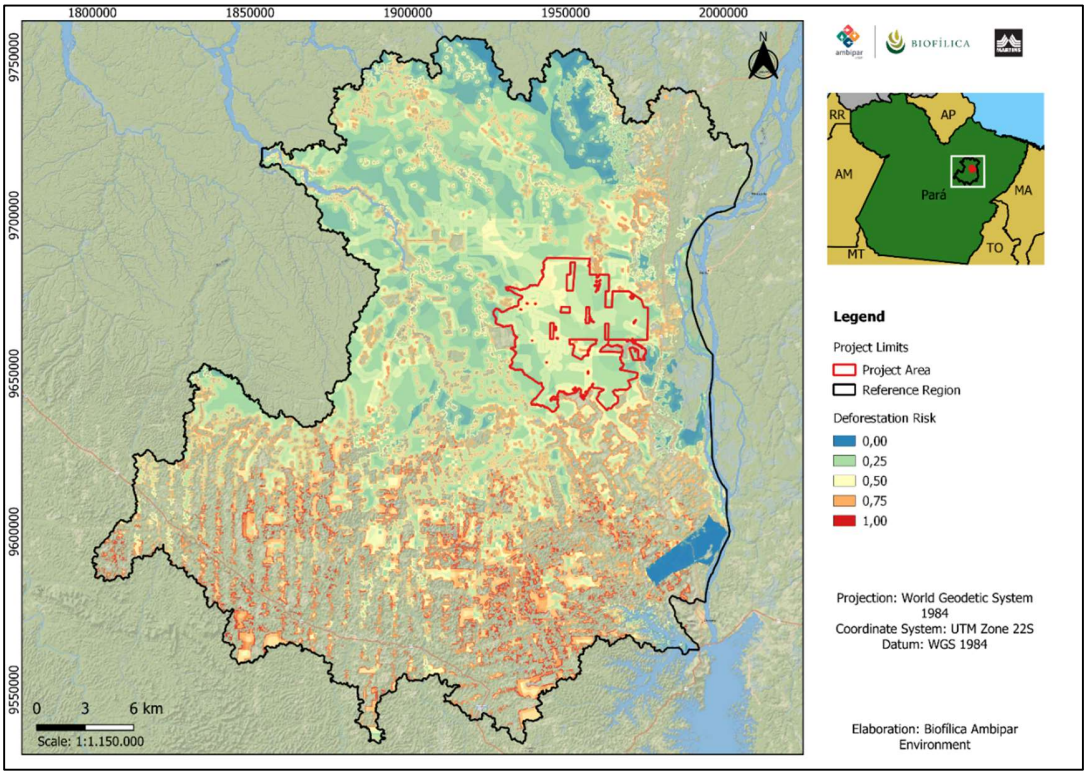


Figure 14 - Map of deforestation risk in the Reference Region

- **Selection of the most accurate deforestation risk map (Calibration and Validation of the model)**

To evaluate the quality of the model produced, the option "a" available in the VM0015 methodology version 1.1 was used: *calibration and confirmation using two historical subperiods*. Data on deforestation between 2009 and 2017 and the variables listed in were used to calibrate the model, while the deforestation map mapped by PRODES in 2020 was used for the confirmation process. In this process, a 2020 deforestation map was simulated from the data observed between 2009 and 2017.

The FOM (Figure of Merit) technique was used to evaluate the accuracy of the simulated map in 2020. The FOM result is the ratio of the intersection of the observed changes (changes between the reference map at time 1 and time 2) and the simulated changes (changes between the reference map at time 1 and the reference map at time 2) for the union of the observed change and the predicted variation, as defined in equation 9 of the VM0015 methodology.

The VM0015 methodology indicates that the minimum threshold for the best fit measured by the FOM should be defined by the net change observed in the reference region for the model calibration period. The net change observed should be calculated as the total area of change modeled in the reference region during the calibration period (percentage of the total area of the reference region), and the FOM value should be at least equivalent to this value. If the FOM value is below this threshold, the project proponent must demonstrate that at least three models have been tested (three deforestation risk maps), and the one with the best FOM must be used.

The net change observed in the Reference Region was 6.70%, and the FOM value obtained by applying equation 9 of VM0015 was 86%. Thus, the FOM of the risk map produced is greater than the required threshold (Step 4.2.4 of VM0015) and presented good accuracy, with a value greater than 80%. With this, the deforestation risk map developed in the calibration stage (Figure 15) offers good performance to spatially project land use changes by 2030 in the Reference Region of the Jutaituba REDD+ Project.

- **Spatial projection of future deforestation**

The procedure of selecting the pixels with the highest deforestation risk and preparing the deforestation baseline maps was automatically performed by Dinamica EGO for the 10-year period, starting in 2021. The results are presented in with deforestation in the Reference Region planned for the first 10 years of the Project. In the developed scenario, Fazenda Jutaituba will have total deforestation of 6,685 hectares over the first 10 years of the Project. It is estimated that, in 30 years, Fazenda Jutaituba may lose a forest area of up to 34,644 hectares.

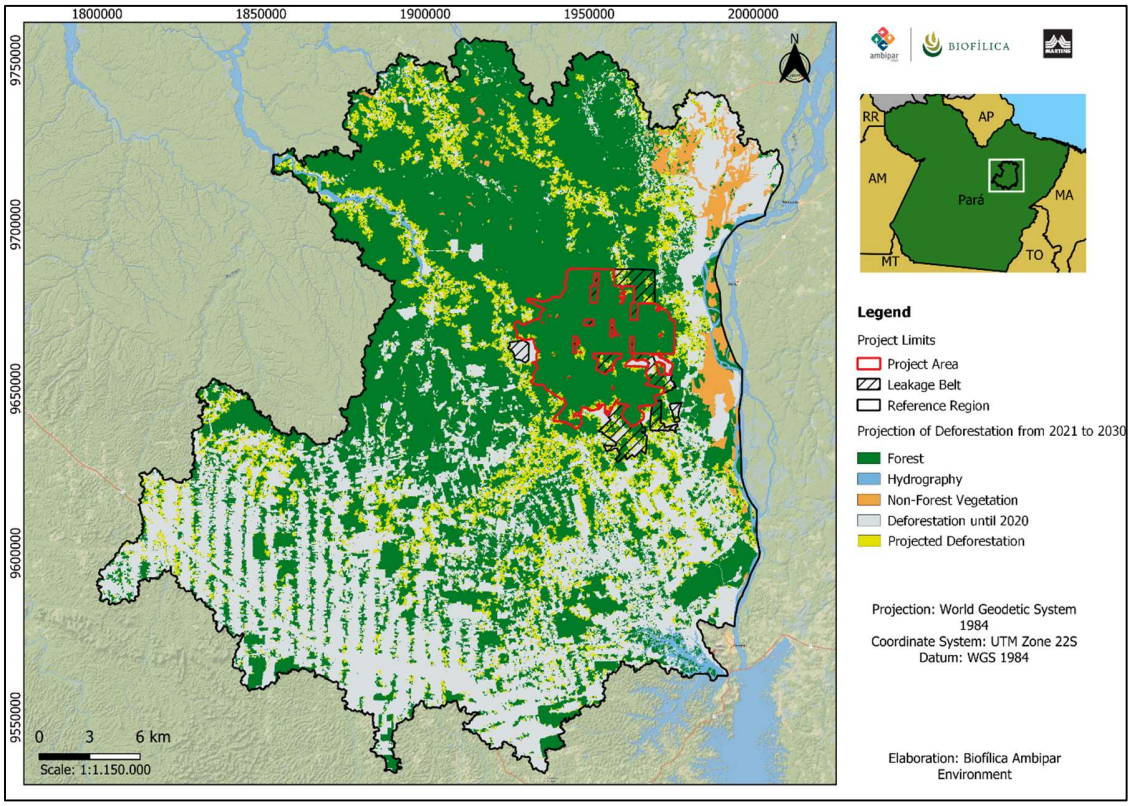


Figure 15 - Deforestation projected in 10 years in the Reference Region.

3.1.5 Additionality

The additionality of the Project was analyzed according to the tool approved by VCS "VT0001 – Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities", version 3.0, of February 01, 2012.

The conditions of applicability of the tool are met, because:

• AFOLU activities are the same as or similar to the proposed activities of the Project, within their respective limits, whether or not registered as an AFOLU VCS Project, and do not lead to violation of any applicable law even if this law is not applied; and

• The VM0015 baseline methodology provides a step-by-step approach to justify the determination of the most plausible baseline scenario (see "Part 2 – Methodology Steps for ex ante estimation of GHG emissions reductions" of VM0015).

Step 1. Identification of alternative land use scenarios to the VCS AFOLU Project activity

Sub-step 1a. – Identify credible alternative land use scenarios to the proposed VCS AFOLU Project activities

The scenarios described in this item were based on the data collected by the socioeconomic study carried out in 2022 and by the field consultation carried out in 2021, which included the use of secondary data (literature review in public institutions bases) and primary data, resulting from the Participatory Rapid Rural Diagnosis (DRP) with rural communities around the Fazenda Jutaituba; individual interviews with farm workers; and individual research carried out with rural owners also around the Fazenda Jutaituba.

Among the realistic and credible alternative land use scenarios that would occur within the limits of the Project in the absence of AFOLU Project activity recorded in the VCS, the following were considered:

i) Continuation of pre-project land use (baseline scenario):

In the project region, the historical process of land use change is closely related to the population increase around the Fazenda Jutaituba, leveraged, especially, by infrastructure works and logistics projects implemented in the region. The installation and maintenance of these enterprises, mainly road and port, attract migrants in search of jobs and land, as well as generate expectations of better living conditions for local communities. At the same time, they facilitate the flow and logistics of irregular logging by locksmiths and charcoal workers. These people, throughout the historical process, become agents of deforestation, putting pressure on the remaining native forests to expand the agricultural frontier, consequently encouraging irregular practices, such as land speculation and illegal logging for the supply of timber, sawmills and charcoal plants. Thus, these "deforestation agents" are defined as family farmers and landowners, local and migrants, who, attracted by favorable logistics conditions, settle in rural areas, practicing deforestation through the conventional technique of agricultural production, construction of improvements, plantations of agricultural commodities and raising of beef cattle on large farms.

Thus, these agents enhance the traditional practice of agricultural production, based on the conventional technique of "cutting and burning", especially for the implantation of subsistence crops

by small rural producers; soybean cultivation in large latifundia and cattle raising in extensive pastures. The frequency of this action, as a consequence, depletes fertility, promotes increased demand for agricultural areas and puts enormous pressure on natural resources from conserved forests in the region. This scenario is observed through indicators that demonstrate the historical growth of deforestation in the localities surrounding the project, generating great social and environmental impacts.

Corroborating the above panorama, according to secondary IBGE data determined by the socioeconomic diagnosis, the demographic census between 2000 and 2010 showed an increase of more than 100% of the population in 10 years. In this sense, the population increase will drastically impact social and environmental aspects in the region. And, consequently, predatory activities will be considerably intensified with the proliferation of degraded and unproductive agricultural areas, considering the low level of training and technical assistance, which generate pressure on new areas. As well as there will be an intensification of the irregular performance of local loggers, sawmills and charcoal factories by attracting outsiders and the action of families from surrounding communities.

An additional factor that stimulates this dynamic in the region is the fragility and low governance by state and federal governments, showing no sign of change, resulting in impunity for illegal practices and enhancing the occurrence of deforestation in native forest fragments in the region.

Therefore, with the continuation of this dynamic, for the next 10 years (2021-2030), a loss of 269,828 hectares is projected in this scenario, of which 6,685 hectares are expected to be deforested in the Project area. In the scenario described, this dynamic tends to remain until much of the forest cover is changed, generating an invaluable impact on local biodiversity, and further deepening social and economic problems. Thus, this scenario can be classified as the common practice scenario in the region, or business as usual scenario.

ii) Wood Management without REDD+ activities and without registration as a VCS AFOLU Project:

This scenario represents the maintenance of sustainable forest management activities within all relevant regulations, norms, standards and legislation, without additional investments in forest conservation, communities and biodiversity.

Sustainable Forest Management, especially that which follows the assumptions of certification, is recognized by several experts as a tool for forest conservation, maintenance of forest carbon stocks and reduction of deforestation rates (PORTER-BOLLAND et al., 2012[77]; VERÍSSIMO et al., 1992[78];

[77] PORTER-BOLLAND L., ELLIS E.A., GUARIGUATA M.R., RUIZ-MALLEN I., NEGRETE-YANKELEVICH S., REYES-GARCIA V. Community managed forests and forest protected areas: An assessment of their conservation effectiveness across the tropics (2012) **Forest Ecology and Management**, 268, pp. 6-17.
[78] VERÍSSIMO, A., BARRETO, P., MATTOS, M., TARIFA, R., & UHL, C. (1992). **Logging impacts and prospects for sustainable forest management in an old Amazonian frontier: the case of Paragominas in Forest Ecology and Management**. Belém: Imazon

BARRETO et al.[79], 1998; HOLMES et al.[80], 2002; PUTZ et al., 2008[81]; SPATHELF et al., 2004[82]). This model of exploitation in natural forests in the Amazon is based on the application of techniques of reduced impact, which integrates the values of the forest with socioeconomic development.

However, the complexity and scale of operation of certain activities, combined with bureaucratic obstacles to the legal management procedure and the financial instability of the timber market make the model excessively costly and risky. Thus, the investment in sustainable practices described in the Fazenda Jutaituba Management Plan (revised in 2020), such as the use of low-impact harvesting systems associated with the perpetuity of the forest; the multiple use of the forest considering non-timber forest resources; the maintenance of ecological balance through the preservation and protection of fauna; social and environmental responsibility actions and initiatives to monitor the economic and financial efficiency of management is compromised and/or becomes secondary in view of the need for survival and effectiveness of the operation in the face of obstacles, barriers and challenges.

At the same time, the establishment of a legal and certified management plan does not effectively guarantee advantages in the market, mainly due to the great competition with illegal timber, whose value is lower than that handled. In addition, rural properties that have forest reserves need to deal with the constant external threat of invasion of forest fragments, since they, due to the historical panorama described in scenario (i), are in imminent situations of pressure and vulnerability.

In this sense, despite the legalized forest management and auxiliary certificate for the conservation of the standing forest and for the maintenance of carbon stocks, through the sustainable management of the forest, forest reserves are subject to the occurrence of illegal deforestation caused by external agents, even if in a smaller proportion and in a more punctual way than unmanaged areas. In addition, the expansion of the agricultural frontier through the conversion of remnants of conserved forests to the implantation of subsistence crops, cultivation of commodities of large estates and livestock farming in extensive pastures becomes more attractive and financially more advantageous, since the governance of deforestation inspection is inefficient, and the cost of implantation and maintenance of these activities are substantially lower. In addition to the demand for agricultural properties, infrastructure and logistics projects in the Fazenda Jutaituba region also contribute to the appreciation of land in deforested areas, leading to real estate speculation.

In this sense, despite the use of guidelines and practices to mitigate forest damage, the high cost of forest management, the constant market uncertainties and the pulsating pressure on areas, which allows the irregular invasion of forest fragments, make forest reserves in the Amazon on private properties vulnerable to illegal deforestation. Thus, sustainable forest management in the Fazenda Jutaituba region requires additional investments and complementary activities in order to slow down the scenario described above. Therefore, the economic viability of management is reduced without the aggregation of additional revenue resulting from the commercialization of credits recorded in the VCS.

[79] BARRETO, P.; AMARAL, P.; VIDAL, P.; UHL, C. Costs and benefits of forest management for wood reduction in the Eastern Amazon. Belém: Imazon, **Série Amazônia**, v. 10, p. 46, 1998.
[80] HOLMES, T. P., BLATE, G. M., ZWEEDE, J. C., PERREIRA JUNIOR, R. L., BARRETO, P., & BOLTZ, F. (2002). Financial costs and benefits od reduced impact logging compared to conventional logging in the Eastern Amazon. Belém: Tropical Forest Foundation, p. 66, 2ª edition.
[81] PUTZ FE, ZUIDEMA PA, PINARD MA, BOOT RGA, SAYER JA, et al. (2008) Improved tropical forest management for carbon retention. **PLoS Biol**, v. 6, n. 7, 166p.
[82] SPATHELF, P.; MATTOS, P. P.; BOTOSSO, P. C. Forest certification in Brazil – na effective tool for the conservation of natural forests? **Revista Floresta** 34(3) Sep/Dec 2004, 373-379, Curitiba-PR.

iii) Wood Management with REDD+ activities registered as a VCS AFOLU Project:

This scenario represents the maintenance of the conduct of FSC certified forest management activities within all relevant regulations, norms, standards and legislation, with investments aimed at reducing deforestation, and initiatives aimed at forest conservation, communities and biodiversity.

Although the activities associated with legalized and certified forest management contribute to the maintenance of forest cover, preservation of biodiversity, climate regulation and socioeconomic development, the forest is still subject to the action of the environmental degradation agents mentioned in scenario (i), which promote illegal deforestation and substantial loss of carbon stock. The difficulty in containing the clearing of forests in the region, aggravated by the problematic inspection system, drives the increase in demand for areas for agricultural activities and real estate speculation around the Fazenda Jutaituba, weakening and pressuring private rural properties with conserved forest reserves. Therefore, in addition to the action of the agents and drivers mentioned, the market uncertainties and the high costs associated with the sustainable management model can lead to fragility in the property security of private properties, especially in times of financial crisis, causing invasions and damage to the forest.

Given this scenario, considering that the economic viability of sustainable forest management is compromised in the long term when complementary activities are covered; the additional revenue resulting from the sale of verified credits for specific investments in containment and monitoring initiatives in the Fazenda Jutaituba region, such as: strengthening of governance, intensification of surveillance and asset security, monitoring of deforestation via satellite images, formalization of access to property for stakeholders, promotion of sustainable practices in agricultural production and extraction of non-timber forest products, in situ monitoring of biodiversity, training and environmental education with communities and properties surrounding the project area.

Therefore, the aggregation of additional revenue from the commercialization of verified credits and records would provide positive net impacts to the preservation of forest cover and the maintenance of carbon stock, as well as co-benefits to biodiversity and communities in the project region. In addition, it would enable the economic viability of the sustainable management model, leveraging its generation of value in the certified timber market.

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

Of the proposed scenarios, scenarios (ii) and (iii) are in compliance with all applicable legal and regulatory requirements and only the practices contained in scenario (i) are not in accordance with mandatory legislation and regulations.

Illegal or unauthorized deforestation occurs in a systematic and widespread manner in the Legal Amazon. According to the Annual Deforestation Report in Brazil (2020)[83], released by the MapBiomas Project, in the Amazon biome, only 4% of the deforested areas in 2020 had Vegetation Suppression Authorization (ASV) by the responsible government agencies. In addition, the document also exposes the difficulty of the competent environmental agencies in overseeing and

[83] Annual Report on Deforestation in Brazil 2020 - São Paulo, Brazil - MapBiomas, 2021 - 93 pag. Available in: http://alerta.mapbiomas.org

punishing illegal suppressions in the states of the Legal Amazon. For example, between 2018 and 2021, IBAMA embargoed and/or assessed only 8% of the areas with irregular forest clearing in the state of Pará. These figures reinforce government limitation to ensure compliance with laws and regulations that have been created to prevent deforestation.

Strengthening the panorama exposed, a study carried out by the Institute of Man and the Amazon Environment (IMAZON, 2013[84]) showed that for the years 2011 to 2012, 78% of timber exploitation was unauthorized and although of these 78% the majority (67%) was located in private areas, vacant or under dispute. This data corroborates previous studies by the same organization that identified the "private, unused and unclaimed" land categories as the main stages of illegal/ unauthorized deforestation. Reinforcing this information, more recently, the MapBiomas report (2021) revealed that between 2019 and 2020 there was a 15% increase in deforestation in areas under Sustainable Forest Management Plans in force, places where any type of intervention involving shallow cuts of tree individuals and land use conversions is prohibited, until the management period is completed.

Given this context, considering Portel and the other cities that include Fazenda Jutaituba (Bagre, Baião and Oeiras do Pará), as well as the environmental regulations in force (Law 12.651/2012 - Native Vegetation Protection Law[85] - Normative Instruction No. 02, of July 06, 2015[86]), which deals with the suppression of native vegetation in rural properties or cutting trees in urban areas, it is understood that any activity that requires the suppression of native vegetation is conditioned to the issuance of ASV by the government agency, whether state or federal. Since 2018, authorizations granted by states must be issued or registered in the National System of Control of Origin of Forest Products (SINAFLOR), which is managed by IBAMA. However, Pará is not yet fully integrated into the system, and the verification of the existence of authorization is carried out at the state base. In this sense, in consultation with the platform of the Integrated Environmental Monitoring and Licensing System (SIMLAM)[87] of the Secretariat of Environment and Sustainability of Pará (SEMAS-PA), it was observed that no authorizations for suppression of native vegetation were registered in the cities that cover the Fazenda Jutaituba. Thus, it is understood that all suppressed forest area identified in the reference region of the Project in the period analyzed in the diagnoses was carried out illegally.

Finally, the city of Portel, which belongs to Fazenda Jutaituba, is in tenth place among the 50 cities that deforested the most between 2019 and 2020 in Brazil. Therefore, it was defined by the National Council of the Amazon, in February 2021, as a priority for actions of Operation Brazil Green, which aims to promote initiatives for the prevention, control and monitoring of deforestation. Between 2018 and 2021, 29,940 hectares of forests were suppressed in the city. These numbers, obtained through the Amazon monitoring system carried out by INPE[88], demonstrate the historical trend of growth of forest clearing, not only for that city, but also for the entire Project region, even without presenting any licensing record for such activities.

[84] IMAZON. (2013). Imazon: Illegal deforestation grows 151% in Pará. Amazon, P. 1- 3
[85] BRASIL. Law Nº 12.651, may 25, 2012. Available in: L12651 (planalto.gov.br)
[86] Government of state of Pará. Instrução Normativa nº 2, of july 6, 2015.Belém-PA, 08 jul. 2015. Available in: https://www.semas.pa.gov.br/legislacao/files/pdf/176.pdf.
[87] SEMAS – Secretary of state for environment and sustainability. Integrated Environmental Monitoring and Licensing System **(SIMLAM)**. Available in: https://monitoramento.semas.pa.gov.br/simlam/index.htm.
[88] INPE – National Institute for Sapece Research. Deforestation Monitoring Project in the Legal Amazon by Satellite **(PRODES)**. Available in: http://www.dpi.inpe.br/prodesdigital/prodesmunicipal.php.

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

Described in Section 3.1, specified in item 3.1.4 Baseline Scenario.

Step 2: Investment Analysis

Under development

Step 3 – Barrier Analysis

The VCS "VT0001 – Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities - requires investment analysis (Step 2) or Barrier Analysis (Step 3). In this case, we opted for the Investment Analysis, already described in Step 2.

Step 4: Common Practice Analysis

The fourth stage of the additionality analysis considers the evaluation of areas similar to the model proposed by the REDD+ project to identify common practices. For this verification, the geographical delimitation of the Reference Region of the Jutaituba REDD+ Project was considered.

As the region where the Jutaituba REDD+ Project to be implemented has differentiated characteristics compared to other regions of the state of Pará, it was decided to restrict the analysis to the Reference Region, instead of expanding to other regions of the state. For this similarity analysis, basic assumptions associated with land use category, area size, economic activities developed and/or proposed management plan, regulatory structure, environmental characteristics and context of action of deforestation agents and drivers were applied.

To identify possible areas like the Jutaituba REDD+ Project, a search was made of all properties within the Reference Region registered in the Rural Environmental Registry (CAR)[89]. Then an analysis was carried out highlighting which properties had areas close to the size of the project area (Figure 16), one of the premises to be considered a common practice area. In addition, the land situation of the property was evaluated, considering the regularized areas according to the land data available on the INCRA website[90].

[89] SICAR – National Rural Environmental Registry System. Rural Environmental Registry **(CAR)**. Available in: https://www.car.gov.br/#/.
[90] INCRA – National Institute of Colonization and Agrarian Reform. Land Management System **(SIGEF)**. Available in: https://sigef.incra.gov.br/.

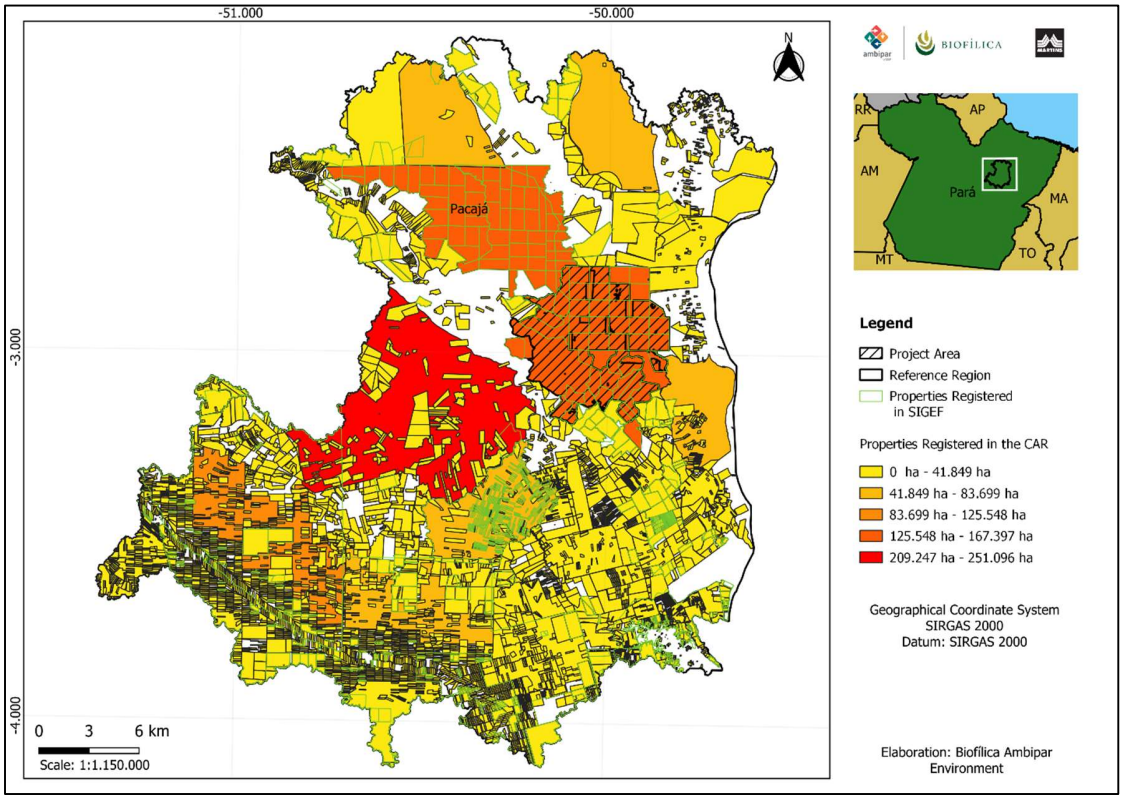


Figure 16 - Properties registered in the CAR within the Reference Region of Jutaituba REDD+ Project.

According to the results found in the analyzes described above, in the context of the Reference Region of the Jutaituba REDD+ Project, the areas surrounding the Fazenda Jutaituba represent a particular context, since the private properties observed in the surroundings are of a considerably smaller scale and do not present a record of application of multiple use forest management. The potential private properties categorized as large in the vicinity of Fazenda Jutaituba, manifest themselves with land instabilities regarding the performance of land grabbers, squatters and land conflicts; making it impossible to analyze "business as usual" in these locations.

Unlike the panorama described, the private property Fazenda Pacajá, located in the city of Portel, has characteristics similar to the Jutaituba REDD+ Project Area in terms of scale, environmental characteristics and assumptions for sustainable exploitation of forest resources. However, it belongs to a REDD+ project registered on the Verra platform (The Rio Anapu-Pacaja REDD Carbon Credit Project – ID 2252), under VCS and CCB certification, which aims to promote environmental, socioeconomic and regulatory benefits for the project area and its surroundings through the conservation of the remaining native forest; making it impossible to assess any kind of common practice similarity.

In this sense, all areas, including Fazenda Pacajá, do not represent the "business as usual" scenario in the Reference Region of the project and, as a conclusion of this analysis, it was found that there is no common practice for the Jutaituba REDD+ Project in the geographic region analyzed.

This understanding demonstrates the relevance of the Jutaituba REDD+ Project for the evaluated region, considering the particular environmental and socioeconomic characteristics of Fazenda Jutaituba and its immediate surroundings. The activities proposed by the project, associated with sustainable forest management, in addition to directly helping to preserve the standing forest, will also mitigate land pressure on native forest fragments, providing co-benefits to biodiversity and communities in the project region.

3.1.6 Methodology Devices

No methodology deviation was applied in this Project.

3.2 Quantification of GHG Emission Reductions and Removals

3.2.1 Baseline Emissions

Step 5 of VM0015 – Definition of land-use and land-cover change component of the Baseline

Calculation of baseline activity data per forest class (Step 5.1 VM0015)

Result of basic projections of the Project indicates deforestation of approximately 6,685 hectares for the Project Area between 2021 and 2030 (Table 29) and 7,948 hectares for the Leakage Belt (Table 30).

Table 29 - Annual deforested areas by forest class icl within the Project Area in the case of the baseline (baseline activity data by forest class) (Table 11b of Methodology VM0015).

Area deforested per forest class *icl* within the project area		Total baseline deforestation in the project area	
ID_{icl}>	icl1	$ABSLPA_t$	ABSLPA
Name>	Forest	annual	cumulative
Project year$_t$	ha	ha	ha
2021	514	514	514
2022	708	708	1.222
2023	547	547	1.769
2024	348	348	2.117
2025	557	557	2.674
2026	699	699	3.373
2027	802	802	4.175
2028	683	683	4.858
2029	986	986	5.844
2030	841	841	6.685

Table 30 - Annual deforested areas by forest class icl within the Leakage Belt area in the case of the baseline (baseline activity data by forest class) (Table 11c of Methodology VM0015).

Area deforested per forest class *icl* within the leakage belt area		Total baseline deforestation in the leakage belt area	
ID_{icl}>	icl1	$ABSLLK_t$	ABSLLK
Name>	Forest	annual	cumulative
Project $year_t$	ha	ha	ha
2021	762	762	762
2022	824	824	1.586
2023	787	787	2.373
2024	860	860	3.233
2025	765	765	3.998
2026	909	909	4.907
2027	631	631	5.538
2028	965	965	6.503
2029	785	785	7.288
2030	660	660	7.948

Calculation of baseline activity data per post-deforestation forest class (Step 5.2 VM0015)

Method 1 available in the VM0015 methodology was used to define the class that will replace the forest cover at the Project baseline (anthropogenic vegetation at equilibrium). Table 31 Shows the area of zone 1, which covers the Project Area, Leakage Belt and Leakage Management Areas, and the corresponding areas of each land use/land use change class post deforestation.

Table 31 - Zone of the Reference Region that covers potential post-deforestation LU/LC class (Table 12 of VM0015 Methodology).

Zone		Name		Total of all other LU/LC classes presents in the zone		Total area of each Zone	
		Zona 1					
		ID_{fcl}	1				
		Area	% of Zone	Area	% of Zone	Area	% of Zone
IDz	Name	ha	%	ha	%	ha	%
1	Zone 1	202.689	100	14.633	7,22%	202.689	100
Total area of each class *fcl*		202.689	100	14.633	7,22%	202.689	100

The area projected to be deforested is reported in Table 32 (for the Project Area) and Table 33.

Table 32 - Annual deforested areas in each zone within the Project Area in the case of the baseline. (VM0015 Methodology Table 13b).

Area established after deforestation per zone within the project area		Total baseline deforestation in the project area	
IDz>	1		
Name>	Zone 1	$ABSLPA_t$	ABSLPA
Project year$_t$	ha	ha	ha
2021	514	514	514
2022	708	708	1.222
2023	547	547	1.769
2024	348	348	2.117
2025	557	557	2.674
2026	699	699	3.373
2027	802	802	4.175
2028	683	683	4.858
2029	986	986	5.844
2030	841	841	6.685

Table 33 - Annual deforested areas in each zone within the Leakage Belt in the baseline box (VM0015 Methodology Table 13c).

Area established after deforestation per zone within the leakage belt		Total baseline deforestation in the leakage belt	
IDz>	1		
Name>	Zone 1	$ABSLLK_t$	ABSLLK
Project year$_t$	ha	ha	ha
2021	762	762	762
2022	824	824	1.586
2023	787	787	2.373
2024	860	860	3.233
2025	765	765	3.998
2026	909	909	4.907
2027	631	631	5.538
2028	965	965	6.503
2029	785	785	7.288
2030	660	660	7.948

Calculation of baseline activity data per land use and land cover change category (Step 5.3 VM0015)

It does not apply because method 2 was not performed.

Step 6 of VM0015: Estimation of baseline carbon stock changes and non-CO_2 emissions

Estimate of baseline carbon stock changes (Step 6.1 VM0015)

The estimate of the carbon stock for the forest class was obtained through the forest inventory carried out by the technical team of STA – Environmental Technical Solutions, in 2021, in partnership with Biofílica Ambipar Environment. The main results found in this study will be described below, and more information can be obtained in the Final Carbon Inventory Report of the company STA.

The following is a summary of the estimates of carbon stocks in the area of Fazenda Jutaituba.

Estimate of average carbon stocks of each land use and land cover class (Step 6.1.1 VM0015)

The development of the forest carbon inventory in the Fazenda Jutaituba area occurred unforeseen and as planned. All work has been carried out to meet the requirements of VCS Standard Methodology VM0015 (*Verified Carbon Standard*). The sample design defined the number, format, spatial distribution and allocation of the plots to ensure a sampling error of the average carbon per hectare, compatible with that required by the VM0015 Methodology. The area was stratified into two attributes: Forest Typology (four types of vegetation described in the item 2.1.5 and Deforestation Risk Level (high risk, low risk). A *buffer* area (6 km) of the roads was generated to enable the access of the field teams in the installation of the plots. In total, 46 plots of 1 ha (100 mx100 m) were installed, and the sampling error achieved for the project was 5.2% - therefore, within the limit required by the methodology, which is at most 10%.

The sample units were allocated mainly in the access areas, considering the stratification of the forest typology and the deforestation risk. The allocation of sample units did not compromise its representativeness, since the access region comprises more than 80% of the project area and more than 50% of each forest typology of the project area

The number of samples under stratified sampling was calculated by multiplying the design effects by the number of samples required under a simple random sampling (Lohr, 2019). Considering the estimate of the total variance, 6% sample error and 95% confidence, the design effect is given by:

$$ef = \frac{\left(\frac{\sum N_k \sigma_k^2}{N}\right)}{\sum\left(\frac{N_k}{N} \times \sigma_k^2 + (\mu_k - \mu)^2\right)}$$

Where:

ef = effect of the drawing;

N_k= number of hectares of stratum k;

σ_k^2 = variance of the stratum k;

μ_k= average of stratum k.

Thus, the total number of samples under stratified sampling was equal to:

$$n = ef \times n^{\wedge *}$$

Where:

n= total number of samples;

ef = effect of the drawing;

$n^{\wedge}$*= a constant (31), calculated from the variance and mean ratio (n^{*}).

$$n^{*} = \left(\frac{1{,}96\sigma}{0{,}06\mu}\right)^{2}$$

We consider the same cost for all regions of the project, the sampling is distributed proportionally to the variance and the size of the strata, so that the number of samples per stratum is given by:

$$n_k = n \times \frac{N_k \sigma_k}{\sum N_k \sigma_k}$$

In this context, the number of samples independently calculated per stratum varied between 03 and 09, totaling 27 samples in high-risk areas and 19 samples in low-risk areas.

The 46 plots were randomly allocated and for this, the area was gridded in 100 m x 100 m numbered squares and randomly drawn in the R Software[91]. The draw aimed to reach the number of samples required for each of the eight strata as shown in Figure 17.

For the data collection of fallen dead wood on the ground, a transect was systematically allocated 20 m from the first vertex of the plot.

[91]R Core Team. 2018. “R: The R Project for Statistical Computing". 2018. https://www.r-project.org/.

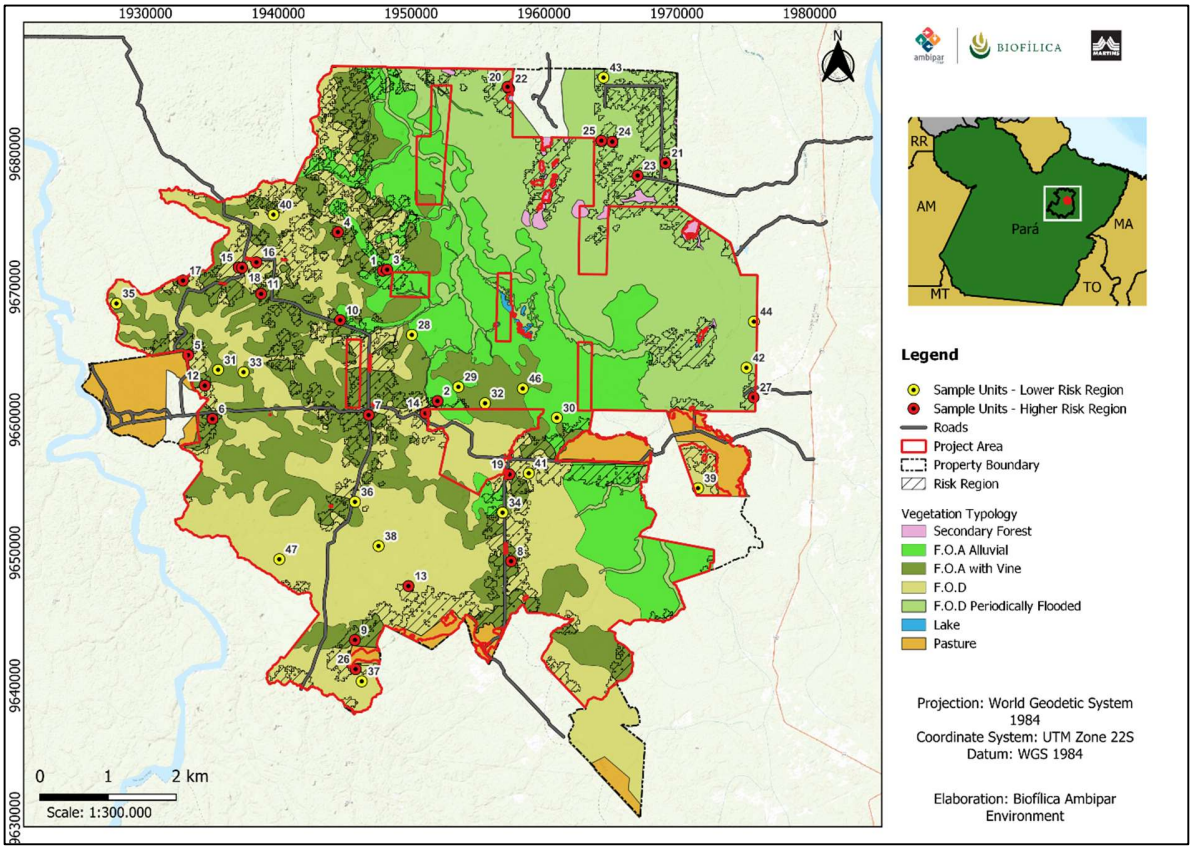


Figure 17 - Location of the sample plots of the carbon inventory.

Calculation of biomass and stock estimates

The estimates of biomass and carbon stock were calculated for four carbon pools, important for forest typologies, they are: Live biomass above ground; Live biomass below ground – roots; Dead wood biomass standing; Dead wood biomass on the ground.

Live above-ground biomass:

For each plot of 1 ha, all individuals with pad ≥ 10 cm within the plot were inventoried; individuals were identified by the common name and their circumferences at height (CAP) of 1.30 m were measured and later transformed into pad. All trees were marked at the height of diameter measurement, so that there was no duplication of measurement.

The biomass of each tree with pad ≥ 10 cm was obtained using the allometric equation developed by Nogueira et al. (2008):

$$DWabg = exp\,(-1{,}716 + 2{,}413\,x\,ln\,(DAP))$$

Where:

$DWabg$= dry weight of the living biomass above ground;

DAP = diameter at breast height (1.30 m).

Palm trees and vines were excluded from the sample, as they are not significant components of the carbon stock, according to the VM0015 methodology.

Thus, the biomass of living trees was converted to carbon (Mg) using the dry biomass/ carbon conversion factor of 0.485, according to Nogueira et al. (2008).

Biomass below ground:

For all trees within the plots with pad > 10 cm, the root biomass was estimated, for which the equation of Silva (2007)[92] was used:

$$FWRoot = 0{,}0469\ x\ DAP^{2{,}4754}$$

Where:

$FWRoot$= fresh weight of the roots;

DAP = diameter at breast height (1.30 m).

The fresh weight of the roots was then converted to dry *weight* (DWroot) using the 0.533 root moisture factor as described by Silva (2007).

DWroot= FWroot X 0.533

The biomass of the roots of living trees was also converted to carbon (in Mg) with a dry biomass/ carbon conversion factor of 0.485, according to Nogueira et al. (2008)[93].

Dead wood biomass:

The sampling of standing dead wood and dead wood on the floor was performed according to the guidance of the VM0015 methodology. The deadwood data were collected in the same plots of the sample inventory of live trees, but different procedures were used to estimate the average carbon stocks of standing deadwood and deadwood on the ground.

The average of the total carbon of dead wood per hectare is given by the sum of the average of each component (dead standing and dead on the ground):

$$Cdwclx = Csdwx + Cldwx$$

Where:

$Cdwcl$ = average carbon stock per hectare in the dead wood carbon pool of the typology$x$;

$Csdwx$= average of the carbon stock per hectare in the deadwood carbon pool standing from the typology$x$; $Cldwx$ = average of the carbon stock per hectare in the deadwood carbon pool on the floor of the typology$x$.

Dead wood standing:

[92] SILVA, R.P. 2007. Alometria, estoque e dinâmica da biomassa de florestas primárias e secundárias na região de Manaus (AM). Tese de Doutorado, Curso de Ciências de Florestas Tropicais do INPA. 135p.

[93]Nogueira, E., P. Fearnside, B. Nelson, R. Barbosa, and E. Keizer. 2008. Estimates of forest biomass in the Brazilian Amazon: New allometric equations and adjustments to biomass from wood-volume inventories." Forest Ecology and Management 256 (11): 1853–67. https://doi.org/10.1016/j.foreco.2008.07.022.

All dead standing trees, with DBH ≥ 10 cm, had the DBH measured, and the height estimated, similarly, to living trees (Figure 6). The carbon pool "standing dead wood" was divided into 4 classes (per se methodology VM00015):

- **Class 1:** Trees with large, medium branches and sticks (same for living tree, but without leaves);
- **Class 2:** Trees without sticks, but with large and small branches;
- **Class 3:** Trees with large branches only;
- **Class 4:** Unbranched log.

In class 1, the biomass of each standing dead tree was estimated using the same allometric equation that was applied to the living trees (Methodology VM00015), that is, the equation of Nogueira et al. (2008) and then the biomass of the leaves was subtracted (3% of the living biomass above the soil, according to page 147 “d” of the VM0015 methodology).

In Classes 2, 3 and 4, the LN Guerra volume equation was first used and then the volume was then converted to dry biomass using the average density of the region's species (0.57 Mg m^3). At this time, the biomass expansion factor (BEF) was not used. The volume and biomass equations were:

Equation for volume:

$$V = \left(\frac{\pi}{4}\right) \times DAP^2 \times H \times 0{,}7$$

Equation for Biomass: $DW = V \; x \; 0{,}57$

Where:

V= volume of the tree in cubic meter;

H= height of the tree in meters;

DAP= diameter of the tree at breast height (1,30 m);

π= 3.1416;

DW= biomass of the tree.

The biomass of standing deadwood was converted to carbon (Mg) using the dry biomass/ carbon conversion factor of 0.485, according to Nogueira et al. (2008).

Dead wood on the ground:

Only dead wood on the floor with pad > 10 cm was measured. The measurement of dead wood on the ground was performed on top of an in-line transect, 100 m long, positioned 20 m from one side of the plot. Along the length of the transect was measured the diameter of each piece of dead wood that had: (1) more than 50% of the trunk above the ground and (2) that touched the transect at least 50% of the diameter of the part.

One of the following three density classes (per se VM00015 methodology) was assigned to each piece of dead wood: rotten; intermediate; and hard.

Using a chainsaw, a piece of the dead wood piece (corresponding to a sample) was cut and taken to the laboratory to determine the density of the wood.

The average density of each class was calculated according to the VM0015 Methodology:

$$Dm = \frac{1}{Ps - \frac{Po}{Po} + \frac{1}{1{,}53}}$$

Where:

Dm= dead wood density (g cm^{-3})

Ps= saturated weight of the sample (g);

Po= dry weight of the sample (g);

$1{,}53$= density constant.

For each density class, the volume was calculated separately as follows:

$$V = \pi \cdot \frac{d_1^2 + d_2^2 + d_n^2}{8 \,.\, L}$$

Where:

V= volume (m^3 ha^{-1});

$d_1,\ d_2\ e\ d_n$ = diameter of the pieces of wood at the intersection with the intersect (cm);

L= length of the line (m).

Finally, the carbon stock per hectare of dead wood on the floor of each class was calculated using the following equation:

$$C_{ldw} = \sum volume d_c \,.\, d_c \,.\, FC$$

Where:

C_{ldw} = average carbon per hectare of dead wood on the ground (Mg C ha^{-1});

$volume d_c$= volume of dead wood in the density class d_c (m^3);

d_c= density class (Mg m^{-3});

FC= carbon fraction (Mg C dm^{-1}) = 0.485.

In the equation above, the conversion factor (FC) follows the same factor applied to the other pools, according to Nogueira et al. (2008).

Carbon stock in the Project Area:

The average carbon per hectare found in the four carbon pools analyzed was 184.7 Mg C ha^{-1}. The carbon stored in the biomass of living trees represents the highest percentage of the total carbon pools studied (87.06%), followed by the carbon stored in the biomass of the roots representing 13.1% of the total studied.

The carbon stock in dead wood was high, representing 12.94% of the total, being dead wood on the floor (9.64%) much higher than standing dead wood (3.30%). These percentages of dead wood are very similar to those found by Nogueira et al. (2008) and Houghton et al. (2001)[94], which found 9% and 8.3%.

[94]Houghton, R., D. Skole, C. Noble, and J. Hackler. 2000. "Annual fuxes of carbon from deforestation and regrowth in the Brazilian Amazon". Nature 403: 301–4.

The overall error percentage in the project area was 5.2%, well below the 10% established in the VM0015 methodology.

In order to calculate the values of Carbon equivalent (COe, sometimes also called CO_2e) presented in Table 34, the reduced emissions were calculated by multiplying the estimated inventory stock by 3.6667, because mass of CO_2 = 44 and mass of C = 12; 44/12 = 3.6667. The values were calculated in Carbon equivalent to be in accordance with Table 15 of the VM0015 methodology.

Table 34 - Carbon stock per hectare for the initial icl class existing in the Project area and leakage belt (table 15a of VM0015)

Initial forest class *icl*							
Name:	Forest						
ID_{icl}	1						
Average carbon stock per hectare + 90% CI							
Cab_{icl}		Cbb_{icl}		Cdw_{icl}		$Ctot_{icl}$	
C stock $tCO_2e\ ha^{-1}$	± 95% CI $tCO_2e\ ha^{-1}$	C stock $tCO_2e\ ha^{-1}$	± 95% CI $tCO_2e\ ha^{-1}$	C stock $tCO_2e\ ha^{-1}$	± 95% CI $tCO_2e\ ha^{-1}$	C stock $tCO_2e\ ha^{-1}$	± 95% CI $tCO_2e\ ha^{-1}$
500,9	24,54	88,7	4,53	87,6	15,8	677,2	44,9
tC ha-1	IC %	tC ha-1	IC %	tC ha-1	IC %	tC ha-1	IC %
136,6	5%	24,2	5%	23,9	5%	184,7	5%

Where:

Cabicl : Average equivalent carbon stock per hectare for the above-ground biomass reservoir for the initial forest class;

Cbbicl : Average equivalent carbon stock per hectare for the below-ground biomass reservoir for the initial forest class;

Cdwicl : Average equivalent carbon stock per hectare for the dead biomass reservoir for the initial forest class;

Ctoticl : Average carbon stock per hectare for the total biomass reservoir for the initial forest class

Post-deforestation classes designed for the Project area and leakage belt in the baseline scenario and non-forestry classes existing in the leakage management areas

The VM0015 methodology allows estimates of local studies and, therefore, the value of 60,4 $tCO_2e\ ha^{-1}$ was taken as a reference for the carbon stock of anthropogenic vegetation in the equilibrium class, the class that was designed to exist in the Project Area and Leakage Belt in the Project scenario. This carbon stock estimate was obtained by (WANDERLLI; FEARNSIDE, 2015)[95], through a long-term study of the landscape and average composition of vegetation in deforested

[95] WANDERLLI, E.V.; FEARNSIDE, P.M. Secondary vegetation in central Amazonia: Land-use history effects on aboveground biomass. Forest Ecology and Management, v. 347, n. 11, p. 140 – 148, 2015.

areas of the Brazilian Amazon, which consists of a matrix composed of pastures, small-scale agriculture and secondary vegetation, usually found in a post-deforestation scenario in the Amazon.

Wanderlli & Fearnside (2015) is a reviewed scientific literature, and represents one of the most current studies for the Brazilian Amazon on carbon stock in deforested areas, satisfying the requirements of Section 4.5.6 of the VCS Standard:

1. Data were not collected directly from primary sources;

2. The data were collected from secondary sources, by researchers from INPA (renowned research institute for the subject in Brazil), published by an International and reputable scientific journal (Forest Ecology and Management);

3. The data is from a period that accurately reflects the current practice available for the determination of carbon stock;

4. No sampling was applied to these data;

5. The data are available to the public through the website: http://www.ppginpa.eco.br/documents/teses_dissertacoes/wandelli-fearnside-2015-for-ecol-man_Land-use-history-and-capoeira-growth.pdf

6. They are available for independent evaluation of VCSA and VVB;

7. The data is appropriate for the geographical scope of VM0015,

8. Expert analysis was not necessary; and

9. Data is not kept only in a central storage repository.

Calculation of carbon stock change factors (Step 6.1.2 VM0015)

In the baseline scenario, the Project considers the change in the carbon stock of forest cover to be replaced by a type of vegetation that can be pasture areas, small-scale agricultural plantations or plantations (temporary or permanent). AFOLU requirements require that decomposition of carbon stock into soil carbon, biomass below ground, deadwood and harvested wood products, in the case of the baseline, be considered. To calculate this reduction in carbon stock, version VM0015 1.1 applies a standard linear function to explain the reduction in carbon stock in the initial forest classes (icl) and increase in carbon stock in post-deforestation use classes. Table 35 and Table 36 summarize how the carbon stock change factor was calculated.

Table 35 - Carbon stock change factors for initial forest classes icl (Method 1) (Table 20a of Methodology VM0015).

Year after deforestation		$\Delta Cab_{icl,t}$	$\Delta Cbb_{icl,t}$	$\Delta Cdw_{icl,t}$	$\Delta Ctot_{cl,t}$
0	t*	500,9	8,9	8,8	518,5
1	t*+1	0	8,9	8,8	17,6
2	t*+2	0	8,9	8,8	17,6
3	t*+3	0	8,9	8,8	17,6
4	t*+4	0	8,9	8,8	17,6
5	t*+5	0	8,9	8,8	17,6
6	t*+6	0	8,9	8,8	17,6

Year after deforestation		$\Delta Cab_{icl,t}$	$\Delta Cbb_{icl,t}$	$\Delta Cdw_{icl,t}$	$\Delta Ctot_{cl,t}$
7	t*+7	0	8,9	8,8	17,6
8	t*+8	0	8,9	8,8	17,6
9	t*+9	0	8,9	8,8	17,6
10	t*+10				
11	t*+11				
12	t*+12				
13	t*+13				
14	t*+14				
15	t*+15				
16	t*+16				
17	t*+17				
18	t*+18				
19	t*+19				
20-T	t*+20...				

Table 36 - Carbon stock change factors for final classes fcl or z zones (Method 1) (Table 20b of Methodology VM0015).

Year after deforestation		$\Delta Ctot_{fcl,t}$
0	t*	0,0
1	t*+1	6,0
2	t*+2	6,0
3	t*+3	6,0
4	t*+4	6,0
5	t*+5	6,0
6	t*+6	6,0
7	t*+7	6,0
8	t*+8	6,0
9	t*+9	6,0
10	t*+10	6,0
11	t*+11	0
12	t*+12	0
13	t*+13	0
14	t*+14	0
15	t*+15	0
16	t*+16	0
17	t*+17	0

Year after deforestation		$\Delta Ctot_{fcl,t}$
18	t*+18	0
19	t*+19	0
20-T	t*+20...	

Calculation of baseline carbon stock changes (Step 6.1.3 VM0015)

Method 1 (activity data available for classes) was used to calculate the total baseline carbon stock change in the Project Area (Table 37) and in the Leakage Belt (Table 38) in the following year equation 10 on page 72 of VM0015 version 1.1, as shown:

$$\Delta CBSLPA_t = \sum_{p=1}^{P}\left(\sum_{icl=1}^{Icl} ABSLPA_{icl,t} * \Delta Cp_{icl,t=t*} - \sum_{z=1}^{Z} ABSLPA_{z,t} * \Delta Cp_{z,t=t*} + \sum_{icl=1}^{Icl} ABSLPA_{icl,t-1} * \Delta Cp_{icl,t=t*+1} - \sum_{z=1}^{Z} ABSLPA_{z,t-1} * \Delta Cp_{z,t=t*+1} + \sum_{icl=1}^{Icl} ABSLPA_{icl,t-2} * \Delta Cp_{icl,t=t*+2} - \sum_{z=1}^{Z} ABSLPA_{z,t-2} * \Delta Cp_{z,t=t*+2} + \cdots + \sum_{icl=1}^{Icl} ABSLPA_{icl,t-19} * \Delta Cp_{icl,t=t*+19} - \sum_{z=1}^{Z} ABSLPA_{z,t-19} * \Delta Cp_{z,t=t*+19}\right)$$

Where:

ΔCBSLPAt: Total change of carbon stock from baseline in the Project Area in year t (tCO2-e);

ABSLPAicl, t: Area of the initial forest class icl deforested at time t within the Project Area in the case of the baseline (ha);

ABSLPAicl, t-1: Area of the initial forest class icl deforested at time t-19 within the Project Area in the case of the baseline (ha);

ABSLPAicl, t = t-19: Area of the initial class of the forest icl deforested at time t-19 within the Project Area in the case of the baseline (ha);

ΔCpicl, t = t *: The average carbon stock change factor for the carbon pool fixes the initial forest class icl applicable at time t (according to Table 20.a) (tCO2-e.ha-1);

ΔCpicl, t = t * + 19: The average carbon stock change factor for the carbon pool fixes the initial forest class icl applicable at time t = t * + 19 (20th year after deforestation, (according to Table 20.a VM0015) (tCO2-e. ha-1);

ABSLPAz, t: Zone z area "deforested" at time t within the Project Area in the case of the baseline (ha);

ABSLPAz, t-1: Zone z area "deforested" at time t- 1 in the Project Area in the case of the baseline (there is);

ABSLPAz, t-19: Zone z area "deforested" at time t-19 in the Project Area in the case of the baseline (ha);

ΔCpz, t = t * : Average change factor in carbon stock for the carbon pool z applicable at time t = t * (according to Table 20.b VM0015) (tCO2-e.ha-1);

ΔCpz, t = t + 1: Average change factor in carbon stock for the carbon pool applicable at time t = t * + 1 ((= second year after deforestation, according to Table 20.b VM0015) (tCO2-e.ha-1);

ΔCpz, t = t * + 19: Average change factor in carbon stock for the carbon pool applicable at time t = t * + 19 ((= 20 years after deforestation, according to Table 20.b VM0015) (tCO2-e.ha -1).

Table 37 - Baseline of carbon stock change in the Project Area (Table 21b of VM0015 Methodology).

Carbon stock changes per initial forest class *icl*		Total carbon stock change of initial forest class in the project area		Carbon stock changes per post-deforestation zone z		Total carbon stock change of post-deforestation zones in the project area		Total net carbon stock change of the project area	
ID_{icl}>	1	$\Delta CBSLPA_{ic\ l,t}$	$\Delta CBSLPA_{i\ cl}$	ID_{iz}>	1	$\Delta CBSLPA_{z,t}$	$\Delta CBSLPA_{z}$	$\Delta CBSLPA_{t}$	ΔCBSLPA
Name >	Forest	annual	cumulative	Name >	Zone 1	annual	cumulative	annual	cumulative
Project Year *t*	tCO_2-e	tCO_2-e	tCO_2-e	Project Year *t*	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2021	266.513	266.513	266.513	2021	0	0	0	266.513	266.513
2022	376.168	376.168	642.681	2022	3.105	3.105	3.105	373.064	639.576
2023	305.176	305.176	947.857	2023	7.381	7.381	10.486	297.794	937.371
2024	211.640	211.640	1.159.497	2024	10.685	10.685	21.172	200.955	1.138.325
2025	326.146	326.146	1.485.643	2025	12.788	12.788	33.959	313.358	1.451.684
2026	409.598	409.598	1.895.241	2026	16.152	16.152	50.111	393.446	1.845.130
2027	475.332	475.332	2.370.573	2027	20.374	20.374	70.485	454.958	2.300.088
2028	427.775	427.775	2.798.348	2028	25.219	25.219	95.704	402.556	2.702.644
2029	596.928	596.928	3.395.276	2029	29.344	29.344	125.048	567.584	3.270.228
2030	539.135	539.135	3.934.411	2030	35.300	35.300	160.348	503.835	3.774.063

Table 38 - Baseline of carbon stock change in the Leakage Belt area (Table 21c of VM0015 Methodology).

Carbon stock changes per initial forest class *icl*		Total carbon stock change of initial forest class in the leakage belt area		Carbon stock changes per post-deforestation zone z		Total carbon stock change of post-deforestation zones in leakage belt area		Total net carbon stock change of the leakage belt area	
ID_{icl}>	1	$\Delta CBSLLK_{icl,t}$	$\Delta CBSLLK_{icl}$	ID_{iz}>	1	$\Delta CBSLLK_{z,t}$	$\Delta CBSLLK_{z}$	$\Delta CBSLLK_{t}$	$\Delta CBSLLK$
Name>	Forest	annual	cumulative	Name>	Zone 1	annual	cumulative	annual	cumulative
Project Year *t*	tCO_2-e	tCO_2-e	tCO_2-e	Project Year *t*	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2021	395.102	395.102	395.102	2021	0	0	0	395.102	395.102
2022	440.689	440.689	835.791	2022	4.603	4.603	4.603	436.086	831.189
2023	436.037	436.037	1.271.829	2023	9.580	9.580	14.183	426.457	1.257.646
2024	487.769	487.769	1.759.597	2024	14.334	14.334	28.517	473.435	1.731.081
2025	453.678	453.678	2.213.276	2025	19.529	19.529	48.045	434.150	2.165.230
2026	541.836	541.836	2.755.111	2026	24.149	24.149	72.195	517.686	2.682.917
2027	413.723	413.723	3.168.834	2027	29.640	29.640	101.835	384.082	3.066.999
2028	598.033	598.033	3.766.867	2028	33.452	33.452	135.287	564.581	3.631.580
2029	521.721	521.721	4.288.588	2029	39.281	39.281	174.567	482.441	4.114.021
2030	470.753	470.753	4.759.341	2030	44.022	44.022	218.590	426.731	4.540.752

Baseline non-CO2 emissions from forest fires (Step 6.2 VM0015)

Non-CO2 emissions were not considered and accounted for the REDD+ Jutaituba Project, due to the low risk in the Project Area.

3.2.2 Project Emissions

Step 7 of VM0015 - Ex ante estimation of actual carbon stock changes and non-CO2 emissions in the Project area

Non-CO2 emissions were not considered and accounted for the Jutaituba REDD+ Project.

Ex ante estimation of actual carbon stock changes (Step 7.1 VM0015)

Ex ante estimation of actual carbon stock changes due to planned activities (Step 7.1.1 VM0015)

The Jutaituba REDD+ Project Area has a forest management plan within its limits, which follows all regulations, norms, standards and legislation in force, aiming at the sustainable production of wood, through Reduced Impact Exploration (EIR) techniques that mitigate damage to the remaining forest, regulating production, guaranteeing a 35-year cutting cycle, thus allowing the conservation and development of natural regeneration and, consequently, biomass and carbon stocks. Because of this, the Project includes in its ex ante estimates planned deforestation, estimating the reduction of carbon stocks caused by the implementation of infrastructures, such as opening of roads and forest yards, necessary for the management within each Annual Production Unit (UPA), these changes will be monitored and measured in the ex post scenario, using the information from the post-exploratory reports and, discounting the value in hectares of the areas impacted for such infrastructures. The calculation of these areas was based on the annual operational plans and the

UPAs. The ex ante scenario estimates were reviewed with those responsible for forest management on the Fazenda Jutaituba based on the average area of the UPAs and the average open areas.

The Table 39 shows the estimated area of planned deforestation and the impact on carbon stock in the Project Area, these values were obtained by multiplying the average area of infrastructures opened annually by the average variation of carbon stock.

Table 39 - Ex ante estimate of inventory reduction due to planned deforestation in the Project area (Table 25a of the VM0015 Methodology).

Project Year *t*	Areas of planned deforestation x Carbon stock change (decrease) in the project area		Total carbon stock decrease due to planned deforestation	
	ID_{cl} =	1	annual	cummulative
	$APDPA_{icl,t}$	$Ctot_{icl,t}$	$\Delta CPDdPA_t$	$\Delta CPDdPA$
	ha	$tCO_2e\ ha^{-1}$	tCO_2e	tCO_2e
2021	76,5	677,2	51.814,7	51.814,7
2022	76,5	677,2	51.814,7	103.629,3
2023	76,5	677,2	51.814,7	155.444,0
2024	76,5	677,2	51.814,7	207.258,7
2025	76,5	677,2	51.814,7	259.073,3
2026	76,5	677,2	51.814,7	310.888,0
2027	76,5	677,2	51.814,7	362.702,7
2028	76,5	677,2	51.814,7	414.517,3
2029	76,5	677,2	51.814,7	466.332,0
2030	76,5	677,2	51.814,7	518.146,6

Planned timber extraction

The forest management area located within the limits of the Project has the logging operation based on techniques of reduced impact, aiming to mitigate the damage to the remaining forest, regulating production in order to ensure the cutting cycle of 35 years. The legislation governing this practice allows a cutting intensity of 30 m³/ha, but according to the PMFS of Fazenda Jutaituba, the maximum intensity allowed is 22 m³/ha, within an authorization of 30 m³/ha, even if there is availability to expand the volume due to replacements. While the survey made in the post-exploratory reports showed an average exploration intensity in the area of 21.30 m³/ha, 17.4% lower than established.

The implementation of low-impact techniques is fundamental for the establishment of sustainability in management, and this is observed directly in the forest response after the activities.

Forest management activities as well as the opening of forest areas for the implementation of planned infrastructures will be monitored and reported at each Project verification event. The monitoring will be based on relevant documents, ideally the post-exploratory reports, and other relevant information provided by those responsible for forest management on the Fazenda

Jutaituba. If a significant reduction in inventory is evidenced due to logging, it will be reported in the monitoring report and following the model in table 25b of the VM0015 methodology.

Charcoal production and firewood collection

The production of charcoal or firewood collection is not expected for the Project, and during the social diagnosis the practice of coal production was associated with family farming, and it is reported that there has always been a practice locally for domestic use and sporadic sale of surplus, with low-scale local production. However, if there is a reduction in the forest's carbon stock due to this activity, table 25c of VM0015 will be presented ex post. The Table 40 shows the ex-ante estimate of the reduction of carbon stock due to activities planned by the Project.

Table 40 - Ex ante estimate of inventory reduction due to planned activities in the Project area (Table 25d of the VM0015 Methodology).

Project Year t	Total carbon stock decrease due to planned deforestation		Total carbon stock decrease due to planned logging activities		Total carbon stock decrease due to planned fuel-wood and charcoal activities		Total carbon stock decrease due to planned activities	
	annual $\Delta CPDdPA_t$ tCO_2e	cumulative $\Delta CPDdPA$ tCO_2e	annual $\Delta CPLdPA_t$ tCO_2e	cumulative $\Delta CPLdPA$ tCO_2e	annual $\Delta CPFdPA_t$ tCO_2e	cumulative $\Delta CPFdPA$ tCO_2e	annual $\Delta CPAdPA_t$ tCO_2e	cumulative $\Delta CPAdPA$ tCO_2e
2021	51.814,7	51.814,7	0,0	0,0	0,0	0,0	51.814,7	51.814,7
2022	51.814,7	103.629,3	0,0	0,0	0,0	0,0	51.814,7	103.629,3
2023	51.814,7	155.444,0	0,0	0,0	0,0	0,0	51.814,7	155.444,0
2024	51.814,7	207.258,7	0,0	0,0	0,0	0,0	51.814,7	207.258,7
2025	51.814,7	259.073,3	0,0	0,0	0,0	0,0	51.814,7	259.073,3
2026	51.814,7	310.888,0	0,0	0,0	0,0	0,0	51.814,7	310.888,0
2027	51.814,7	362.702,7	0,0	0,0	0,0	0,0	51.814,7	362.702,7
2028	51.814,7	414.517,3	0,0	0,0	0,0	0,0	51.814,7	414.517,3
2029	51.814,7	466.332,0	0,0	0,0	0,0	0,0	51.814,7	466.332,0
2030	51.814,7	518.146,6	0,0	0,0	0,0	0,0	51.814,7	518.146,6

Optional accounting for increased carbon stocks

The ex-ante estimate of the increase in carbon stock by regeneration after management activities was not considered by conservative measure.

Ex ante estimation of carbon stock changes due to unavoidable unplanned deforestation within the Project Area (Step 7.1.2 VM0015)

No inevitable and significant unplanned deforestation is expected in the Project scenario, due to the implementation of effective monitoring of forest cover, the strengthening of the degree of governance in the area due to the management activity, the activities foreseen by the Project and the greater alignment with the communities, with this, the project is expected to reach high levels of effectiveness during its 30 years of duration.

However, some unplanned deforestation may occur in the Project Area, depending on the effectiveness of the proposed activities, which cannot be measured ex ante. Ex post measurements prepared for the Monitoring Report will be important to determine actual emission reductions

To allow for ex ante projections, a conservative assumption was made about the effectiveness of the proposed activities to define the Efficacy Index (EI). The estimated value of EI is used to multiply the base projections by the factor (1 - EI) and the result was considered to be the estimated ex ante emissions from unplanned deforestation in the case of the project. To calculate the actual ex ante change in carbon stock due to unplanned unavoidable deforestation, equation 16 of the VM0015 Methodology version 1.1, presented below.

$$\Delta CUDdPAt = \Delta CBSLt * (1 - EI)$$

Where:

ΔCUDdPAt: Total ex ante change of the actual carbon stock due to unplanned and unavoidable deforestation in year t in the Project Area (tCO2-e);

ΔCBSLt: Total variation of the carbon stock of the baseline in the year, in the Project Area (tCO2-e);

EI: Ex ante Efficacy Index estimated;

t: 1, 2, 3 ... T, year of the proposed project credit period (dimensionless)

Based on the history of deforestation that occurred in the area prior to the start of the project, the Effectiveness Index (EI) of the project activities was conservatively assumed to be 90% in the first five years of implementation, and that this value will gradually increase with its efficiency over the years.

Ex ante estimation net actual carbon stock changes in the project area (Step 7.1.3 VM0015)

Changes in carbon stock related to planned activities and the effectiveness of the Project are presented in Table 41.

Table 41 - Ex ante estimates of the net carbon reduction in the Project Area over the Project scenario (Table 27 of VM0015).

Project Year t	Total carbon stock decrease due to planned activities		Total carbon stock increase due to planned activities		Total carbon stock decrease due to unavoided unplanned deforestation		Total carbon stock change in the project case	
	annual $\Delta CPAdPA_t$ tCO_2e	cumulative $\Delta CPAdPA$ tCO_2e	annual $\Delta CPAiPA_t$ tCO_2e	cumulative $\Delta CPAiPA$ tCO_2e	annual $\Delta CUDdPA_t$ tCO_2e	cumulative $\Delta CUDdPA$ tCO_2e	annual $\Delta CPSPA_t$ tCO_2e	cumulative $\Delta CPSPA$ tCO_2e
2021	51.814,7	51.814,7	0,0	0,0	26.651,3	26.651,3	78.465,9	78.465,9
2022	51.814,7	103.629,3	0,0	0,0	37.306,4	63.957,6	89.121,0	167.587,0
2023	51.814,7	155.444,0	0,0	0,0	29.779,4	93.737,1	81.594,1	249.181,1
2024	51.814,7	207.258,7	0,0	0,0	20.095,5	113.832,5	71.910,1	321.091,2

Project Year t	Total carbon stock decrease due to planned activities		Total carbon stock increase due to planned activities		Total carbon stock decrease due to unavoided unplanned deforestation		Total carbon stock change in the project case	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$\Delta CPAdPA_t$	$\Delta CPAdPA$	$\Delta CPAiPA_t$	$\Delta CPAiPA$	$\Delta CUDdPA_t$	$\Delta CUDdPA$	$\Delta CPSPA_t$	$\Delta CPSPA$
	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e
2025	51.814,7	259.073,3	0,0	0,0	31.335,8	145.168,4	83.150,5	404.241,7
2026	51.814,7	310.888,0	0,0	0,0	31.475,7	176.644,0	83.290,3	487.532,0
2027	51.814,7	362.702,7	0,0	0,0	36.396,6	213.040,7	88.211,3	575.743,3
2028	51.814,7	414.517,3	0,0	0,0	28.178,9	241.219,6	79.993,6	655.736,9
2029	51.814,7	466.332,0	0,0	0,0	39.730,9	280.950,5	91.545,6	747.282,5
2030	51.814,7	518.146,6	0,0	0,0	30.230,1	311.180,6	82.044,8	829.327,3

Ex ante estimation of actual non-CO2 emissions from forest fires (Step 7.2 VM0015)

Non-CO2 emissions from fire were not accounted for in the baseline scenario.

Total ex ante estimations for the project area (Step 7.3 VM0015)

The Table 42 presents the expected net changes and non-CO2 emissions in the Project Area. If these emissions occur during the development of the Project activities, they will be monitored and reported to verify if there will be an increase in projected emissions in the Project scenario.

Table 42 - Total ex ante estimate of net changes in carbon stock and non-CO2 emissions in the Project Area (Table 29 of VM0015).

Project Year t	Total ex ante carbon stock decrease due to planned activities		Total ex ante carbon stock increase due to planned activities		Total ex ante carbon stock decrease due to unavoided unplanned deforestation		Total ex ante net carbon stock change		Total ex ante estimated actual non-CO_2 emissions from forest fires in the project area	
	annual $\Delta CPAdPA_t$ tCO_2e	cumulative $\Delta CPAdPA$ tCO_2e	annual $\Delta CPAiPA_t$ tCO_2e	cumulative $\Delta CPAiPA$ tCO_2e	annual $\Delta CUDdPA_t$ tCO_2e	cumulative $\Delta CUDdPA$ tCO_2e	annual $\Delta CPSPA_t$ tCO_2e	cumulative $\Delta CPSPA$ tCO_2e	annual $EBBPSPA_t$ tCO_2e	cumulative $EBBPSPA$ tCO_2e
2021	51.814,7	51.814,7	0,0	0,0	26.651,3	26.651,3	78.465,9	78.465,9	0,0	0,0
2022	51.814,7	103.629,3	0,0	0,0	37.306,4	63.957,6	89.121,0	167.587,0	0,0	0,0
2023	51.814,7	155.444,0	0,0	0,0	29.779,4	93.737,1	81.594,1	249.181,1	0,0	0,0
2024	51.814,7	207.258,7	0,0	0,0	20.095,5	113.832,5	71.910,1	321.091,2	0,0	0,0
2025	51.814,7	259.073,3	0,0	0,0	31.335,8	145.168,4	83.150,5	404.241,7	0,0	0,0
2026	51.814,7	310.888,0	0,0	0,0	31.475,7	176.644,0	83.290,3	487.532,0	0,0	0,0
2027	51.814,7	362.702,7	0,0	0,0	36.396,6	213.040,7	88.211,3	575.743,3	0,0	0,0
2028	51.814,7	414.517,3	0,0	0,0	28.178,9	241.219,6	79.993,6	655.736,9	0,0	0,0
2029	51.814,7	466.332,0	0,0	0,0	39.730,9	280.950,5	91.545,6	747.282,5	0,0	0,0
2030	51.814,7	518.146,6	0,0	0,0	30.230,1	311.180,6	82.044,8	829.327,3	0,0	0,0

3.2.3 Leakage

Step 8 of VM0015 - Ex ante estimate of leakage

Ex ante estimation of the decrease in carbon stock and increase in GHG emissions due to leakage prevention measures (Step 8.1 VM0015)

Leakage prevention measures will occur within the boundaries of the leakage management areas. As described in section 2.1.11, three activities proposed by the Project will contribute as management measures to the leak: “Non-timber forest management at Fazenda Jutaituba”, “Formalization of access to Fazenda Jutaituba for stakeholders” and “Promotion of sustainable practices”. Thus, no activities are foreseen to improve agricultural or grazing management, or forage production or any other activities that reduce carbon stocks and increase GHG emissions compared to the baseline scenario.

The monitoring of the developed activities that act as leakage management will be monitored as indicated and reported on all Project verification events.

Carbon stock changes due to activities implemented in the leakage management areas (Step 8.1.1 VM0015)

Table 30c of VM0015 is not applicable, as no reduction is expected due to the implementation of activities. In the event of significant changes in carbon stock, these activities will be monitored, accounted for and reported.

Ex ante estimation of methane (CH4) and nitrous oxide (N20) emissions from grazing animals (Step 8.1.2 VM0015)

As mentioned above, the development of activities that create a significant increase in CH4 and N2O emissions from grazing animals are not foreseen within the Project activities. Therefore, tables 31 and 32 of VM0015 are not applicable.

Total ex ante estimated carbon stock changes and increases in GHG emissions due to leakage prevention measures (Step 8.1.3 VM0015)

Table 33 of VM0015 does not apply (justifications presented above).

Ex ante estimation of the decrease in carbon stocks and increase in GHG emissions due to activity displacement leakage (Step 8.2 VM0015)

Activities that will cause deforestation within the Project Area in the case of baseline may be shifted outside the project boundaries due to the implementation of the AUD project activity. A greater decrease in carbon stocks within the leak range during the project scenario than those predicted ex ante would indicate the displacement of deforestation activities due to the project.

The ex ante activity displacement leak was calculated based on the anticipated combined effectiveness of the proposed leakage prevention measures and Project activities. As explained above, the Project will seek to prevent deforestation through the activities of “Non-timber forest management at Fazenda Jutaituba”, “Formalization of access to Fazenda Jutaituba for stakeholders” and “Promotion of sustainable practices”.

The activity of "Non-timber forest management at Fazenda Jutaituba" will seek to identify improvements and other opportunities to be developed in order to strengthen the practice in the region. Through the valorization of the "standing" forest, it is expected to influence new dynamics and sustainable productive models for the region, bringing a positive model of a forest-based and sustainable economy in the Amazon. Thus, it is expected that the scope of the results will reach as many stakeholders as possible from the communication channels available by the Project. In addition, the activity "Formalization of access to the Fazenda Jutaituba for stakeholders" will work with the different stakeholders who need access to the Farm to facilitate locomotion, promoting a control of entry into the Farm, avoiding illegal activities. The activity "Fostering sustainable practices" will also work with stakeholders and with a special focus on local communities that have shown interest in working with the Project.

Although the Project aims to reach 100% of the agents at the baseline, it was conservatively considered a “Leak Displacement Factor”. The calculation of the ex ante change of the actual carbon stock due to unplanned unavoidable deforestation, an equation similar to equation 16 of the VM0015 Methodology version 1.1 presented in Step 7.1.2 was used; however, making an adaptation by multiplying the changes of the estimated base carbon stock for the Project Area by a “Displacement Leakage Factor” (DLF) representing the percentage of deforestation that is expected to be displaced outside the project boundaries, starting with an index of 10% and decreasing it over the lifetime of the project. The equation is presented below:

$$\Delta CADLKt = \Delta CBSLPAt * DLF$$

Where:

ΔCADLKt: Total decrease in carbon stock due to displaced deforestation in year t (tCO2e);

ΔCBSLPAt: Total change in carbon stock from baseline in the Project Area in year t (tCO2e);

DLF: Leakage displacement factor (%).

Thus, a displacement factor of 10% was adopted during the first five years. Then, the reduction of the leakage displacement factor is gradual, already considering the influence of the project in this context. Thus, the leakage displacement factor tends to approach zero during the 30 years of project implementation. The ex-ante estimates of the leakage due to the activity shift for the first fixed baseline period is found in Table 43 and the total ex ante leakage is shown in

Table 44.

Table 43 - Estimated ex ante leakage due to activity displacement (Table 34 of the VM0015 Methodology version 1.1).

Project Year t	Total ex ante estimated decrease in carbon stocks due to displaced deforestation		Total ex ante estimated increase in GHG emissions due to displaced forest fires	
	annual $\Delta CADLK_t$ tCO_2e	cumulative $\Delta CADLK$ tCO_2e	annual $EADLK_t$ tCO_2e	cumulative $EADLK$ tCO_2e
2021	26.651,3	26.651,3	0,0	0,0
2022	37.306,4	63.957,6	0,0	0,0
2023	29.779,4	93.737,1	0,0	0,0
2024	20.095,5	113.832,5	0,0	0,0
2025	31.335,8	145.168,4	0,0	0,0
2026	31.475,7	176.644,0	0,0	0,0
2027	36.396,6	213.040,7	0,0	0,0
2028	28.178,9	241.219,6	0,0	0,0
2029	39.730,9	280.950,5	0,0	0,0
2030	30.230,1	311.180,6	0,0	0,0

Ex ante estimation of total leakage (Step 8.3 VM0015)

Table 44 - Total ex ante leakage estimate (Table 35 of the VM0015 Methodology version 1).

Project Year *t*	Total ex ante GHG emissions from increased grazing activities		Total ex ante increase in GHG emissions due to displaced forest fires		Total ex ante decrease in carbon stocks due to displaced deforestation		Carbon stock decrease due to leakage prevention measures		Total net carbon stock change due to leakage		Total net increase in emissions due to leakage	
	annual $EgLK_t$ tCO_2e	cumulative EgLK tCO_2e	annual $EADLK_t$ tCO_2e	cumulative EADLK tCO_2e	annual $\Delta CADLK_t$ tCO_2e	cumulative ΔCADLK tCO_2e	annual $\Delta CLPMLK_t$ tCO_2e	cumulative ΔCLPMLK tCO_2e	annual ΔCLK_t tCO_2e	cumulative ΔCLK tCO_2e	annual ELK_t tCO_2e	cumulative ELK tCO_2e
2021	0,0	0,0	0,0	0,0	26.651,3	26.651,3	0,0	0,0	26.651,3	26.651,3	0,0	0,0
2022	0,0	0,0	0,0	0,0	37.306,4	63.957,6	0,0	0,0	37.306,4	63.957,6	0,0	0,0
2023	0,0	0,0	0,0	0,0	29.779,4	93.737,1	0,0	0,0	29.779,4	93.737,1	0,0	0,0
2024	0,0	0,0	0,0	0,0	20.095,5	113.832,5	0,0	0,0	20.095,5	113.832,5	0,0	0,0
2025	0,0	0,0	0,0	0,0	31.335,8	145.168,4	0,0	0,0	31.335,8	145.168,4	0,0	0,0
2026	0,0	0,0	0,0	0,0	31.475,7	176.644,0	0,0	0,0	31.475,7	176.644,0	0,0	0,0
2027	0,0	0,0	0,0	0,0	36.396,6	213.040,7	0,0	0,0	36.396,6	213.040,7	0,0	0,0
2028	0,0	0,0	0,0	0,0	28.178,9	241.219,6	0,0	0,0	28.178,9	241.219,6	0,0	0,0
2029	0,0	0,0	0,0	0,0	39.730,9	280.950,5	0,0	0,0	39.730,9	280.950,5	0,0	0,0
2030	0,0	0,0	0,0	0,0	30.230,1	311.180,6	0,0	0,0	30.230,1	311.180,6	0,0	0,0

3.2.4 Net GHG Emission Reductions and Removals

Step 9 of VM0015 – Ex ante total net anthropogenic GHG emissions reduction

Significance assessment (Step 9.1 VM0015)

Using the most recent document "EB-CDM approved "Tool for testing significance of GHG emissions in A/R CDM Project activities"it was possible to verify that the above-ground biomass will contribute to 74% of the expected emissions in the baseline scenario, the below-ground biomass with 13% and the dead wood with 13%. Therefore, all represent significant sources of emission (above 5%).

Calculation of ex ante estimates of total net GHG emission reductions (Step 9.2 VM0015)

The equation below was used as suggested by the VM0015 methodology version 1.1 to estimate ex ante net reduction of Project emissions. The result is presented in Table 45 (Table 36 of the Methodology version VM0015 1.1).

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

Where:

∆REDDt: Reduction of ex-post anthropogenic GHG emissions attributed to the project's AUD activity in year t (tCO2e);

∆CBSLPAt: Sum of changes in baseline carbon stock in the Project Area in year t (tCO2e);

EBBBSLPAt: Sum of baseline emissions caused by biomass burning in the Project Area in year t (tCO2e);

∆CPSPAt: Sum of ex-post carbon stock changes in the Project Area in year t (tCO2e);

EBBPSPAt: Sum of ex-post emissions caused by biomass burning in the Project Area in year t (tCO2e);

∆CLKt: Sum of ex-post changes in carbon stock due to leakage in year t (tCO2e);

ELKt: Sum of ex post emissions from leakage in year t (tCO2e);

t: 1, 2, 3 ... T, one year of the proposed credit period (no size).

Calculation ex-ante Verified Carbon Units (VCUs) (Step 9.3 VM0015)

Equation 20 of the VM0015 Methodology was used to estimate the number of VCUs. Risk Factor the parameter was estimated through the Non Permanence Risk Tool VCS AFOLU, resulting in 10%. The result is presented in the

Table 45 below (Table 36 of the VM0015 Methodology version 1.1).

$$\Delta VCUt = \Delta REDDt - VBCt$$

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

Where:

VCUt: Number of Verified Carbon Units that can be marketed in year t (tCO2e);

∆REDDt: Reduction of ex-post anthropogenic GHG emissions attributed to the project's AUD activity in year t (tCO2e);

VBCt: Number of buffer credits deposited in the VCS buffer in year t (t CO2-e);

∆CBSLPAt: Sum of changes in baseline carbon stock in the Project Area in year t (tCO2e);

∆CPSPAt: Sum of ex post carbon stock changes in the Project Area in year t (tCO2e);

RFt: Risk factor used to calculate the VCS buffer of credits (%);

t: 1, 2, 3 ... T, one year of the proposed credit period (no size).

Table 45 - Ex ante estimate of net anthropogenic GHG emissions reductions (ΔREDDt) and Verified Carbon Units (VCUt) (Table 36 of Methodology VM0015).

Project Year t	Baseline carbon stock changes		Baseline GHG emissions		Ex ante project carbon stock changes		Ex ante project GHG emissions		Ex ante leakage carbon stock changes		Ex ante leakage GHG emissions		Ex ante net anthropogenic GHG emission reductions		Ex ante VCUs tradable		Ex ante buffer credits	
	annual $\Delta CBSLPA_t$ tCO_2-e	cumulative $\Delta CBSLPA$ tCO_2-e	annual $\Delta EBBBSLPA_t$ tCO_2-e	cumulative $\Delta EBBBSLPA$ tCO_2-e	annual $\Delta CPSPA_t$ tCO_2e	cumulative $\Delta CPSPA$ tCO_2e	annual $EBBPSPA_t$ tCO_2e	cumulative $EBBPSPA$ tCO_2e	annual ΔCLK_t tCO_2e	cumulative ΔCLK tCO_2e	annual ELK_t tCO_2e	cumulative ELK tCO_2e	annual $\Delta REDD_t$ tCO_2e	cumulative $\Delta REDD$ tCO_2e	annual VCU_t tCO_2e	cumulative VCU tCO_2e	annual VCB_t tCO_2e	cumulative VCB tCO_2e
2021	266.513	266.513	0	0	78.466	78.466	0	0	26.651	26.651	0	0	161.395	161.395	142.591	142.591	18.805	18.805
2022	373.064	639.576	0	0	89.121	167.587	0	0	37.306	63.958	0	0	246.636	408.032	218.242	360.833	28.394	47.199
2023	297.794	937.371	0	0	81.594	249.181	0	0	29.779	93.737	0	0	186.421	594.452	164.801	525.634	21.620	68.819
2024	200.955	1.138.325	0	0	71.910	321.091	0	0	20.095	113.833	0	0	108.949	703.402	96.045	621.678	12.904	81.723
2025	313.358	1.451.684	0	0	83.151	404.242	0	0	31.336	145.168	0	0	198.872	902.274	175.851	797.530	23.021	104.744
2026	393.446	1.845.130	0	0	83.290	487.532	0	0	31.476	176.644	0	0	278.680	1.180.954	247.664	1.045.194	31.016	135.760
2027	454.958	2.300.088	0	0	88.211	575.743	0	0	36.397	213.041	0	0	330.350	1.511.304	293.675	1.338.869	36.675	172.434
2028	402.556	2.702.644	0	0	79.994	655.737	0	0	28.179	241.220	0	0	294.384	1.805.687	262.127	1.600.996	32.256	204.691
2029	567.584	3.270.228	0	0	91.546	747.282	0	0	39.731	280.951	0	0	436.308	2.241.995	388.704	1.989.700	47.604	252.295
2030	503.835	3.774.063	0	0	82.045	829.327	0	0	30.230	311.181	0	0	391.560	2.633.555	349.381	2.339.081	42.179	294.474

3.2.5 Data and Parameters Available at Validation

Date / Parameter	**$Ctot_{icl}$**
Data unit	$tCO_2e\ ha^{-1}$
Description	Average carbon stock per hectare in all carbon pools in the forest class used in the baseline scenario
Source of data	Calculated by allometric equations, literature conversion factors and data measured in the field
Value applied	677.24
Justification of choice of data or description of measurement methods and procedures applied	Biomass estimates above and below ground and deadwood were obtained using forest inventory data and allometric equations developed in areas similar to the Project Area (Nogueira et al., 2008 & Silva, 2007)
Purpose of date	• Baseline Scenario Determination • Calculation of baseline emissions • Calculation of project emissions • Leakage Calculation
Comments	See document: Final report Inventory of Carbon Stock of the Jutaituba REDD+ Project

Date / Parameter	**$Cab_{icl} = B_{ab} * (44/12)$**
Data unit	$tCO_2e\ ha^{-1}$
Description	Average carbon stock per hectare in above-ground biomass carbon pool
Source of data	Calculated by allometric equation, literature conversion factor and data measured in the field
Value applied	500.87
Justification of choice of data or description of measurement methods and procedures applied	Above-ground biomass estimates were made using forest inventory data and allometric equations performed in areas similar to the Project area (Nogueira et al., 2008)
Purpose of date	• Determination of the baseline scenario • Calculation of baseline emissions • Calculation of project emissions

	• Leakage Calculation
Comments	See document: - Final report Inventory of Carbon Stock of the Jutaituba REDD+ Project

Date / Parameter	**$Cbb_{icl} = B_{bb} * (44/12)$**
Data unit	$tCO_2e\ ha^{-1}$
Description	Average carbon stock per hectare in the below-ground biomass carbon pool
Source of data	Calculated by allometric equation, literature conversion factor and data measured in the field
Value applied	88.73
Justification of choice of data or description of measurement methods and procedures applied	Above-ground biomass estimates were made using forest inventory data and allometric equations performed in areas similar to the Project area (Silva, 2007).
Purpose of date	• Determination of the baseline scenario • Calculation of baseline emissions • Calculation of project emissions • Leakage Calculation
Comments	See document: - Final report Inventory of Carbon Stock of the Jutaituba REDD+ Project

Date / Parameter	**$Cdw_{icl} = (B_{dw1} + B_{dw2}) * (44/12)$**
Data unit	$tCO_2e\ ha^{-1}$
Description	Average carbon stock per hectare in the carbon pool of dead wood
Source of data	Calculated by allometric equation, literature conversion factor and data measured in the field
Value applied	87.64
Justification of choice of data or description of measurement methods and procedures applied	Above-ground biomass estimates were made using data and samples from the forest inventory and allometric equations performed in areas similar to the Project area (Nogueira et al., 2008)

Purpose of date	• Determination of the baseline scenario • Calculation of baseline emissions • Calculation of project emissions • Leakage Calculation
Comments	See document: - Inventory of Carbon Stock of the Jutaituba REDD+ Project

Date / Parameter	**DAP**
Data unit	cm
Description	Diameter at breast height (130 cm) for each tree with DBH equal to or greater than 10 cm in each plot of the forest inventory
Source of data	Measured in the field by STA – Environmental Technical Solutions
Value applied	View worksheet with field data
Justification of choice of data or description of measurement methods and procedures applied	Requirement required by VCS VM0015 methodology. Forest inventory data collected less than 10 years ago in multiple plots located in wide spatial distribution
Purpose of date	• Determination of the baseline scenario • Calculation of baseline emissions • Calculation of project emissions • Leakage Calculation
Comments	Main variable for the estimation of the carbon stock of the Jutaituba REDD+ Project

Date / Parameter	**H**
Data unit	meters
Description	Tree Height
Source of data	Measured in the field by STA – Environmental Technical Solutions
Value applied	View worksheet with field data
Justification of choice of data or description of measurement methods and procedures applied	Requirement required by VCS VM0015 methodology. Forest inventory data collected less than 10 years ago in multiple plots located in wide spatial distribution

Purpose of date	• Determination of the baseline scenario • Calculation of baseline emissions • Calculation of project emissions • Leakage Calculation
Comments	Important variable for calculating carbon stock in standing deadwood biomass

Date / Parameter	**$Volume_{dc}$**
Data unit	m^3
Description	Volume of dead wood on the floor
Source of data	Measured in the laboratory by STA – Environmental Technical Solutions
Value applied	View Datasheet
Justification of choice of data or description of measurement methods and procedures applied	Important variable for the calculation of the carbon stock in the biomass of dead wood on the floor
Purpose of date	• Determination of the baseline scenario • Calculation of baseline emissions • Calculation of project emissions • Leakage Calculation
Comments	-

Date / Parameter	**D_{dc}**
Data unit	$Mg\ m^{-3}$
Description	Deadwood Density
Source of data	Measured in the laboratory by STA – Environmental Technical Solutions
Value applied	View Datasheet
Justification of choice of data or description of measurement methods and procedures applied	Important variable for the calculation of the carbon stock in the biomass of dead wood on the floor
Purpose of date	• Determination of the baseline scenario

	• Calculation of baseline emissions • Calculation of project emissions • Leakage Calculation
Comments	-

Date / Parameter	**44/12**
Data unit	tCO2e
Description	Carbon mass to CO2e mass conversion factor
Source of data	Scientific literature: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 AFOLU
Value applied	44/12
Justification of choice of data or description of measurement methods and procedures applied	IPCC default value
Purpose of date	• Determination of the baseline scenario • Calculation of baseline emissions • Calculation of project emissions • Leakage Calculation
Comments	-

Date / Parameter	**B_{ab}= (exp (-1,716+2,413 *ln (DAP))) * CF**
Data unit	tC ha $^{-1}$
Description	Equation to convert DAP to dry above-ground carbon biomass
Source of data	Nogueira et al. (2008). Estimates of forest biomass in the Brazilian Amazon: New allometric equations and biomass adjustments of wood volume inventories. Forest Ecology and Management, v. 256, n. 11, p. 1853-1867, 2008
Value applied	136.6
Justification of choice of data or description of measurement methods and procedures applied	Equation developed for forests with the same characteristics as the reference region

Purpose of date	• Determination of the baseline scenario • Calculation of baseline emissions • Calculation of project emissions • Leakage Calculation
Comments	See document: - Final report Inventory of Carbon Stock of the Jutaituba REDD+ Project

Date / Parameter	**B_{bb}= ((0.0469*DAP$^{2.475}$) * 0.533) * CF**
Data unit	tC ha $^{-1}$
Description	Equation to convert DAP to dry below-ground carbon biomass
Source of data	Silva, R.P (2007). Allometry, stock and dynamics of biomass of primary and secondary forests in the region of Manaus (AM). Thesis (Doctorate in Tropical Forest Sciences) – Graduate Program in Tropical Biology and Natural Resources, INPA/UFAM. Manaus, p. 152.
Value applied	24.2
Justification of choice of data or description of measurement methods and procedures applied	Equation developed for forests with the same characteristics as the reference region
Purpose of date	• Determination of the baseline scenario • Calculation of baseline emissions • Calculation of project emissions • Leakage Calculation
Comments	See document: - Final report Inventory of Carbon Stock of theJutaituba REDD+ Project

Date / Parameter	**B_{dw1} = ((B_{ab} - 0.03) + (((pi/4) * DAP^2 * H * 0.7) * 0.57)) * CF**
Data unit	tC ha $^{-1}$
Description	Equation for converting DAP to dry carbon biomass in standing deadwood

Source of data	Calculated by allometric equation, literature conversion factor and data measured in the field
Value applied	6.1
Justification of choice of data or description of measurement methods and procedures applied	Equation developed for forests with the same characteristics as the reference region
Purpose of date	• Determination of the baseline scenario • Calculation of baseline emissions • Calculation of project emissions • Leakage Calculation
Comments	See document: - Final report Inventory of Carbon Stock of the Jutaituba REDD+ Project

Date / Parameter	$\mathbf{B_{dw2} = \neq Volume_{dc} * D_{dc} * CF}$
Data unit	tC ha $^{-1}$
Description	Equation to estimate the sum of the amount of dry carbon biomass in dead wood on the ground in rotten, intermediate and hard samples
Source of data	Equation provided by VCS VM0015 methodology
Value applied	17.8
Justification of choice of data or description of measurement methods and procedures applied	Equation developed for forests with the same characteristics as the reference region
Purpose of date	• Determination of the baseline scenario • Calculation of baseline emissions • Calculation of project emissions • Leakage Calculation
Comments	See document: - Final report Inventory of Carbon Stock of the Jutaituba REDD+ Project

3.2.6 Data and Parameters Monitored

The selected data and parameters that are contemplated and described below are only to respond to and measure the effectiveness of the activities developed for the General and Climate scope of the Project, defined in Section 2.1.11. For the social scope, the chosen data and parameters that will be collected in the verifications were inserted in Section 4.4.1 and those related to the biodiversity scope were included in Section 5.4.1.

Data to be collected for the overall scope of the Project

Date / Parameter	Number of reports
Data unit	Number
Description	This parameter will be responsible for accounting for the amount of all material produced, in the form of a report, designed with considerations, clarifications and contents containing information regarding the implementation, monitoring and evaluation of the activities developed as well as the contents prepared to strengthen the governance of the Project
Source of data	Calculated through reports, meeting minutes, monitoring guides and memos developed by the Project focused on issues related to Project management (governance, implementation, monitoring and evaluation of activities)
Description of measurement methods and procedures to be applied	All documents that can be read as “reports” produced for the Project will be stored in digital files throughout the Project's accreditation period. Thus, these reports from the activity of "Implementation, monitoring and evaluation of the activities developed by the Project" and "Strengthening of governance" will be monitored and accounted for.
Frequency of monitoring/recording	Annual
Value applied	To be accounted for after Project commencement
Monitoring equipment	Not applicable
QA/QC procedures to be applied	The information systematized in the reports will be validated between the bidders, allowing greater reliability and quality of the data. In addition, the Project will undergo continuous evaluation of the information generated, allowing the identification of improvements in the collection and registration processes, and the incorporation of these in the strategic planning of the Project when they are identified
Purpose of date	Improve and monitor the adaptive management of the Project on issues related to governance, implementation, monitoring and development of activities over the 30 years of the Project
Calculation method	Not applicable

Comments	-

Date / Parameter	Number of procedures/protocols
Data unit	Number
Description	This parameter will be responsible for accounting for the amount of all material produced, in the form of procedures and protocols, which will be established to develop and improve the governance, implementation, monitoring and evaluation of the activities developed by the Project
Source of data	Documents with procedures and protocols developed and established to guide and improve the activities of the general scope of the Project "Implementation, monitoring and evaluation of the activities developed by the Project" and "Strengthening of governance"
Description of measurement methods and procedures to be applied	All documents that can be read as protocols and procedures produced by the Project will be stored in digital files throughout the Project's accreditation period. Thus, any and all procedures and protocols to be developed for the activity of "Implementation, monitoring and evaluation of activities developed" and "Strengthening of Governance" by the Project will be monitored and accounted for.
Frequency of monitoring/recording	Annual
Value applied	To be accounted for after Project commencement
Monitoring equipment	Not applicable
QA/QC procedures to be applied	The systematized information will be validated between the proponents, allowing greater reliability and quality of the data. In addition, the Project will undergo continuous evaluation of the information generated, allowing the identification of improvements in the collection and registration processes, and the incorporation of these in the strategic planning of the Project when they are identified
Purpose of date	Improve and monitor the adaptive management of the Project on issues related to governance, implementation, monitoring and development of activities over the 30 years of the Project
Calculation method	Not applicable
Comments	-

Data to be collected for the Project Climate scope

Date / Parameter	ABSLPAt
Data unit	Hectare (ha)
Description	Annual base deforestation area in year *t* of the Jutaituba REDD+ Project
Source of data	Calculated through remote sensing images and scientifically available data
Description of measurement methods and procedures to be applied	Monitoring of the forest component through satellite images and scientifically proven data in the Project Area
Frequency of monitoring/recording	Annual
Value applied	Average annual deforestation in the Project Area during the calculated baseline: 669 ha
Monitoring equipment	Remote sensing images of digital processing program and geographic information systems
QA/QC procedures to be applied	Images with a special resolution of 30 m or more will be used in the mapping and the minimum mapping unit is 1 ha. The minimum accuracy of the land use and cover classification map is 80%
Purpose of date	• Calculation of emissions in the Project Area
Calculation method	If unplanned deforestation areas are detected, the Forest Coverage Benchmark Map will be updated by map algebra
Comments	-

Date / Parameter	ΔCUDdPAt
Data unit	tCO2e
Description	Total change in actual carbon stock due to unplanned deforestation unavoidable in year t in the Jutaituba REDD+ Project Area
Source of data	Calculated through the detected areas of forest loss by unplanned deforestation in the Project Area and the average carbon stock

Description of measurement methods and procedures to be applied	Monitoring of the indicator Δ BSLPAt for subsequent calculation of the change in carbon stock from unplanned and unavoidable deforestation
Frequency of monitoring/recording	Annual
Value applied	To be accounted for after Project commencement
Monitoring equipment	Emissions Spreadsheets
QA/QC procedures to be applied	Good practices applied in the calculation of ABSLPAt
Purpose of date	• Calculation of emissions in the Project Area
Calculation method	The variation of the carbon stock is estimated by multiplying the detected area of forest loss in the Project Area and the average carbon stock per unit area
Comments	-

Date / Parameter	ΔPDPAicl,t
Data unit	Hectare (ha)
Description	Planned deforestation areas in forest class icl in year t in Project Area of the Jutaituba REDD+ Project.
Source of data	Remote sensing images, technical maps and specific field charts to monitor the construction of highways, trails and yards for sustainable forest management activities and/or estimation by the literature.
Description of measurement methods and procedures to be applied	Monitoring will be done through the analysis of satellite images and available forest management data, such as maps and post-exploratory reports.
Frequency of monitoring/recording	Annual
Value applied	To be accounted for after Project commencement
Monitoring equipment	Data available for forest management, geographic information system and literature

QA/QC procedures to be applied	The mapping of deforestation areas planned for the implementation of Forest Management infrastructures will be aligned over time in accordance with the practices used by those responsible for Management in the Project Area, ideally using high resolution images and field checks
Purpose of date	• Calculation of emissions in the Project Area
Calculation method	If planned deforestation areas are identified, the Forest Coverage Reference Map will be updated through the algebraic map
Comments	-

Date / Parameter	ΔCPLdPAt
Data unit	tCO2e
Description	Total reduction in carbon stock due to planned extraction activities in year t in the Project Area of the Jutaituba REDD+ Project.
Source of data	Calculated through the detected areas of forest loss due to planned deforestation in the Project Area and the average carbon stock
Description of measurement methods and procedures to be applied	Monitoring of the indicator Δ PDPAicl,t for later calculation of the change in carbon stock from planned deforestation
Frequency of monitoring/recording	Annual
Value applied	To be accounted for after Project commencement
Monitoring equipment	Emissions Spreadsheets
QA/QC procedures to be applied	Good practices applied in the calculation of ΔPDPAicl,t
Purpose of date	• Calculation of emissions in the Project Area
Calculation method	The variation of the carbon stock is estimated by multiplying the detected area of forest loss in the Project Area and the average carbon stock per unit area
Comments	-

Date / Parameter	AUFPAicl,t
Data unit	Hectare (ha)
Description	Areas affected by forest fires in class icl in which the recovery of carbon stock occurs in year t of the Jutaituba REDD+ Project
Source of data	Adequate sources of detection of forest fires and scars caused for identification and classification of affected areas
Description of measurement methods and procedures to be applied	Identification and classification of affected areas from appropriate sources of forest fire detection and scarring
Frequency of monitoring/recording	Whenever the occurrence of forest fires is identified
Value applied	To be accounted for after Project commencement and when any forest fire occurs
Monitoring equipment	Remote sensing images of digital processing program and geographic information system
QA/QC procedures to be applied	Images with a special resolution of 30 m or more will be used in the mapping and the minimum mapping unit is 1 ha. The minimum accuracy of the land use and cover classification map is 80%
Purpose of date	• Calculation of emissions in the Project Area
Calculation method	If affected areas are detected, the Forest Coverage Reference Mark Map will be updated by map algebra
Comments	-

Date / Parameter	ΔCUFdPAt
Data unit	tCO2e
Description	Total reduction in carbon stock due to unplanned (and planned - where applicable) forest fires in year t in the Project Area of the Jutaituba REDD+ Project.
Source of data	Calculated through the areas affected by forest fires in the Project Area and the average carbon stock
Description of measurement methods	Monitoring of the AUFPAicl indicator,t for later calculation of the carbon stock change from the areas affected by forest fires

and procedures to be applied	
Frequency of monitoring/recording	Whenever the occurrence of forest fires is identified
Value applied	To be accounted for after Project commencement and when any forest fire occurs
Monitoring equipment	Emissions Spreadsheets
QA/QC procedures to be applied	Good practices applied in the calculation of AUFPAicl,t
Purpose of date	• Calculation of emissions in the Project Area
Calculation method	The variation in carbon stock is estimated by multiplying the area affected by the forest fire and the average carbon stock per unit area
Comments	-

Date / Parameter	ACPAicl,t
Data unit	Hectare (ha)
Description	Analysis Area within the REDD-Jutaituba Project Area affected by catastrophic events in class icl in year t
Source of data	High-resolution satellite imagery
Description of measurement methods and procedures to be applied	Realization of photointerpretation of high-resolution satellite images identifying areas of forest cover affected by catastrophic events
Frequency of monitoring/recording	Whenever the occurrence of a catastrophic event is identified
Value applied	To be accounted for after Project commencement and when a catastrophic event occurs
Monitoring equipment	Remote sensing images and geographic information system
QA/QC procedures to be applied	Images with a special resolution of 30 m or more will be used in the mapping and the minimum mapping unit is 1 ha. The minimum accuracy of the land use and cover classification map is 80%
Purpose of date	• Calculation of emissions in the Project Area

Calculation method	If affected areas are detected, the Forest Coverage Reference Mark Map will be updated by map algebra
Comments	-

Date / Parameter	ΔCUCdPAt
Data unit	tCO2e
Description	Total reduction in carbon stock due to catastrophic events in year t in the Project Area of the Jutaituba REDD+ Project.
Source of data	Calculated through the areas affected by catastrophic events in the Project Area and the average carbon stock
Description of measurement methods and procedures to be applied	Monitoring of ACPAicl indicator,t for subsequent calculation of carbon stock change from areas affected by catastrophic events
Frequency of monitoring/recording	Whenever a catastrophic event occurs
Value applied	To be accounted for after Project commencement and when a catastrophic event occurs
Monitoring equipment	Emissions Spreadsheets
QA/QC procedures to be applied	Good practices applied in the calculation of ACPAicl,t
Purpose of date	• Calculation of emissions in the Project Area
Calculation method	The variation of the carbon stock is estimated by multiplying the affected area and the average carbon stock per unit area.
Comments	-

Date / Parameter	ΔBSLLKt
Data unit	Hectare (ha)
Description	Annual base deforestation area within the Leakage Belt in year *t* of the Jutaituba REDD+ Project.
Source of data	Qualified and scientifically recognized sources

Description of measurement methods and procedures to be applied	Monitoring of the forest component through satellite images and scientifically proven data in the Leakage Belt
Frequency of monitoring/recording	Annual
Value applied	To be accounted for after Project commencement
Monitoring equipment	Remote sensing images of digital processing program and geographic information system
QA/QC procedures to be applied	Images with a special resolution of 30 m or more will be used in the mapping and the minimum mapping unit is 1 ha. The minimum accuracy of the land use and cover classification map is 80%
Purpose of date	• Calculation of emissions in the Leakage Belt
Calculation method	If unplanned deforestation areas are detected, the Forest Coverage Benchmark Map will be updated by map algebra
Comments	-

Date / Parameter	ΔCADLKt
Data unit	tCO2e
Description	Total reduction in carbon stocks due to displaced deforestation in year t in the Leakage Belt of the Jutaituba REDD+ Project
Source of data	Calculated through the detected areas of forest loss in the Leakage Belt, the average carbon stock and the estimated loss in carbon stock at the baseline for the Leakage Belt
Description of measurement methods and procedures to be applied	Monitoring of the indicator Δ BSLLKt for subsequent calculation of the change in carbon stock from unplanned and unavoidable deforestation in the Leakage Belt
Frequency of monitoring/recording	Annual
Value applied	To be accounted for after Project commencement
Monitoring equipment	Emissions Spreadsheets

QA/QC procedures to be applied	Good practices applied in the calculation of ΔBSLLKt
Purpose of date	• Calculation of emissions in the Leakage Belt
Calculation method	Carbon stock variation is estimated by multiplying the detected area of forest loss in the Leakage Belt and the average carbon stock per unit area, minus the estimated carbon stock variation at baseline for the Leakage Belt
Comments	-

Date / Parameter	ΔCLPMLKt
Data unit	tCO2e
Description	Decrease in carbon stock due to leakage prevention measures in year t
Source of data	Monitoring report of project activities that have been implemented and other records related to leak prevention activities
Description of measurement methods and procedures to be applied	Monitoring of grazing activities following the guidelines of section 8.1.1 of the VM0015 v1.1 methodology
Frequency of monitoring/recording	Annual
Value applied	To be accounted for after Project commencement
Monitoring equipment	Emissions Spreadsheets
QA/QC procedures to be applied	To be defined when it is necessary to be used
Purpose of date	• Calculation of emissions in the Leakage Belt
Calculation method	Emissions will be calculated using the guidelines in section 8.1.1 of the VM0015 v1.1 methodology
Comments	Leakage prevention activities that generate a decrease in carbon stock are not foreseen

Date / Parameter	ΔCADLKt

Data unit	tCO2e
Description	Total reduction in carbon stocks due to displaced deforestation in year t in the Leakage Belt of the Jutaituba REDD+ Project
Source of data	Calculated through the detected areas of forest loss in the Leakage Belt, the average carbon stock and the estimated loss in carbon stock at the baseline for the Leakage Belt
Description of measurement methods and procedures to be applied	Monitoring of the indicator ∆ BSLLKt for subsequent calculation of the change in carbon stock from unplanned and unavoidable deforestation in the Leakage Belt
Frequency of monitoring/recording	Annual
Value applied	To be accounted for after Project commencement
Monitoring equipment	Emissions Spreadsheets
QA/QC procedures to be applied	Good practices applied in the calculation of ∆BSLLKt
Purpose of date	• Calculation of emissions in the Leakage Belt
Calculation method	Carbon stock variation is estimated by multiplying the detected area of forest loss in the Leakage Belt and the average carbon stock per unit area, minus the estimated carbon stock variation at baseline for the Leakage Belt
Comments	-

Date / Parameter	EgLKt
Data unit	tCO2e
Description	Emissions from animals in pastures in spill management areas in year t
Source of data	Existing records on grazing practice
Description of measurement methods and procedures to be applied	Monitoring of grazing activities following the guidelines of section 8.1.2 of the VM0015 v1.1 methodology

Frequency of monitoring/recording	Annual
Value applied	To be accounted for after Project commencement
Monitoring equipment	Emissions Spreadsheets
QA/QC procedures to be applied	To be defined when performed
Purpose of date	• Calculation of emissions in the Leakage Belt
Calculation method	Emissions will be calculated using the guidelines in section 8.1.2 of the VM0015 v1.1 methodology
Comments	No activities involving grazing are foreseen

Date / Parameter	ΔREDDt
Data unit	tCO2e
Description	Net reduction of anthropogenic greenhouse gas emissions attributable to the activity of the AUD Project in year t
Source of data	Calculated by subtracting the carbon stock rates in the baseline scenario from changes in carbon stock throughout the Project
Description of measurement methods and procedures to be applied	The calculation of net anthropogenic GHG emissions reductions attributable to Project activities will be calculated using equation 19 and using table 36 of the VM0015 v1.1 methodology
Frequency of monitoring/recording	Annual
Value applied	To be accounted for after Project commencement
Monitoring equipment	Emissions Spreadsheets
QA/QC procedures to be applied	Good practices applied to Project emission calculations
Purpose of date	This parameter will be used to measure the efficiency of the Project when calculating the net reductions of anthropogenic emissions by the Project over the years by comparing the baseline scenario
Calculation method	Emissions will be calculated using the guidelines in section 9.2 of the VM0015 v1.1 methodology

Comments	-

Date / Parameter	VCU,t
Data unit	tCO2e
Description	Number of Verified Carbon Units (VCUs) to be made available for commercialization in year t
Source of data	Calculated by subtracting the net GHG emission reductions from the buffer
Description of measurement methods and procedures to be applied	VCU's calculation will be calculated using equations 20 21 and 22 and using table 36 of the VM0015 v1.1 methodology
Frequency of monitoring/recording	Annual
Value applied	To be accounted for after Project commencement
Monitoring equipment	Emissions Spreadsheets
QA/QC procedures to be applied	Good practices applied to Project emission calculations
Purpose of date	This parameter will be used to measure the amount of marketable carbon credits (VCU's) for the Project
Calculation method	Emissions will be calculated using the guidelines in section 9.3 of the VM0015 v1.1 methodology
Comments	-

Date / Parameter	Number of reports
Data unit	Number
Description	This parameter will be responsible for accounting for the amount of all material produced, in the form of a report, designed to monitor deforestation as well as promote improvements in the equity surveillance of the Project
Source of data	Calculated through reports, meeting minutes, monitoring guides and bulletins developed and focused on issues related to the

	Project's climate scope (monitoring deforestation and improving asset surveillance)
Description of measurement methods and procedures to be applied	All documents that can be read as “reports” produced for the Project will be stored in digital files throughout the Project's accreditation period. In this way, these reports from the activity of "Monitoring of deforestation by satellite image" and "Improvement of asset surveillance within the farm" will be monitored and accounted for
Frequency of monitoring/recording	Annual
Value applied	To be accounted for after Project commencement
Monitoring equipment	Not applicable
QA/QC procedures to be applied	The information systematized in the reports will be validated between the bidders, allowing greater reliability and quality of the data. In addition, the Project will undergo continuous evaluation of the information generated, allowing the identification of improvements in the collection and registration processes, and the incorporation of these in the strategic planning of the Project when they are identified
Purpose of date	Not applicable
Calculation method	Not applicable
Comments	-

Date / Parameter	Number of procedures/protocols
Data unit	Number
Description	This parameter will be responsible for accounting for the quantity of all material produced, in the form of procedures and protocols, which will be established to develop and improve deforestation monitoring and asset surveillance of the Project
Source of data	Documents with procedures and protocols developed to guide and improve climate activities for the Project: "Monitoring of deforestation by satellite image" and "Improvement of heritage surveillance within the Farm"

Description of measurement methods and procedures to be applied	All documents that can be read as procedures and protocols produced for the Project will be stored in digital files throughout the Project's accreditation period. In this way, these reports from the activities of "Monitoring of deforestation by satellite image" and "Improvement of asset surveillance within the farm" will be monitored and accounted for
Frequency of monitoring/recording	Annual
Value applied	To be accounted for after Project commencement
Monitoring equipment	Not applicable
QA/QC procedures to be applied	The information systematized in the procedures and protocols will be validated among the proponents, allowing greater reliability and quality of the data. In addition, the Project will undergo continuous evaluation of the information generated, allowing the identification of improvements in the collection and registration processes, and the incorporation of these in the strategic planning of the Project when they are identified
Purpose of date	Not applicable
Calculation method	Not applicable
Comments	-

Date / Parameter	Number of trainings/interventions
Data unit	Number
Description	This parameter aims to measure the amount of all courses and/or interventions carried out that will be defined and implemented throughout the Project, specifically for the activity of "Property surveillance within the farm". It is important to note that although the frequency is established to be accounted for annually, it is expected to decrease over time, as this indicator is associated with short and medium term actions for the Project
Source of data	Reports (e.g., monitoring report of project activities that have been implemented), attendance lists of participants, contracts, photos, among other documents

Description of measurement methods and procedures to be applied	All reports and documents produced will be stored in digital files for the entire duration of the Project. Thus, the realization of training/interventions linked to the activity of "Improvement of patrimonial surveillance within the farm" will have records of its developments either by reports, attendance lists, contracts, photos, among other documents, which will be monitored and accounted for
Frequency of monitoring/recording	Annual
Value applied	To be accounted for after Project registration
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Systematized training and/or intervention information will be validated among proponents, allowing greater reliability and quality of data. In addition, the Project will undergo continuous evaluation of the information generated, allowing the identification of improvements in the collection and registration processes, and the incorporation of these in the strategic planning of the Project when they are identified
Purpose of date	Demonstrate the courses and interventions the Project is undertaking to improve the property surveillance of the farm
Calculation method	Not applicable
Comments	-

Date / Parameter	Frequency of asset surveillance operations
Data unit	Number
Description	This parameter will account for the recording frequency of the number of surveillance operations carried out on the farm during the monitoring period
Source of data	There is currently no official record to account for the frequency of control and surveillance actions within the Project Area. Ideally, the counting of this data will be done by the reports (e.g., monitoring report of the project activities that have been implemented), monitoring sheets, occurrence records, etc.
Description of measurement methods	All documents produced will be stored in digital files for the entire duration of the Project. Thus, the performance of surveillance and patrol operations related to the activity of "Improvement of asset

and procedures to be applied	surveillance within the farm" will have records that will be monitored and accounted for
Frequency of monitoring/recording	Every six months
Value applied	To be accounted for after Project registration
Monitoring equipment	Not applicable
QA/QC procedures to be applied	To be established after Project registration
Purpose of date	Improve asset surveillance in containing unplanned deforestation of the Project Area and illegal activities
Calculation method	Not applicable
Comments	The monitoring sheets and reports of the patrimonial surveillance on the farm will be implemented from the validation of the Project

3.2.7 Monitoring Plan

The Climate Impact Monitoring Plan will encompass key issues for demonstrating the reduction of emissions from deforestation and degradation due to avoided unplanned deforestation, according to the methodology applied VM0015 and changes in carbon stock throughout the life cycle of the Project, resulting from changes in land use within the Project Area and in the Leakage Belt.

The monitoring plan consists of two main parts:

i) Monitoring of changes in carbon stocks and GHG emissions considering periodic checks that will occur within a fixed baseline period (PART 1);

ii) Monitoring of key parameters for baseline reassessment at the close of a fixed baseline period (PART 2).

PART 1. MONITORING CHANGES IN CARBON STOCKS AND GHG EMISSIONS FOR PERIODIC CHECKS

1.1 Monitoring of actual changes in carbon stock and GHG emissions within the Project Area

Monitoring of actual changes in carbon stock and GHG emissions within the Project Area involves four main scopes, which are:

i) implementation of the project,

ii) land use change and land cover,

iii) carbon stocks and non-CO2 emissions, and

iv) impacts from natural disturbances and other catastrophic events.

The procedures applied to this monitoring plan contemplate what is developed and applied within the perspective of the project, thus, within the scope, non-CO2 (III) emissions were not contemplated, as the emissions derived from biomass burning were not considered in the baseline.

The following are the details on the monitoring of the four scopes.

a) Technical description of monitoring tasks

Changes in carbon stock due to conversion of forest to non-forest areas by unplanned and planned deforestation will be monitored. Similarly, changes in carbon stock due to uncontrolled forest fires and other catastrophic events will be monitored and discounted on the Project scenario in cases where they are significant.

As explained in Section 2.1.11, the proponents will develop two main activities to contemplate this monitoring, which consist of monitoring deforestation via satellite images and improving asset surveillance within Fazenda Jutaituba, with the opportunity to check in the field in cases where deforested areas are detected.

The Biofílica Ambipar Environment will develop actions to monitor REDD+ activities, which aim to avoid unplanned deforestation, through the verification of forest coverage areas by satellite images and field checks. The monitoring of planned deforestation caused by forest management activities will be carried out through data and information that allow determining the amount and average size of deforested areas, such as maps and vector data of roads and yards.

b) Data to be collected

Data/Parameter	Description	Unit	Source	Attendance
ABSLPAt	Annual baseline deforestation area in the Project Area in year t	ha (hectare)	Qualified and scientifically recognized sources	Annual
ΔCUDdPAt	Total change from actual carbon stock due to unplanned deforestation unavoidable in year t in the Project Area	tCO2e	Calculated through the detected areas of forest loss in the Project Area and the average carbon stock	Annual
APDPAicl,t	Planned deforestation areas in forest class icl in year t in Project Area	ha (hectare)	Calculated through images, technical maps, field information and post-exploratory reports	Annual
ΔCPLdPAt	Total decrease in carbon stock due to timber cutting activities planned in year t in the Project Area	t CO2-e	Calculated by planned deforestation areas and average carbon stock	Annual

AUFPAicl,t	Areas affected by forest fires in class icl where carbon stock recovery occurs in year t	ha (hectare)	Adequate sources of detection of forest fires and scars caused for identification and classification of affected areas	Whenever forest fires occur
ΔCUFdPAt	Total reduction in carbon stock due to unplanned (and planned - where applicable) forest fires in year t in the Project Area	tCO2e	Calculated through the affected areas in the Project Area and the average carbon stock	Whenever forest fires occur
ACPAicl,t	Analysis Area within the Project Area affected by catastrophic events in class icl in year t	ha (hectare)	High-resolution satellite imagery and qualified and scientifically recognized sources	Whenever a catastrophic event occurs (including forest fires)
ΔCUCdPAt	Total reduction in carbon stock due to catastrophic events in year t in the Project Area	tCO2e	Calculated through the affected areas in the Project Area and the average carbon stock	Whenever a catastrophic event occurs (including forest fires)

c) Summary description of data collection procedures

Monitoring the implementation of Project activities

The monitoring of the implementation of REDD+ activities will be carried out through schedules, performance reports of activities and indicators, financial reports, attendance lists, minutes of meetings, procedures and protocols established, forest coverage maps, among other relevant documents.

Monitoring of land use change and land cover within the Project Area

This monitoring will be developed and carried out for the planned and unplanned deforestation in the Project, through the mapping of the forest cover of the Project Area, through qualified and scientifically recognized sources, such as PRODES and DETER, developed through the National Institute of Space Research, MapBiomas, developed by a collaborative network formed by NGOs, universities and technology startups, among other qualified and recognized sources that may be used in the future. The choice of methodology will be evaluated in order to meet the requirements of data quality and accuracy.

Also, in particular for the monitoring of planned deforestation, open areas will be considered for the implementation of infrastructure, such as the construction of roads, extensions and storage yards

within the Project Area and reports, post-exploratory maps and satellite images containing information on forest cover areas converted to the non-forest class will be used.

Aiming at greater flexibility in the deforestation mapping process, different classification and visual interpretation techniques can be used during the progress of the Project, such as complementary mapping using alternative images and sensors and data collected in the field.

After the survey of deforestation data, these will be compared with the baseline scenario, and the emission reduction values for the monitored period will be based on the comparison between expected deforestation and actual deforestation.

Monitoring of carbon stock changes and non-CO2 emissions

It is expected that the ex-ante estimation of carbon stock for forest class will not change during the baseline period. However, the VM0015 Methodology requests monitoring of carbon stock in the Project Area subject to relevant decrease in the Project scenario in accordance with ex ante evaluation due to controlled deforestation and planned management activities, or areas subject to unplanned and significant decrease of carbon stock in the Project scenario.

In view of this, the monitoring of changes (reduction) in the carbon stock of unplanned and planned deforested areas will be carried out first by multiplying these areas identified in year *t* in the Project Area by the initial average stock values in the forest class. The carbon stock estimated for the Reference Region in a post-deforestation scenario is subtracted from the result of this multiplication, finally obtaining the net value of carbon stock that was reduced in year *t*. If there is a significant reduction in carbon stock due to deforestation in the Project Area, this reduction will be presented in the verification processes using Table 29 of the Approved Methodology VM0015 version 1.

For the monitoring of non-CO2 emissions, these will be monitored through the photointerpretation of high-resolution images as well as adequate sources of detection of forest fires and scars caused for identification and classification of affected areas. For damage verification and verification of vegetation recovery over time, NDVI analyzes will be performed, and if necessary, there will be field verification of the affected areas. In cases where affected forest areas are identified, the reduction of the carbon stock caused by forest fires will be evaluated based on the multiplication of the mapped area of forest loss by the average forest carbon stock. If there is a significant decrease in carbon stock, this reduction will be reported in the verification processes using Tables 25e, 25f and 25g of the VM0015 methodology version 1.1.

Monitoring of natural disturbances and other catastrophic events

Reduction of carbon stock and increase of GHG emissions as well as reduction of significant carbon stock caused by natural disturbances or catastrophic events will be controlled, monitored and reported similar to non-CO2 emissions in the Project Area. Therefore, if there is a significant decrease in carbon stock due to natural disturbances or catastrophic events, this reduction will be reported in the verification processes using Tables 25e, 25f and 25g of Approved Methodology VM0015 version 1.1.

d) Quality control and quality assurance procedures

For the monitoring of the activities of the Jutaituba REDD+ Project, the activity of "implementation, monitoring and evaluation of the activities developed" is foreseen, in which it will allow the

continuous monitoring of the Project, accompanied by evaluation processes, enabling the incorporation of learning and improvements and, consequently, quality assurance to the Project.

As described in the previous items, changes in carbon stock due to conversion of forest to non-forest areas by unplanned and planned deforestation will be monitored. Similarly, changes in carbon stock due to uncontrolled forest fires and other catastrophic events will be monitored and discounted over the project scenario in cases where they were significant. The quality control and assurance of these analyzes will be carried out through the accuracy process indicated by the VM0015 methodology version 1.1, in which it will be the same regardless of the type of data used in the monitoring.

The analysis will be done through the analysis of general accuracy and the kappa index obtained from a confusion matrix such as that of Congalton (1999)[96], in which at least 100 points randomly distributed in relation to the analyzed area will be generated through a geographic information system. The validation will be performed through high spatial resolution satellite images and/or data collected in the field. The minimum mapping accuracy, according to VM0015, for each class or category on the land use and land cover map must be 80%.

In addition to the accuracy process carried out, when necessary, field checks will be carried out on areas where conversion from forest to non-forest areas is identified either by unplanned deforestation or by uncontrolled forest fires and other catastrophic events.

e) Data archiving

The Biofílica Ambipar Environment will store all data and reports of the Jutaituba REDD+ Project in digital files throughout the duration of the Project. All documents related to the monitoring of the Project will be made available to the auditors at each verification event.

f) Organization and responsibilities of the parties involved in all the above points

The procedures described will be the responsibility of the Project proponents: Biophilic Ambipar Environment and Martins Agropecuária.

1.2 Leakage monitoring

The monitoring of the leak by the Project involves two main scopes, which are:

i) changes in carbon stocks and GHG emissions associated with leakage prevention activities, and
ii) changes in carbon stocks and GHG emissions associated with leakage from displacement of activities

The procedures applied to this monitoring plan contemplate what is developed and applied within the perspective of the project, thus, within scope ii) the monitoring of changes in GHG emissions derived from biomass burning was not contemplated, as it was not considered at the baseline.

The following are the details on the monitoring of the two scopes.

a) Technical description of monitoring tasks

[96] CONGALTON, R. G.; KASS GREEN. **Assessing The Accuracy Of Remotely Sensed Data: Principles And Practices.** New York – CRC Press, 1999.

There are not expected to be changes in carbon stock and GHG emissions associated with leakage prevention activities, since no activity is foreseen, such as agrarian improvement or management of pasture areas or forage production, capable of changing the carbon stock and increasing GHG emissions when compared to the baseline scenario. Also, as mentioned in Section 3.2.1, three activities proposed by the Project will contribute as management measures to the leak: "Non-timber forest management at Fazenda Jutaituba", "Formalization of access to Fazenda Jutaituba for stakeholders" and "Promotion of sustainable practices".

However, although no inventory reduction is foreseen in leakage prevention activities, if they are necessary during the implementation of the Project, ex ante changes in carbon stock and GHG emissions associated with these activities will be estimated according to step 8 of the Approved Methodology VM0015. If the results are relevant, they will be monitored and the data will be made available to the verifiers at each verification event using Tables 30b, 30c, 31, 32 and 33 of the VM0015 Methodology version 1.1.

Changes in carbon stock and GHG emissions associated with leakage from displacement of activities will be monitored using the same technique applied in monitoring changes in carbon stock due to conversion of forest to non-forest areas by unplanned deforestation in the Project Area.

b) Data to be collected

Data/Parameter	Description	Unit	Source	Attendance
ΔBSLLKt	Annual baseline deforestation area within the Leakage Belt in year t	ha (hectare)	Qualified and scientifically recognized sources	Annual
ΔCLPMLKt	Decrease in carbon stocks due to preventive measures in the Leakage Belt in year t	tCO2e	Monitoring report of project activities that have been implemented and other records related to leak prevention activities	Whenever the event occurs
ΔCADLKt	Total decrease in displaced carbon stocks due to deforestation in year t	tCO2e	Calculated through the detected areas of forest loss in the Leakage Belt, the average carbon stock and the estimated loss in carbon stock at the baseline for the Leakage Belt	Annual
EgLKt	Emissions of grazing animals in areas in leakage management in year t	tCO2e	Existing records on grazing practice	Whenever the event occurs

c) Summary description of data collection procedures

Changes in carbon stocks and GHG emissions associated with leakage prevention activities

As explained in item a), it is not expected that there will be changes in carbon stock and GHG emissions associated with leakage prevention activities, since no activity capable of changing the carbon stock and increasing GHG emissions is foreseen when compared to the baseline scenario. However, if such activities prove necessary, ex ante changes in carbon stock and GHG emissions associated with these activities will be monitored and the data will be made available to the auditors at each verification event using Tables 30b, 30c, 31, 32 and 33 of the VM0015 Methodology version 1.1.

Monitoring, considering the data collection procedures, will consider the following activities:

- List of leakage prevention activities;

- Production of a map showing the areas of intervention and the type of intervention;

- Recognition of areas where leakage prevention activities have an impact on carbon stock;

- The non-forest classes existing in these areas in the case of the baseline will be identified;

- The carbon stocks in the identified classes will be measured or there will be the use of a conservative estimate of the literature;

- Changes in carbon stock in the leakage management areas under the project scenario will be reported using Table 30b of VM0015;

- Calculation of net changes in carbon stock caused by leakage prevention measures during the fixed period of the baseline and the project credit period;

- The results of the calculations will be reported by Table 30c of the approved VM0015 Methodology.

Changes in carbon stock and GHG emissions associated with leakage from displacement of activities

These will be monitored through the same methods applied to monitor the conversion of forest areas to non-forest areas by unplanned deforestation in the Project Area, that is, qualified and scientifically recognized sources will be used, such as PRODES, DETER and MapBiomas, in which they will be evaluated by data quality and accuracy requirements. If in the Leakage Belt there is a greater than expected deforestation event for the baseline scenario and is assigned to deforestation agents in the Project Area, carbon stock losses will be accounted for and reported using either Table 22c or Table 21c of the Approved Methodology VM0015 version 1.1.

d) Quality control and quality assurance procedures

The control and quality assurance in relation to the monitoring of changes in carbon stock and GHG emissions associated with leakage prevention activities will be determined according to the activity, if implemented, already in relation to changes in carbon stock and GHG emissions associated with leakage due to the displacement of activities will be carried out through the accuracy analysis, as indicated by the VM0015 methodology version 1.1.

The accuracy analysis of the classification will be carried out through the analysis of general accuracy and the kappa index obtained from a confusion matrix such as that of Congalton e Green

(2008)[97], in which at least 100 points randomly distributed in relation to the analyzed area will be generated through a geographic information system. The validation will be performed through high spatial resolution satellite images and/or data collected in the field. The minimum mapping accuracy, according to VM0015, for each class or category on the land use and land cover map must be 80%.

e) Data archiving

Biofílica Ambipar Environment will store all Jutaituba REDD+ Project data and reports in digital files for the entire duration of the Project.

All documents related to the monitoring of the Project will be made available to the auditors at each verification event.

f) Organization and responsibilities of the parties involved in all the above points

The procedures described will be the responsibility of the Project proponents: Biophilic Ambipar Environment and Martins Agropecuária.

1.3 Monitoring of ex-post reductions in net anthropogenic GHG emissions

Details on monitoring are presented below.

a) Technical description of monitoring tasks

In the verification procedures, the results will be represented using Table 36 of the VM0015 Methodology version 1.1, along with spatial data (deforestation maps, when available).

A map showing the cumulative areas credited within the Project Area will be updated and presented to VVB at each verification event.

b) Data to be collected

Data/Parameter	Description	Unit	Source	Attendance
ΔREDD,t	Net GHG emission reductions attributable to the Project's AUD activities year t	tCO2e	Calculated by subtracting the changes that occurred in the ex-post carbon stock from the baseline scenario	Annual
VCU,t	Number of Verified Carbon Units (VCUs) to be made available for commercialization in year t	tCO2e	Calculated by subtracting net ex-post GHG emission reductions from the Buffer Project	Annual

PART 2. MONITORING BASELINE PROJECTIONS IN THE FUTURE

[97] Congalton, R. and Green, K. (2008) Assessing the Accuracy of Remotely Sensed Data: Principles and Practices. Second Edition, CRC Press, Boca Raton.

2.1 Updating information on agents, drivers and underlying causes of deforestation

The Project baseline will be updated and used in the revision of the baseline projections after a fixed period of 6 years, in addition to statistical and spatial data, studies and information on agents, motivations and underlying causes of deforestation necessary to carry out Steps 2 and 3 of the Approved Version of the VM0015 Methodology.

2.2 Update of Land Use Change Component and Baseline Land Cover

The Project will follow the updates regarding the national and sub-national baselines, and thus will apply if improvements compatible with the rigor applied to the Project are verified. Otherwise, step 4 of the VM0015 Methodology will be redone considering the period of the last 6 years and using updated variables on the agents, drivers and underlying causes of deforestation in the Reference Region. The annual deforestation area and the location of deforestation at the baseline are the two main components to be reviewed.

The assumptions and hypotheses considered in the modeling of the dynamic component of future deforestation (population data), as well as the data used in spatial projection (update of highways, location and distance of new deforestation) will be reviewed and updated.

2.3 Update of Carbon Component from Baseline

According to the results generated during the changes in carbon stock monitoring processes throughout the Project, the spatial estimate of the carbon component can be reviewed in the VM0015 Methodology version 1.1, Part 3, item 1.1.3. Thus, if there are more accurate estimates, from the use of techniques, such as LIDAR or SAR interferometric data, they will be applied are baseline revisit period.

3.2.8 Dissemination of Monitoring Plan and Results (CL4.2)

The monitoring plan, as well as the results obtained by monitoring the Jutaituba REDD+ Project, will be made available to the public through a page on the official website of Biofílica Ambipar Environment Investments. The summary documents regarding the monitoring plan and results, as well as relevant information, will be made available to communities and stakeholders through meetings, lectures and through physical means on the premises of Fazenda Jutaituba.

3.3 Optional Criterion: Climate Change Adaptation Benefits

3.3.1 Regional Climate Change Scenarios (GL1.1)

Not applicable.

3.3.2 Climate Change Impacts (GL1.2)

Not applicable.

3.3.3 Measures Needed and Designed for Adaptation (GL1.3)

Not applicable.

4 COMMUNITY

4.1 Without-Project Community Scenario

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

Historical social transformations of the territory

The occupation of the Lower Tocantins estuary was given around the region's rivers in the 17th century (RODRIGUES, 2019[98]), which served as an entrance for blacks, enslaved to work in the mills. The rivers also served as an escape route for these slaves. In this sense, the towns and parish landmarks were built on the banks of the rivers.

The formation of quilombola communities in the region dates back to the 18th century. The capacity of commercial articulation of these groups with society in the enthronement, led to the formation of a quilombola stronghold through trade that allowed economic autonomy to the mocambos installed along the Tocantins river and its tributaries. With the enslavement of blacks, the region witnessed acts of resistance, where insurgent movements and escapes from the mills resulted in the formation of aquilombamentos in the region. In these spaces of freedom, blacks sought to redo social and economic life in Baixo Tocantins (RODRIGUES, 2019).

With the support of the Catholic Church, which strengthened community organization and political mobilization, discussions began around territorial rights under the quilombo category in addition to organized black movements. The demand for the demarcation of the remaining quilombo territories demanded from the State the reparation for the centuries of slavery imposed on black groups in Brazil, without disregarding that the extinction of the slave regime did not imply the guarantee of social rights (TRECCANI, 2009[99]). From then on, some changes in legislation led the black political movement to emerge victorious:

- Art. 68 of the Federal Constitution in the Act of Transitional Constitutional Provisions (ADCT): "The remnants of the quilombos communities that are occupying their lands are recognized as definitive property, and the State must issue the respective titles" (BRASIL, 1988[100]).
- Art. 8 of Decree No. 3.572 of July 22, 1999: regulates the process of recognition of the quilombola territories of the state of Pará

In addition, in 2007, as another milestone in strengthening the political organization of black groups in the state of Pará, there was the restructuring of the Instituto de Terras do Pará (ITERPA), which takes care of the policy of supporting quilombola communities. With this event, in 2007, the state reached a significant number of regularized quilombola territories, with a work carried out through technical cooperation between ITERPA and the National Institute of Colonization and Agrarian Reform (INCRA). In this context, several quilombola communities in the Lower Tocantins region

[98] RODRIGUES, Camila Quaresma. **Companies and guests:** ritualization of collective work for the cultivation of cassava. Advisor: Prof. Dr. Sônia M. S. Barbosa Magalhães Santos. 2019. 111 p. Dissertation (Master) - AMAZON INSTITUTE OF FAMILY FARMS - UFPA, Belém/ Pa, 2019.
[99] TRECCANI, Girolamo Domenico. **Title of Possession and Legitimation of Possession as forms of acquisition of property.** Revista da Procuradoria Geral do Estado do Pará, v. 20, p. 121-158, 2009.
[100]BRAZIL. Constitution (1988). Constitution of the Federative Republic of Brazil. Brasília, DF: Federal Senate: Centro Gráfico, 1988. 292 p.

obtained their collective titles of quilombola territory, forming a complex of quilombola communities in the region.

- **Current characteristics of the territory**

  With a total area of 37,392.87 km^2, the estimated population of the four cities to which the Jutaituba REDD+ Project is inserted: Baião, Bagre, Oeiras do Pará and Portel, according to IBGE data, is 48,459, 31,325, 32,850 and 62,945 inhabitants, respectively. Although the largest population contingent is in the city of Portel, Baião presented the largest population increase between 2010 and 2020, according to census data made available by IBGE on the CIDRA (IBGE Automatic Recovery System) and IBGE Cities platforms. Table X shows the population increase of each city between these years.

Table 46: Population increase between 2010 and 2020 for each city. Source: IBGE/CIDER[101](Censuses 2000 and 2010).

City	Year	Inhabitants
Baião	2010	36,882
	2020	48,459
Bagre	2010	23,864
	2020	31,325
Oeiras do Pará	2010	28,595
	2020	32,850
Portel	2010	52,172
	2020	62,945

Related to urbanization rates, it is possible to notice that in 2000, most of the population was located in rural areas, with an urbanization rate below 50%, except for the city of Baião, with a rate of 51%. In 2010, Baião presented a 1% reduction in the urbanization rate, while the other cities in the region presented an increase in the urbanization rate, however, the population remains mostly in the rural area, since the rate values are below 50%. Below, Figure 18 presents a comparison between the years 2000 and 2010 and the cities.

[101]IBGE/CIDER. Brazilian Institute of Geography and Statistics. Census 2000 and 2010. Available at: <https://sidra.ibge.gov.br/pesquisa/censo-demografico/demografico-2010/inicial>. Accessed on July 5, 2022.

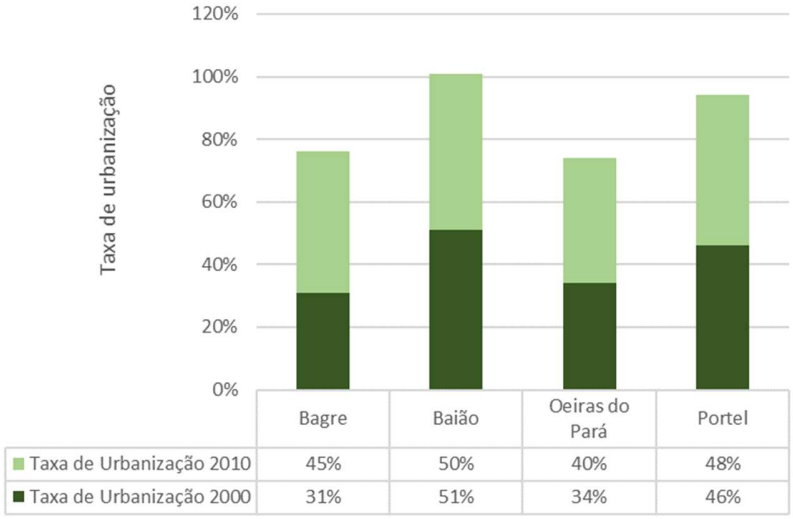


Figure 18 - Urbanization rate by city between 2000 and 2010.

All cities have elementary and high schools, and the city of Portel has the largest number of educational establishments, followed by Bagre, Baião and, finally, Oeiras do Pará (Figure 19).

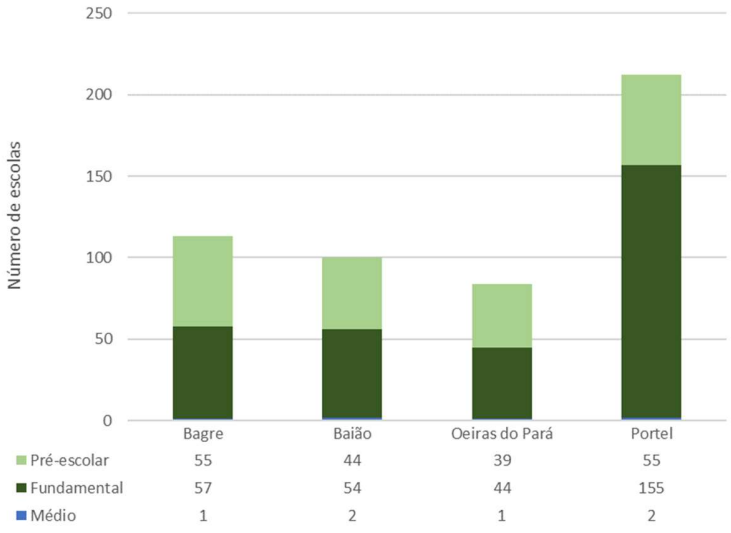


Figure 19 - Number of schools by level and by city in the region in 2021. Source: IBGE/CIDER[27].

As for health, all cities have public health establishments, with a total of 88 establishments among the four cities. Portel leads in number of establishments (27), followed by Baião (25), Oeiras do Pará (19) and Bagre (17).

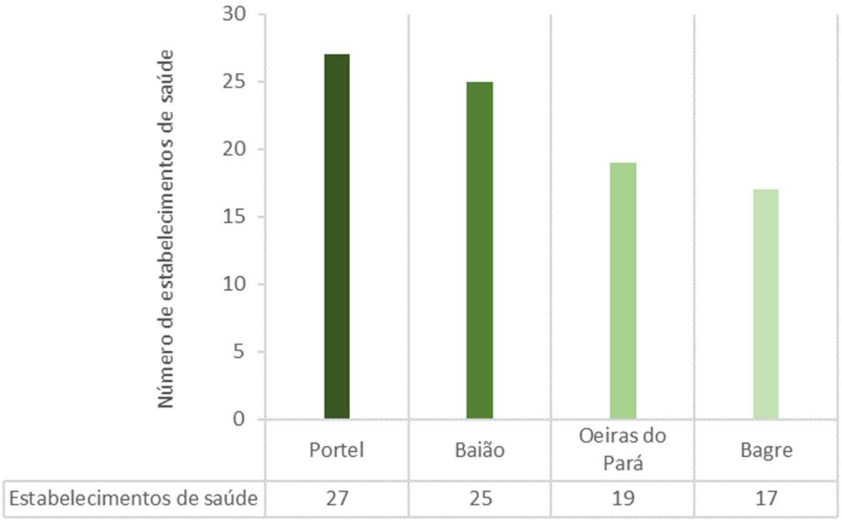


Figure 20 - Health establishments in the cities in 2021. Source: DATASUS.

4.1.2 Interactions between Communities and Community Groups (CM1.1)

The interaction between communities and community groups is good, mainly due to the geographical proximity between them. Thus, it is possible to perceive that students attend schools in communities to which they do not belong, depending on the availability of educational institutions in each community. In addition, as needed, communities go to health institutions in other communities where they do not reside. The Jutaituba REDD+ project could further strengthen interactions between communities and community groups.

4.1.3 High Conservation Values (CM1.2)

The concept of High Conservation Values (HCV) was developed by the Forest Stewardship Concil (FSC, 1996)[102] for the certification of timber products from responsible forest management, according to standardized Principles and Criteria that reconcile environmental and ecological safeguards with social benefits and economic viability (FSC, 2014)[103].

Areas of High Conservation Value (HCVA) are areas that have extreme or critical importance due to some particular characteristic, such as the significant concentration of biodiversity, seasonal concentration of species, endangered and rare ecosystems, presence of endangered species, provision of essential ecosystem services, social, historical and cultural values, among others. Within this context, as defined by the *HCV Resource Network*, there may be six types of high conservation values

In the context of the socioeconomic contextualization of the Jutaituba REDD+ Project, some cultural and historical aspects are discussed, which are relevant to the traditional communities around them, and can characterize an Area of High Values for Conservation, which must be

[102] FOREST STEWARDSHIP COUNCIL (FSC). **FSC principles and criteria for forest stewardship.** FSC-STD-01-001 (version 4-0) EN. FSC, Bonn. 1996.
[103] FOREST STEWARDSHIP COUNCIL (FSC). **International generic indicators**. FSC-STD-BRA-01-004. V1-0 PT. FSC, Bonn. 2014.

identified and managed in order to guarantee its maintenance and improvement (BROWN et al., 2013)[104]. Of the six criteria listed by the FSC, two have a direct relationship with the enthronement communities:

AAVC5: Fundamental areas and resources to maintain the basic needs of local communities (subsistence, food, health, water, etc.);

HCVA 6: Areas of special cultural, archaeological or historical significance, at the national and global level, and/or of cultural, ecological, economic or religious/sacred importance to local communities.

In all communities, forest reserve areas were identified, which are fundamental for cultural identity and from where they obtain natural resources for cultural, religious, social and economic reproduction (HCVA 6). Areas fundamental to the supply of the basic needs of local communities were also identified, such as for subsistence, mainly linked to the food of families and the reservation of medicines and construction materials (HCVA 5).

The use of natural resources in the forest areas of the communities triggers a series of negative consequences, one of which is the depletion of resources. Thus, the forest areas of Fazenda Jutaituba became of paramount importance for the extraction of forest products for the income of the communities. Thus, the AACV identified in the Project area are forest areas that many communities use for subsistence and fundamental uses related to food and health, such as extraction of medicinal plants, fruit plants, wood for civil construction, handicrafts and furniture, as well as areas for hunting and subsistence fishing practices (HCVA 5).

High Conservation Value	Project Zone areas are fundamental for surrounding communities (HCVA 5)
Qualifying Attribute	Areas used by the enthronement communities for the extraction of plants with medicinal uses, fruits, wood, as well as fundamental areas for hunting and subsistence fishing.
Focal Area	Areas within the project used by communities need continuous monitoring to ascertain the maintenance of the environmental structure and not the depletion of forest resources. In addition, it is necessary to monitor the activities carried out by communities in these areas in order to make rational and sustainable use of resources. The surveillance actions carried out on the farm assist in the containment of illegal entry and extraction of resources. The Jutaituba REDD+ Project aims to improve these activities to ensure the continuity of the HCV.

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

The current socioeconomic indicators characterize a region with low welfare conditions for the communities, and with few productive economic alternatives, causing families to seek better living conditions. From this, some scenarios can lead to the advance of deforestation in the region.

[104] BROWN, E.; DUDLEY, N.; LINDHE, A.; MUHTAMAN, D. R.; STEWART, C.; SYNNOTT, T. Common guidance for the identification of high conservation values. **HCV Resource Network**, 1-74, 2013.

- **Levels of education**: despite the deficit in relation to educational establishments in the communities, levels of education are high, in addition, the increase in the number of higher education institutions in the region, especially public institutions and quota policies for quilombola populations, increased the number of people with higher education in rural communities. As a consequence, for the local economy, the increase in the level of education, especially of higher education, may, on the one hand, promote the generation of diversified income for the communities, in addition to expanding the knowledge and training of specialized labor, and on the other, may cause the rural exodus of young graduates, in search of new employment opportunities outside the communities and the region, as well as better living conditions.
- **Economic activities**: economic activities, mainly related to agriculture, are carried out with the absence of technologies and good productive practices, which contributes to deforestation in the region. Family farming is the traditional cutting and burning technique used for planting cassava and black pepper, gradually eroding the land. In addition, since açaí has guaranteed prestige in the national and international market at an attractive price, in addition to being a source of food for the local population and one of the main products of family food, along with cassava flour, there may be the growth of açaí monoculture with an increase in areas destined for its cultivation. Finally, many communities practice hunting and fishing for subsistence and report that hunting, in particular, is practiced mostly by people from outside the region for commercial purposes, using forest areas of Fazenda Jutaituba and forest reserves of the communities, which contributes to the loss of local biodiversity.
- **Low income**: with the lack of alternatives for economic productive activities in the region, in addition to informality at work, especially with regard to the agricultural sector, many families find themselves in a situation of economic and food vulnerability. In this sense, lumber mills and sawmills in the region attract families to buy timber as a form of extra income. This fact can significantly increase the pressure on forest resources and consequent deforestation.
- **Difficulty of access**: Many extractive communities are located in places of difficult access, with poor infrastructure of roads and roads. In this scenario, families took a long time to move to more developed cities with better infrastructure for access to public services. This can stimulate the entry of these families into the Fazenda Jutaituba area to facilitate transportation and travel time. Through this, the possibility of entry of third parties to promote illegal activities is facilitated, increasing deforestation in the area.

In view of this, it is possible to perceive that the socioeconomic and infrastructure conditions of the region can stimulate illegal activities, such as the predatory extraction of wood and non-timber forest products, in addition to hunting and illegal fishing, leading to a series of negative impacts on the ecological processes of the forest and the depletion of the natural resources of interest (ASNER et al., 2009)[105]. It is also confirmed that agricultural activities with traditional cutting and burning techniques, other agricultural crops, monocultures and logging and non-timber are the basis of subsistence, and may represent the greatest potential of the processes of increased deforestation.

[105] ASNER, GP; RUDEL, TK; AIDE, TM; DEFRIES, R.; EMERSON, R. A Contemporary Assessment of Change in Humid Tropical Forests. **Conservation Biology**, 23(6), 1386–1395. 2009. doi:10.1111/j.1523-1739.2009.01333.x

This factor constitutes a future scenario in which the depletion of agricultural areas by repeated techniques of fire and gardening, require the opening of new areas, in addition, with the selective cutting of timber forest species, the wood reserves of the communities may disappear. As a consequence, in the medium and long term, the pressure on the forest areas of the Fazenda Jutaituba may increase.

In addition, some communities use forest areas in the project area as a subsistence base, as presented in Section 4.1.3. Despite the surveillance activities of the farm, there is no monitoring of these forest areas used by the communities to guarantee rational and sustainable use and not depletion of natural resources, in addition, the surveillance actions are carried out by the farm workers themselves, without training or specific training for the activity. This scenario may increase the occurrence of deforestation, invasions and illegal logging and other illegal activities in the project area.

Despite giving better conditions for the disposal and commercialization of family farming products to the communities, the improvement in the trafficability of the Transcametá Highway can be a drivers of deforestation of its forest reserve areas, which will be more exposed to third-party invasions for illegal logging and the practice of predatory hunting of wild animals. In the same sense, in recent years, local transport has undergone changes, increasing the number of motorcycles and bus lines. In the same way that this ease of displacement brings benefits to the community, it can generate negative impacts when it facilitates the displacement with easier access to fishing, hunting and removal of wood in a predatory way.

Given the exposed situation, we can predict two possible scenarios for deforestation in the Project Reference Region. Cenario 1 represents the continuity of the status quo (*business as usual*), without the Jutaituba REDD+ Project, leading to an increasing pressure on forest resources and consequent increase in deforestation. Scenario 2 shows actions aimed at socioeconomic development from the REDD+ Project, possible to mitigate the impacts on forest resources and avoid deforestation in the region.

The actions under the Jutaituba REDD+ Project that stimulate the increase and improvement of income, especially with regard to the "Promotion of sustainable practices" (Section 2.1.11) linked to the potential lines mapped by the project, are essential to achieve the objectives of reducing emissions from deforestation and degradation, enabling the maintenance of families in the rural area and an increase in the supply of food produced in an appropriate way.

It is emphasized the need to stimulate the search for actions that can contribute to the development of public policies aimed at education and improvement in income and employment conditions, as well as access to goods and services. The education of the rural and urban population is essential to optimize knowledge about the forest and its management, as well as to ensure better income and employment conditions. In addition, education is an important tool for the population to participate more in political spaces and decision-making on natural resources.

Another important measure for the success of these actions is the "Strengthening of Governance" and "Implementation, monitoring and evaluation of the activities developed by the Project" (Section 2.1.11), promoting a more consolidated relationship with stakeholders, from the strengthening and consolidation of a local partnership to act *in locu*, and having a monitoring of the effectiveness of the activities proposed and implemented by the Project, contributing to the management of the risks associated with the activities and the conduction of the improvement of the socioeconomic aspects, ensuring access to a positive scenario and the good progress of the Project.

Therefore, it is concluded that the most likely scenario for communities in the absence of the Project would be the continuity of the chain of events that leads to deforestation, such as low income levels, little diversification of production combined with low productivity and unsustainable economic activities, difficulty in accessing public policies and public services, among others.

The unfeasibility of the performance of the Jutaituba REDD+ Project would result in the continuity of the problems encountered in the communities, such as:

- Communities with little access to public policies;
- Development of low-tech, profitable, productive and unsustainable itinerant agriculture;
- Absence of sustainable economic practices related to the production processes and hunting and fishing practices;
- Difficulty of access and trafficability.

In this scenario, considering no significant improvement in public management models, the trend would be that the deforestation rate would remain or increase and with this the socioeconomic context shown above would remain stagnant or worsen due to the demographic increase and the increase in the pressures of hidden causes of deforestation. In the event of a catastrophic scenario, it is possible that the situation of the communities surrounding the Fazenda Jutaituba will deepen the indicators of deterioration in the following aspects:

a) Social: continuity of education, health, access to public policies that guarantee goods and services, communication, infrastructure such as roads and access, incipiently;

b) Economic: stagnation and decrease in household income, agriculture and alternatives to promote diversification and verticalization of production, production flow, in addition to the lack of sustainable production;

c) Environmental: degradation of forests, enhancement of invasions by illegal loggers, looting of existing natural resources, in addition to increased hunting and illegal fishing;

Such a condition presented in this scenario may result in the rural exodus, that is, the going of the residents to the cities, where there is a possibility of marginalization, due to the low conditions of absorption of the labor force in the region.

In the scenario with the presence of the Jutaituba REDD+ Project, the communities are envisioned with the increase in levels of socioeconomic conditions, reaching levels of development from its production to the access of public policies that guarantee the continuity of families in the communities, avoiding rural exodus. In addition, with the Project and from the promotion of the proposed activities, an innovation process is created towards the development of a strategy of a business structure of social impact, generating a favorable and sustainable business environment economically, environmentally and socially

4.2 Net Positive Community Impacts

4.2.1 Expected Community Impacts (CM2.1)

Community Group	Communities surrounding the Fazenda Jutaituba:

	- Quilombola Territory of the Quilombo Remaining Association of Igarapé Preto to Baixinha (ARQIB) - Araquembaua - Baixinha - Campelo - Carará - Itaperuçu - Cupu - Igarapé Preto - França - Igarapezinho - Pampelônia - Teófilo - Varginha
Impact(s)	- Access to training and qualification on practices - sustainable use of natural resources; - Integration with new markets; - Environmental awareness and permanence of families on their lands; - Access to new markets; - Income generation and diversification.
Type of Benefit/Cost/Risk	Expected benefits: - Direct impact on the community; - Cost related to courses and training; - Positive net benefits
Change in Well-being	- Territorial belonging

Community Group	Communities surrounding the Fazenda Jutaituba: - Quilombola Territory of the Quilombo Remaining Association of Tatituquara, São Sebastião, Ajará and Boa Esperança (ARCHITA) - Tatituquara - Ajará - São Sebastião - Boa Esperança
Impact(s)	- Access to training and qualification on sustainable practices of the use of natural resources; - Integration with new markets; - Environmental awareness and permanence of families on their lands; - Income generation and diversification; - Environmental education within the scope of hunting and fishing.

Type of Benefit/Cost/Risk	Expected Benefit: - Direct impact on the community; - Cost related to courses and training; - Positive net benefits
Change in Well-being	- Territorial belonging; - Improvement of income; - Improvement in economic practices

Community Group	Communities surrounding the Fazenda Jutaituba: - Quilombola Territory of the Remaining Association of Quilombo de Bailique Centro, Bailique Beira, Poção and São Bernardo - Bailique Beira - Bailique Centro - Poção - São Bernardo
Impact(s)	- Facilitation of displacement and access to public policies; - Access to training and qualification on sustainable practices of the use of natural resources; - Integration with new markets; - Environmental education within the scope of hunting and fishing.
Type of Benefit/Cost/Risk	Expected benefits: - Direct impact on the community; - Cost related to courses and training; - Positive net benefits
Change in Well-being	- Territorial belonging - Improvement in the Governance of the area - Improvement of income - Improvement in economic practices

Community Group	Communities surrounding the Fazenda Jutaituba: - Quilombola Territory of the Association of Remaining Communities of Quilombo de Umarizal - Umarizal Beira e Centro - Boa Vista - Paritá - Florestão
Impact(s)	- Facilitation of displacement and access to public policies; - Access to training and qualification on sustainable practices of the use of natural resources; - Integration with new markets;

	- Environmental education within the scope of hunting and fishing
Type of Benefit/Cost/Risk	Expected benefits: - Direct impact on the community; - Cost related to courses and training; - Positive net benefits
Change in Well-being	- Territorial belonging; - Improvement in the governance of the area; - Improvement of income; - Improvement in economic practices

Community Group	Communities surrounding the Fazenda Jutaituba: - Balieiro Territory - Balieiro
Impact(s)	- Integration with new markets; - Access to training and qualification on sustainable practices of the use of natural resources; - Environmental education within the scope of hunting and fishing.
Type of Benefit/Cost/Risk	Expected benefit: - Direct impact on the community; - Cost related to courses and training; - Positive net benefits
Change in Well-being	- Territorial belonging; - Improvement of income; - Improvement in economic practices

Community Group	Communities surrounding the Fazenda Jutaituba: - Ipaú-Anilzinho Extractive Reserve - Joana Peres.
Impact(s)	- Facilitation of displacement and access to public policies; - Integration with new markets; - Access to training and qualification on sustainable practices of the use of natural resources; - Environmental education within the scope of hunting and fishing.
Type of Benefit/Cost/Risk	Expected benefits: - Direct impact on the community; - Cost related to courses and training; - Positive net benefits
Change in Well-being	- Territorial belonging; - Improvement in the governance of the area;

	- Improvement of income; - Improvement in economic practices;

Community Group	Communities surrounding the Fazenda Jutaituba: - Other Communities - Combucão; - São Tomé; - Nova Canaã.
Impact(s)	- Facilitation of displacement and access to public policies; - Integration with new markets; - Access to training and qualification on sustainable practices of the use of natural resources; - Environmental education within the scope of hunting and fishing.
Type of Benefit/Cost/Risk	Expected benefit: - Direct impact on the community; - Cost related to courses and training; - Positive net benefits
Change in Well-being	- Territorial belonging; - Improvement in the governance of the area; - Improvement of income; - Improvement in economic practices

4.2.2 Negative Community Impact Mitigation (CM2.2)

As mentioned in the section above (Section 4.2.1) the Jutaituba REDD+ Project does not provide negative impacts for the well-being of local communities. Some potential risks are pointed out as the lack of interest of other stakeholders, a decrease in the number of the population due to the rural exodus and lack of community engagement.

In order to mitigate these risks raised, some measures can be taken such as consolidating the involvement between all parties involved in the decision-making processes of the Project activities, especially in the meetings, in addition to improving the existing communication tools. In order to mitigate the rural exodus, a mitigating measure is to involve the community members in the negotiations and decisions about the activities of the Project, in addition to the involvement in the training and qualification proposed, providing an improvement in the well-being of the population.

For the maintenance and improvement of the High Value Area for Conservation (HCVA), activities related to the use of the Project area by the community members for the sustainable extraction of non-timber Forest Products, promotion of sustainable practices, as well as environmental education related to hunting and fishing (Section 2.1.11) were proposed. In addition, other activities related to the protection of the forest, such as the improvement of heritage surveillance actions, remote monitoring and promotion of sustainable practices, help in the maintenance of forest cover, essential for the survival of the communities in the area.

4.2.3 Net Positive Community Well-Being (CM2.3, GL1.4)

The Jutaituba REDD+ Project, through the proposed activities, brings a socioeconomic and sustainable development to the communities around the Farm, focusing on training and qualification in sustainable practices techniques, increasing engagement through participatory strategies in the activities.

In the scenario without Project, as described in Section 4.1.4, the context of low income, lack of access to public policies and other public services, causes families belonging to the communities to seek changes to increase their income, from economic activities and livelihoods practiced in an unsustainable and unplanned way.

The Jutaituba REDD+ Project proposes activities aimed at the socioeconomic and sustainable development of communities, improving their well-being and quality of life, in addition to promoting articulations with public and private partnerships to encourage investments and other actions aimed at the development of communities.

The Project plans to create opportunities for communities by causing the following positive net impacts:

- Improve production systems, related to all lines mapped by the project, making them sustainable, implementing partnerships, increasing the income of families;
- Increase the engagement of communities from their participation in the activities of the Project, in addition to the strengthening of skills, knowledge and human capacities related to economic activities;
- Increase the levels of knowledge about sustainable practices, both at the levels of extraction of timber and non-timber forest resources, as well as hunting and fishing activities, promoting the protection and conservation of forest cover and biodiversity, which are the means of subsistence and income of families;
- Permanence of families in communities;
- Efficient communication, strengthening partnerships and integration with markets.

The main problems that will be faced in this context are:

- Low access to public policies related to goods and services;
- Unsustainable economic activities, with low diversification and productivity;
- Difficulty in mobility and access;

As a project, it is intended to influence social issues and the living conditions of the communities surrounding the Project area, in order to reduce social vulnerability and rural exodus, providing families with an improvement in quality of life and income stability that allow families to obtain conditions to obtain goods and services that promote economic and social well-being.

4.2.4 High Conservation Values Protected (CM2.4)

Until now, during the preliminary evaluation conducted with the DSEA (socioeconomic and environmental diagnosis) studies, no impacts were identified on attributes of high value for conservation related to social issues (HCVAs 5 and 6 – Section 4.1.3). However, should these be

identified at some future time, measures should be taken to ensure that there are no negative net impacts to the attributes.

To ensure that no HCVA related to the well-being of communities will be negatively affected, the activities proposed by the Jutaituba REDD+ Project incorporate measures for the purpose of protecting and conserving forest areas used by communities as livelihoods, food, health, as well as cultural and historical aspects. Activities related to the Promotion of sustainable practices, non-timber forest management, environmental education related to hunting and fishing activities, in addition to activities related to monitoring forest cover, heritage surveillance and access to the Farm (Section 2.1.11), promote the protection of AACVs, avoiding the loss of natural resources and illegal activities in these areas.

4.3 Other Stakeholder Impacts

4.3.1 Impacts on Other Stakeholders (CM3.1)

For the Jutaituba REDD+ Project, negative impacts on other stakeholders are not anticipated or are unlikely. It is possible to observe positive impacts of the project, which can bring well-being to other actors, such as:

- All local communities, as well as other actors residing in the project region, whether or not participating in the project activities, will benefit from all the positive impacts related to the conservation and protection of forest cover and biodiversity;

- All communities and other actors will benefit from sustainable development, as well as the opportunities generated by the Project's activities, improving quality of life and well-being;

- All stakeholders in the region will benefit not only from the project activities, but also the improvements made in access to the Farm, in the flow of production and with greater access to public policies;

As indicated above, the negative impacts of these activities are unlikely and may be:

- Lack of engagement of communities and other actors in the activities of the Project and other articulations;

- Failure to communicate Project actions and establish possible conflicts arising from the implementation and conduct of activities.

4.3.2 Mitigation of Negative Impacts on Other Stakeholders (CM3.2)

As mentioned above, the occurrence of negative impacts on other actors in this Project is not expected. As mitigating measures is the implementation of participatory strategies in the design of the activity and decision-making regarding the most appropriate moment and structure of interaction, with the joint construction of the agenda minimizing the overlap of activities, as it has already been carried out. In addition, a communication plan was structured with conflict resolution procedures and, if this is not being effective, an adaptation in the forms of communication and referral of conflicts is recommended.

4.3.3 Net Impacts on Other Stakeholders (CM3.3)

As described and detailed in Section 4.3.1, other negative impacts on the well-being of other groups of local actors are not foreseen, since the Project does not limit access to natural resources in the Project area of any agent originally dependent on these resources, and the activities to be carried out in relation to the surrounding communities are mainly based on articulation with government agencies and other local institutions precisely to promote improvement in living conditions, greater access to public policies, in addition to activities related to the improvement in practices already carried out. The activities outlined and proposed for this Project crave only impacts that promote inclusion and well-being to communities and other stakeholders.

4.4 Community Impact Monitoring

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

Monitoring the Project's impacts on communities and other stakeholders is an important management tool, enabling the evaluation of the effectiveness of activities in achieving the proposed objectives. In this sense, it is suggested the development of a monitoring system for the Project, based on the goals foreseen for the construction of the indicators to be collected, in the verification tools and in the procedures for analysis and evaluation of results and evaluation, to, when necessary, indicate the essential measures to improve the intended advances.

Monitoring the benefits to communities has four components:

- Strengthening of governance, which through the implementation of the partnership in locu, will be implemented and monitored the activities proposed by the Project, as well as the risks and improvements related to them;

- Formalization of access to Fazenda Jutaituba for interested parties, which, together with the asset surveillance activity, aims to delimit and implement procedures and protocols for entry into Fazenda Jutaituba;

- Non-timber forest management at Fazenda Jutaituba, which aims to map opportunities to improve non-timber forest management practices, as well as promote training and other actions within the potential mapped lines and implement partnerships for the development of activities;

- Fostering sustainable practices, which aims to map the main development opportunities focused on sustainable practices, which may be related to the demands of stakeholders, as well as promoting training and other actions within the potential mapped lines, in addition to implementing partnerships for the development of activities;

- Promotion of environmental education for hunting and fishing, which aims to identify, with stakeholders, the main species culturally hunted and fished, thus mapping unsustainable practices in these activities and seeking environmental education solutions to be implemented, mapping and implementing partnerships for the development of these actions.

The Community Impact Monitoring Plan covers in essence process indicators and part of the results indicators. Subsequently, it is intended to complement this initial monitoring plan, with the need for evaluation and validation by interested parties.

a) **Technical description of monitoring tasks**

Monitoring the benefits to communities has five components and aims to access the effectiveness of focused interventions: strengthening governance, formalizing access to the Fazenda Jutaituba for stakeholders, non-timber forest management at the Fazenda Jutaituba, promoting sustainable practices and promoting environmental education for hunting and fishing.

a) Data to be collected

Table 47 - Data to be collected for monitoring social activities.

Date / Parameter	Number of reports
Data unit	Number
Description	This parameter will be responsible for accounting for the amount of all material produced, in the form of a report, designed to implement and monitor the social activities planned for the Project
Source of data	Calculated through reports, minutes of meetings, monitoring guides and memos, focused on issues related to the social scope of the Project (formalization of access to the farm, non-timber forest management, promotion of sustainable practices and promotion of education for hunting and fishing)
Description of measurement methods and procedures to be applied	All documents that can be read as “reports” produced for the Project will be stored in digital files throughout the Project's accreditation period. Thus, these reports from the activity of "Formalization of access to the Fazenda Jutaituba for interested parties", "Non-timber forest management on the Fazenda Jutaituba", "Promotion of sustainable practices" and "Promotion of environmental education for hunting and fishing" will be monitored and accounted for
Frequency of monitoring/recording	Annual
Value applied	To be accounted for after Project registration
Monitoring equipment	Not applicable
QA/QC procedures to be applied	The information systematized in the reports will be validated between the bidders, allowing greater reliability and quality of the data. In addition, the Project will undergo continuous evaluation of the information generated, allowing the identification of improvements in the collection and registration processes, and the incorporation of these in the strategic planning of the Project when they are identified
Purpose of date	Not applicable

Calculation method	Not applicable
Comments	-

Date / Parameter	Number of procedures/protocols
Data unit	Number
Description	This parameter will be responsible for accounting for the amount of all material produced, in the form of procedures and protocols, which will be established to develop and improve the actions behind all social activities designed for the Project. It is valid to say that, for the activities related to the formalization of access to interested parties and non-timber forest management, it is expected that throughout the development of the Project, the number of procedures and protocols established will decrease, the actions planned behind these activities are expected to be carried out in the short and medium term
Source of data	Documents containing procedures and protocols developed to guide and improve the activities of the scope of communities for the Project: “Formalization of access to the Fazenda Jutaituba for stakeholders”, “Non-timber forest management on the Fazenda Jutaituba”, “Promotion of sustainable practices” and “Promotion of environmental education for hunting and fishing”
Description of measurement methods and procedures to be applied	All documents that can be read as procedures and protocols produced for the social scope of the Project will be stored in digital files throughout the Project's accreditation period. Thus, these procedures and protocols established from social activities will be monitored and accounted for
Frequency of monitoring/recording	Annual
Value applied	To be accounted for after Project registration
Monitoring equipment	Not applicable
QA/QC procedures to be applied	The information systematized in the procedures and protocols will be validated among the proponents, allowing greater reliability and quality of the data. In addition, the Project will undergo continuous evaluation of the information generated, allowing the identification of improvements in the collection and registration processes, and

	the incorporation of these in the strategic planning of the Project when they are identified
Purpose of date	Not applicable
Calculation method	Not applicable
Comments	-

Date / Parameter	Number of partnerships established
Data unit	Number
Description	This parameter aims to measure the number of partnerships that the Project aims to carry out throughout its life cycle to contribute to the development and improvement of actions and activities linked to the social activities of the Project
Source of data	Reports (e.g. follow-up report of project activities that have been implemented), contracts, memoranda, emails, meeting minutes and/or other documents that corroborate as evidence that a partnership has been established and built
Description of measurement methods and procedures to be applied	All documents produced will be stored in digital files for the entire duration of the Project. Thus, the realization of partnerships linked to the social activities of the Project will have records of its developments either by reports, contracts, photos, memos, emails, meeting minutes, among other documents that will be monitored and accounted for
Frequency of monitoring/recording	At each verification event
Value applied	To be accounted for after Project registration
Monitoring equipment	Not applicable
QA/QC procedures to be applied	The systematic information of the partnerships established for social activities will be validated among the proponents, allowing greater reliability and quality of the data. In addition, the Project will undergo continuous evaluation of the information generated, allowing the identification of improvements in the collection and registration processes, and the incorporation of these in the strategic planning of the Project when they are identified
Purpose of date	Demonstrate that the Project is dedicating itself and expanding its performance in its social scope through partnerships made

Calculation method	Not applicable
Comments	-

Date / Parameter	Number of environmental education actions
Data unit	Number
Description	This data will account for any action that aims to raise environmental awareness among stakeholders by talking
Source of data	Reports (e.g. follow-up report of project activities that have been implemented), attendance lists, presentations, and other documents that corroborate as evidence that an environmental education action has been implemented. It is evident that the reflection of this parameter will be given by the actions prescribed for social activities, especially the "Promotion of sustainable practices" and the "Promotion of environmental education for hunting and fishing". However, this data may be counted in any event, workshop, training, among others that have, in their content, actions that can be considered environmental education and that were stimulated and/or executed by the Project
Description of measurement methods and procedures to be applied	All documents produced will be stored in digital files for the entire duration of the Project. Thus, the environmental education actions promoted for the social activities of the Project will have records of their developments whether by reports, contracts, photos, emails, presentations, meeting minutes, certificates, among other documents that will be monitored and accounted for
Frequency of monitoring/recording	At each verification event
Value applied	To be accounted for after Project registration
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Systematized information on environmental education actions established for social activities will be validated among proponents, allowing greater reliability and quality of data. In addition, the Project will undergo continuous evaluation of the information generated, allowing the identification of improvements in the collection and registration processes, and the incorporation of these in the strategic planning of the Project when they are identified

Purpose of date	Not applicable
Calculation method	Not applicable
Comments	-

Date / Parameter	Number of people benefited
Data unit	Number
Description	This data will account for any person in whom the Project, through the planned actions and activities related to the social theme, has been able to benefit throughout its implementation and monitoring
Source of data	Reports (e.g., monitoring report of project activities that have been implemented), interviews, results feedback and/or consultations, attendance lists, presentations, and other documents that corroborate as evidence that a person, whether community or not, has benefited from the Project
Description of measurement methods and procedures to be applied	All documents produced will be stored in digital files for the entire duration of the Project. Thus, the benefits generated for all people in which they will be promoted by the social activities of the Project, will have records for accounting, either by reports, emails, presentations, meeting minutes, certificates, attendance lists, among other documents that will be monitored and accounted for
Frequency of monitoring/recording	Annual
Value applied	To be accounted for after Project registration
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Systematized information on the benefits produced for social activities will be validated among the proponents, allowing greater reliability and quality of data. In addition, the Project will undergo continuous evaluation of the information generated, allowing the identification of improvements in the collection and registration processes, and the incorporation of these in the strategic planning of the Project when they are identified
Purpose of date	Not applicable
Calculation method	Not applicable
Comments	-

b) **Summary of the data collection procedure**

The data will be collected during and after the activities with the interested parties, as well as whenever a dialogue is established with the local partner responsible for developing the activities on site. This information will be systematized and presented through reports of social activities of the Project.

c) **Control and quality assurance procedures**

The data collected and portrayed in the reports will be presented and validated during the meetings between the proponents and the local partner, as well as in the meetings with the stakeholders to show the results of the Project.

d) **Data Archiving**

All data and reports produced by the Jutaituba REDD+ Project will be stored by Biofilica Ambipar Environment Investments through digital files during the life cycle of the Project. Original (physical) reports, minutes of meetings and field records produced during the execution of social activities will be stored by the local partner who will act in locu, as well as by Martins Agropecuária. Biofilica Ambipar Environment Investments will keep a copy of these documents in digital format throughout the Project. All documents related to the monitoring of the Project will be made available to the verification body at each verification event.

e) **Organization and responsibilities of the parties involved as described above**

All monitoring activities are the responsibility of Biofiílica Ambipar Environment Investments, Martins Agropecuária and the local partner hired to act *in locu.*

4.4.2 Monitoring Plan Dissemination (CM4.3)

The community monitoring plan and its results will be publicly disclosed on the official website of Biofiílica Ambipar Environment Investments. Also, the summaries referring to the community monitoring plan and its results, as well as relevant information regarding the Project will be passed on to the communities, proponents, partners and other stakeholders through meetings, lectures and physically made available on the premises of Fazenda Jutaituba.

4.5 Optional Criterion: Exceptional Community Benefits

Not applicable. The Jutaituba REDD+ Project is not intended to be validated to gold level in this section.

4.5.1 Exceptional Community Criteria (GL2.1)

Not applicable.

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

Not applicable.

4.5.3 Community Participation Risks (GL2.3)

Not applicable.

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

Not applicable.

4.5.5 Net Impacts on Women (GL2.5)

Not applicable.

4.5.6 Benefit Sharing Mechanisms (GL2.6)

Not applicable.

4.5.7 Benefits, Costs, and Risks Communication (GL2.7)

Not applicable.

4.5.8 Governance and Implementation Structures (GL2.8)

Not applicable.

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

Not applicable.

5 BIODIVERSITY

5.1 Without-Project Biodiversity Scenario

5.1.1 Existing Conditions (B1.1)

The Amazon is one of the biomes with the greatest biological diversity of terrestrial ecosystems in the world. Among the organisms already identified, there are at least 40,000 vascular plant species, 425 mammals, 1,300 birds, 371 reptiles and 427 amphibians (MITTERMEIER, 2003[106]). However, these numbers are underestimated, especially in relation to organisms still little studied such as invertebrates, fungi and microorganisms (Ideflor-Bio/PA[107]).

The biological importance of the region is recognized by international and national bodies and institutions. Given this context, the Project Area, located in the western portion of the State of Pará, overlaps with Priority Areas for Conservation defined by the Ministry of the Environment. The definition of these priority areas is done through the collection and processing of spatial information on the occurrence of species and ecosystems, as well as costs and opportunities for conservation. The product of this process is a map of priority areas for biodiversity conservation in all large Brazilian biomes and in the Coastal and Marine Zone (MMA, 2022[108]). Each of the defined areas

[106]MITTERMEIER, R. et al. Wilderness and biodiversity conservation. **Proceedings of the National Academy of Sciences of the United States of America**, n. 100(18), pp.10309-13. Available at: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=193557&tool=pmcentrez&rendertype=abstract>, 2003.

[107] Institute for Forest Development and Biodiversity – Iderflor-Bio. **The Future of Pará's endangered fauna: implications for conservation in different habitat loss scenarios**. Belém: Nan, 2016. 76 p. Available at: https://ideflorbio.pa.gov.br/wp-content/uploads/2017/01/livro-gbio-ilovepdf-compressed.pdf. Accessed on: Mar 21st, 2022.

[108]2nd Update of Priority Areas for Biodiversity Conservation 2018 – Ministry of Environment. Available at: http://areasprioritarias.mma.gov.br/2-atualizacao-das-areas-prioritarias

has a degree of priority, which can be high, very high or extremely high. The overlap of this product with the Project Area identified that its limits are inserted in areas with a high and extremely high priority for conservation (Figure 21).

Deforestation emerges as a major threat to the Amazonian biota, and has worsened every year. In the ranking of Brazilian states that have deforested the most over time, Pará appears first, with 42% of all deforestation in the Legal Amazon (FONSECA et al., 2021[109]).

In this scenario, the sustainable use of forests, such as low-impact forest management and carbon projects are one of the few alternatives to reconcile economic gains with biodiversity conservation. In addition, the creation of Conservation Units is also essential to establish area of fauna refuges and flora protection. The State of Pará has 90 Conservation Units (UCs), with emphasis on the Extractive Reserve (Resex) and National Forest (Flona) categories with 23 and 18 UCs, respectively. As an example, near the Project Area, the Extractive Reserves Arióca Pruanã and Ipaú-Anilzinho are inserted in whole or in part within the Reference Region.

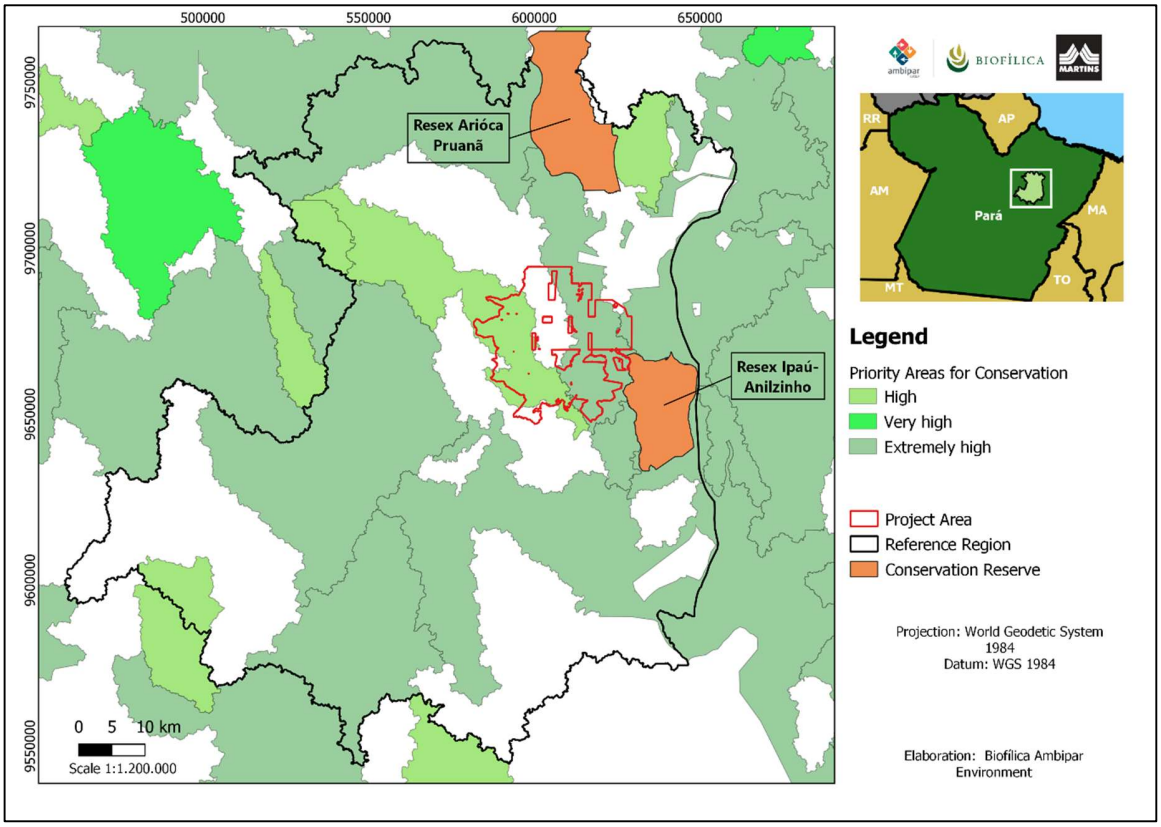


Figure 21 - Degrees of conservation priority in the Project Area and nearby Conservation Units. (Adapted from MMA, 2022)

[109] FONSECA, A., AMORIM, L., RIBEIRO, J., FERREIRA, R., MONTEIRO, A., SANTOS, B., ANDRADE, S., SOUZA JR., C., & VERÍSSIMO, A. **Boletim do desmatamento da Amazônia Legal (September 2021) sad (p. 1).** Belém: Imazon, 2021

Based on the information presented above and the initial conditions regarding the biodiversity of the Project that will be described below, the important role of the Project Area for the connectivity of the local landscape is confirmed, as well as the maintenance and perpetuation of the flora and fauna of the Brazilian Amazon region.

In addition, for the entire survey carried out, in which the scenario without a biodiversity project was originated, they were used to identify flora and fauna species threatened globally (IUCN, 2021)[110], nationally (BRAZIL, 2014)[111] and locally (PARÁ, 2008)[112].

5.1.1.1 Flora

For the phytosocioecological characterization, 47 plots of 1 hectare spread throughout the Project Area were sampled. The minimum inclusion criterion for sampling the arboreal individuals, taking the measurement at 1.30 m from the ground, was 10 cm of pad (diameter above the chest), that is, any individual with pad value equal to or greater than 10 cm was considered in the sampling. Other elements of the flora such as lianas, epiphytes, herbs and shrubs were not considered.

From this evaluation, considering the parameters elucidated, 22,647 records of living arboreal individuals distributed in 280 taxa were obtained. The distinction of these individuals at the species level was made only by their popular names, which may imply nomenclatural misconceptions. Thus, in order to minimize possible identification errors, the data from inventories previously carried out in the area (identified with their scientific names) were cross-checked with the data obtained in the sampling. Thus, it was possible to identify at a specific level, among the 280 taxa found, 100 species. (Table 487).

Table 48 - Flora species registered in the Project Area.

Family	Species	Popular Name
Fabaceae	*Alexa grandiflora*	Melancieiro (Watermelon plant)
Fabaceae	*Anadenanthera peregrina*	Anginco
Fabaceae	*Andira unifoliolata*	Acapurana
Malvaceae	*Apeiba echinata*	Pente de macaco
Fabaceae	*Apuleia leiocarpa*	Barajuba
Apocynaceae	*Aspidosperma album*	Araracanga
Apocynaceae	*Aspidosperma desmanthum*	Araracanga
Apocynaceae	*Aspidosperma marcgravianum*	Carapanauba
Anacardiaceae	*Astronium lecointei*	Muiracatiara
Moraceae	*Bagassa guianensis*	Tatajuba
Sapotaceae	*Pouteria decussata*	Preguiceira
Lecythidaceae	*Bertholletia excelsa*	Castanheira (chestnut tree)
Malvaceae	*Pachira paraensis*	Mamorana
Moraceae	*Brosimum guianense*	Amapá
oraceae	*Brosimum rubescens*	Conduru
Moraceae	*Brosimum parinarioides*	Amapá doce

[110]INTERNATIONAL UNION FOR CONSERVATION OF NATURE AND NATURAL RESOURCES (IUCN). **The IUCN Red List of threatened species**, 2021.
[111]BRAZIL. MMA ORDINANCE No. 443, OF DECEMBER 17, 2014. Official National List of Endangered Flora Species. **Official Gazette**, Brasília, DF, 18 Dec. 2014. Section 1, p.110-121, 2014.
[112]PARÁ, 2008. State Decree No. 802, of February 20, 2008. Creates the State Program of Endangered Species - Zero Extinction Program, declares the species of wild fauna and flora threatened with extinction in the State of Pará, and makes other provisions. **Official Press of the State of Pará**, Belém, 2008.

Family	Species	Popular Name
Malpighiaceae	*Byrsonima sericea*	Barbatimão
Rubiaceae	*Capirona macrophylla*	Escorrega macaco
Meliaceae	*Carapa guianensis*	Andiroba
Caryocaraceae	*Caryocar glabrum*	Pequiarana
Caryocaraceae	*Caryocar villosum*	Pequiá
Urticaceae	*Cecropia sciadophylla*	Embaúba
Fabaceae	*Cedrelinga cateniformis*	Cedorana
Sapotaceae	*Chrysophyllum venezuelanense*	Guajara bolacha
Fabaceae	*Copaifera guyanensis*	Copaíba
Fabaceae	*Copaifera reticulata*	Copaíba
Boraginaceae	*Cordia sagotii*	Freijó
Lecythidaceae	*Couratari guianensis*	Tauari
Fabaceae	*Dinizia excelsa*	Angelim vermelho
Fabaceae	*Diplotropis martiusii*	Sucupira preta
Fabaceae	*Diplotropis purpurea*	Sucupira preta
Fabaceae	*Dipteryx polyphylla*	Cumarú
Humiriaceae	*Endopleura uchi*	Uxi
Fabaceae	*Enterolobium schomburgkii*	Orelha de macaco
Vochysiaceae	*Erisma uncinatum*	Quarubarana
Lecythidaceae	*Eschweilera amazonica*	Matamatá
Lecythidaceae	*Eschweilera coriacea*	Matamatá Branco
Lecythidaceae	*Eschweilera parviflora*	Matamatá vermelho
Lecythidaceae	*Eschweilera subglandulosa*	Matamatá preto
Rutaceae	*Euxylophora paraensis*	Amarelão
Euphorbiaceae	*Glycydendron amazonicum*	Mirindiba
oupiaceae	*Goupia glabra*	Cupiuba
Moraceae	*Helicostylis tomentosa*	Casca seca
Euphorbiaceae	*Hevea brasiliensis*	Seringueira (Rubber tree)
Fabaceae	*Hymenaea courbaril*	Jatobá
Fabaceae	*Hymenolobium nitidum*	Angelim
Fabaceae	*Hymenolobium petraeum*	Angelim pedra
Fabaceae	*Inga marginata*	Ingá
Fabaceae	*Inga paraensis*	Ingá
Myristicaceae	*Iryanthera paraensis*	Ucubarana
Bignoniaceae	*Jacaranda copaia*	Parapará
Lecythidaceae	*Lecythis pisonis*	Sapucaia
Chrysobalanaceae	*Hymenopus heteromorphus*	Macucu
Chrysobalanaceae	*Hymenopus macrophyllus*	Anoerá
Chrysobalanaceae	*Licania paraensis*	Casca seca
Lauraceae	*Licaria crassifolia*	Louro canela
Fabaceae	*Macrolobium latifolium*	Ipeuba
Sapotaceae	*Manilkara elata*	Maçaranduba
Sapotaceae	*Manilkara paraensis*	Maparajuba
Lauraceae	*Mezilaurus itauba*	Itauba
Sapotaceae	*Micropholis venulosa*	Guajara
Clusiaceae	*Moronobea pulchra*	Anani
Nyctaginaceae	*Neea oppositifolia*	João mole
Lauraceae	*Ocotea neesiana*	Louro canela
Lauraceae	*Sextonia rubra*	Louro vermelho
Fabaceae	*Ormosia coccinea*	Sucupira
Fabaceae	*Parkia multijuga*	Faveira
Fabaceae	*Peltogyne lecointei*	Roxinho

Family	Species	Popular Name
Moraceae	*Perebea guianensis*	Muiratinga
Fabaceae	*Pseudopiptadenia suaveolens*	Timborana
Fabaceae	*Platymiscium filipes*	Macacauba
Sapotaceae	*Pouteria glomerata*	Abiu
Sapotaceae	*Pouteria oblanceolata*	Abiurana
Burseraceae	*Protium tenuifolium*	Breu
Vochysiaceae	*Qualea paraensis*	Mandioqueira
Proteaceae	*Roupala montana paraensis*	Louro faia
Proteaceae	*Roupala montana*	Louro faia
Humiriaceae	*Sacoglottis amazonica*	Uxirana
Humiriaceae	*Sacoglottis guianensis*	Uxirana
Araliaceae	*Didymopanax morototoni*	Morototó
Fabaceae	*Tachigali paraensis*	Taxirana
Simaroubaceae	*Simarouba amara*	Marupá
Elaeocarpaceae	*Sloanea nitida*	Urucurana
Malvaceae	*Sterculia apetala*	Envira quiabo
Malvaceae	*Sterculia excelsa*	Capoteiro
Fabaceae	*Swartzia corrugata*	Coração de nego
Clusiaceae	*Symphonia globulifera*	Anani
Bignoniaceae	*Handroanthus serratifolius*	Ipê
Fabaceae	*Tachigali paniculata*	Taxi
Anacardiaceae	*Tapirira guianensis*	Tapiririca
Combretaceae	*Terminalia amazonia*	Tanibuca
Burseraceae	*Trattinnickia burserifolia*	Breu
Humiriaceae	*Vantanea parviflora*	Uxirana
Fabaceae	*Vatairea paraensis*	Angelim amargoso
Hyppericaceae	*Vismia guianensis*	Lacre
Hypericaceae	*Vochysia guianensis*	Quarubatinga
Vochysiaceae	*Vochysia maxima*	Quaruba
Fabaceae	*Vouacapoua americana*	Acapú
Rutaceae	*Zanthoxylum rhoifolium*	Tamanqueira
Fabaceae	*Zollernia paraensis*	Pau santo

- Endangered species of flora

Of these 100 species identified at the specific level, 10 are threatened with extinction and are listed in endangered species provided by organisms such as IBAMA and IUCN. The Table 498 lists the species of flora that have been sampled and are threatened with extinction according to the IUCN Red List of Threatened Species and also according to national and state determinations.

Table 49 - Endangered species recorded in the flora inventory of Fazenda Jutaituba, Portel – PA. Degrees of threat: VU: vulnerable; EN: endangered; CR: critically endangered

Family	Species	Popular Name	Threatened	
			IUCN	Brazil
Fabaceae	*Apuleia leiocarpa*	Barajuba	-	VU
Apocynaceae	*Aspidosperma album*	Araracanga	-	-
Apocynaceae	*Aspidosperma desmanthum*	Araracanga	-	-
Sapotaceae	*Pouteria decussata*	Preguiceira	-	EN
Lecythidaceae	*Bertholletia excelsa*	Castanheira (chestnut tree)	VU	VU
Lecythidaceae	*Couratari guianensis*	Tauari	VU	VU

Rutaceae	*Euxylophora paraensis*	Amarelão	EN	CR
Sapotaceae	*Manilkara elata*	Maçaranduba	EN	-
Lauraceae	*Mezilaurus itauba*	Itauba	VU	VU
Fabaceae	*Vouacapoua americana*	Acapú	CR	EN

One species that deserves attention is *Bertholletia excelsa* Bonpl, known as castanheira, castanheira-do-Brasil ou castanha-do-Pará. This species is considered one of the most important in the entire biome, as it is one of the most exploited. It has moderately good and resistant wood, but its exploitation by forest management is prohibited by state law (Pará) No. 6.895[113], allowing only the sustainable use of its fruits. Thus, in addition to being a species characterized as threatened at the Brazilian national level and by the IUCN, it is protected by law and prohibited from court.

In addition, the chestnut tree is considered a key species and its presence in the forest is of significant importance since the communities located nearby use its fruits both for consumption and for commercialization.

Regarding the structural parameters in the different sampled phytophysiognomies (*see description in Section 2.1.5*) that make up the Project Area, the average DAP (diameter of tree trunks in approximately 1.5 m from the ground) found was 22.48 cm, while the Total Basal Area (Total AB) was 27.56 m²/ha. Both did not have great variations between the different forest physiognomies that make up the region. Table 50 presents the results obtained in the sample plots.

Table 50 - Structural parameters of the forest in the four phytophysiognomies sampled in the Project Area and in the set of samples. ***FOAA*** *- Alluvial open ombrophilous forest;* ***FOAC*** *- Open ombrophilous forest with vine;* ***FOD*** *- Dense ombrophilous forest;* ***FODPA*** *- Periodically flooded dense ombrophilous forest; General – the entire set of samples.*

General characteristics of the tree layer	FOAA	FOAC	FOD	FODPA	General
Total individuals sampled:	2,870	6,070	7,542	6,165	22,647
Sampled area (ha)	6	14	16	11	47
Total species:	156	209	223	161	280
Average DAP (cm):	22.22	22.94	23.18	21.28	22.48
Total AB (m²/ha):	27.65	26.23	28.95	27.41	27.56
Shannon (H'):	3.7	3.86	3.92	3.71	3.97
Equitability (J'):	0.73	0.72	0.72	0.73	0.7
Absolute density (ind./ha):	478	434	471	560	482

Still, the higher the value of H' (Shannon-Weaver index), the greater the floristic diversity of the studied population. This index can express wealth and uniformity. According to Knight (1975)[114], the Shannon-Weaver diversity index varies between 3.83 and 5.85 for the Amazon rainforests. The diversity of Shannon among the sampled phytophysiognomies varied between 3.7 and 3.92, reaching an average value of 3.97, which can be considered adequate for the region.

[113]STATE OF PARÁ. Law No. 6.895, of August 1, 2006. **Declares permanent preservation, of common interest and immune to cutting in the State of Pará, the chestnut.**
[114]KNIGHT, D. H. **A phytosociological analysis of species-rich tropical forest on Clay Colorado Island, Panama.** Ecological Monographs, v. 45, p. 259 - 284, 1975.

The value of the Pielou (J') equability ranged between 0.72 and 0.73. These values, considered low, result from the large abundance of some species to the detriment of the low quantity of many others. As an example, we can mention the great abundance of individuals of Matamatá (*Eschweilera amazonica*) while several species occurred with only one individual such as Apuí, Paricá and Palmeira bacaba. This large difference in abundance between species tends to decrease the equability, which would be maximum in a sample where all species had the same abundance.

Finally, it should be noted that Acapú (*Vouacapoua americana*) and maçaranduba (*Manilkara elata*) were very representative species, presenting high IVI (Importance Value Index) in the four phytophysiognomies and, both, are threatened with extinction in a high degree of threat (Figure 22). Unidentified trees also represented a good number of individuals, having been grouped into a specific category (NI).

Figure 22 - Species with the highest IVI (Importance Value Index) in the four phytophysiognomies sampled in the Project Area in the set of 47 plots. It was not possible to find the scientific names of the species cinnamon, ajará, laurel and guajara-pedra. DR=Density; DoR=Dominance FR=Frequency

5.1.1.2 Fauna

For the development of conservation strategies, it is essential to understand the habitat requirements of resident animal species and determine which of them are more vulnerable to disturbances in human activities. In this perspective, a survey of the fauna of the Fazenda Jutaituba area was carried out, comprising four fauna groups: Avifauna, Mastofauna, Herpetofuna and Ichthyofauna. These groups were chosen due to the representativeness that these individuals have in the composition of the local fauna, as well as the availability of methodological procedures already established in the literature for the diagnosis.

The survey of the biological potential of fauna was based on the survey of primary and secondary data. Regarding the secondary data, it was considered the Reference Region. With regard to the

collection of primary data, the survey was carried out in the summer, between September 15 and 22, 2021, only in the Project Area. A systematic sampling was performed, selecting four areas of interest. Of these, three are called Annual Production Units (UPAs), that is, they constitute areas intended for forest management, one being newly managed, with exploitation in 2020 (UPA 15), one operated in 2016 (UPA 11), and another not yet managed, whose exploitation is scheduled for 2021/2022 (UPA 16). The other location selected was the Absolute Reserve (AR), as it is an area that is not expected to undergo any management intervention, and is then considered in the evaluation as "control area".

- Avifauna

To survey the avifauna, the transection method was used, which consists of performing pre-established walks along routes, noting all species visually and audibly recorded (BIBBY et al., 1992)[115]. This method is the most suitable to obtain the record of the largest number of bird species in a short time (DEVELEY, 2003[116]). Thus, one transection was performed per selected area, totaling four samples. The distribution of the routes, with approximately 1 km each, glimpsed the greatest possible diversity of phytophysiognomies and successional stages present in the sample units.

In addition to the transections, in order to start a monitoring, fixed points were established in order to obtain abundance data (VIELLIARD and SILVA, 1990[117]). The method consists of remaining parked at a pre-established point, quantifying the species recorded during this period. The length of stay at each point was 15 min and the minimum distance between them was 200 m, which reduces the chances of counting the same individuals at different points.

Timely records were also made at any time and place in order to add species not recorded in both methods. In addition, to contemplate birds of nocturnal activity, departures were made at night and at dawn, seeking species of occurrence in the region through the attraction of pre-stored recordings (*playback*). There was also sampling in the Jacundá and Açu rivers, through a route via vessel, in which species recorded in the route were recorded, either in the aquatic environment or in the surrounding forest.

From the methods described, 272 bird species were recorded, belonging to 21 orders and 57 families. In relation to the total, 25 are endemic to the South Amazon, that is, they are restricted to the Amazon biome, occurring only to the south of the Amazon river (DE LUCA et al., 2009)[118]. However, the data consulted in the literature and the projections elaborated from the dynamics of records of the species carried out in the field, such as the upward sampling effort curve and the Jacknife wealth estimators (Figure 23), suggest a potential of more than 400 species for the region.

[115] BIBBY, C.J.; BURGESS, N. D.; HILL, D. A. **Bird census techniques**. Orlando: Academic Press, 1992.
[116]DEVELEY, P. F. Methods for Bird Studies. On: CULLEN JR, L.; RUDRAN, R. and PADUA, C. V. (Ed.). **Methods of studies in Biology of Conservation and Management of Wildlife**. Ed. EFPR, São Paulo, p. 19-42, 2003.
[117]VIELLIARD, J.M.E; SILVA, W.R. New methodology for quantitative survey of avifauna and first results in the interior of São Paulo, Brazil. Pp 117-151. In S.M. de Azevedo Jr. (Ed.) **Proceedings of the IV National Meeting of Bird Ringers**, Federal Rural University of Pernambuco, Recife/PE, 1990.
[118] DE LUCA, A. C.; DEVELEY, P. F.; BENCKE, G. A.; GOERK, J. M. **Areas important for the conservation of birds in Brazil**: part II – Amazon, Cerrado and Pantanal. São Paulo: SAVE Brasil, 2009.

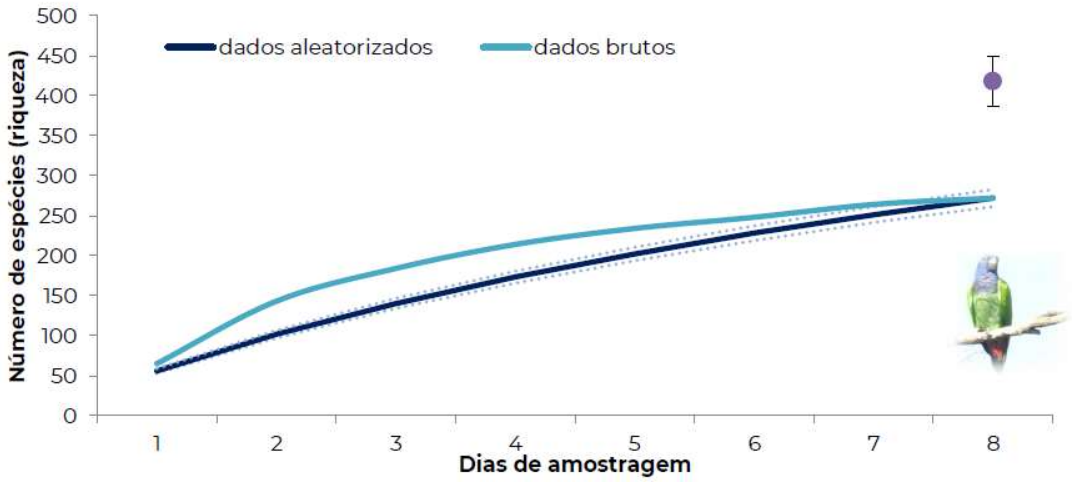


Figure 23 - Sample sufficiency curve of the avifauna campaign, in the Project Area, containing raw and estimated data. The bars correspond to the standard deviations of the randomized wealth. The purple circle refers to the estimated value for wealth according to first-order Jackknife estimator, with respective deviations

The conservationist situation of the endemic species recorded can be considered delicate and therefore some are listed as endangered. This is the case of jacamim-do-xingu (*Psophia interjecta*) of tiriba-do-xingu (*Pyrrhura anerythra*) and the arapaçu-do-carajás (*Xiphocolaptes* carajaensis), for which a sharp population decline is inferred in a short period of time (DANTAS and LEES[119]; SILVEIRA[120]; SOMENZARI, 2018)[121]. In addition to endemic species, there was a record of species of broader distribution that are also considered endangered. Thus, 17 taxa registered in the area appear in threat categories, whether at the state, national and/or global level. Among the endangered species, there are birds that lack extensive healthy forest masses, such as the king hawk (*Harpia harpyja*). Thus, the Project Area covers much of the remnant habitat of species that are at risk of extinction and, thus, may represent a refuge for their populations, such as jacamim-do-xingu (*Psophia interjecta*), the tiriba-do-xingu (*Pyrrhura anerythra*) and the arapaçu-do-carajás (*Xiphocolaptes carajaensis*).

[119]DANTAS, S. M.; LEES, A. C. Xiphocolaptes carajaensis Silva, Novaes & Oren. In: **Red Book of Brazilian Fauna Threatened with Extinction**, vol. III: Birds. Brasília, DF: ICMBio/MMA. 2018. p. 440-443, 2002.
[120]SILVEIRA, L. F. Psophia interjecta Griscom & Greenway, 1937. In: **Red Book of Brazilian Fauna Threatened with Extinction**, vol. III: Birds. Brasília, DF: ICMBio/MMA. 2018. p. 131-133.
[121] SOMENZARI, M. Pyrrhura lepida (Wagler, 1832), In: **Red Book of Brazilian Fauna Threatened with Extinction**, vol. III: Birds. Brasília, DF: ICMBio/MMA. 2018. p. 268-270.

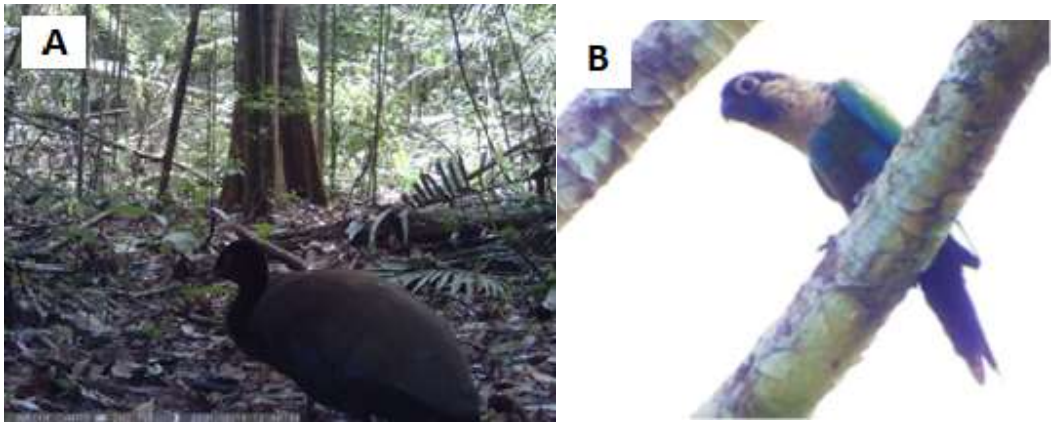


Figure 24 -. Endemic species registered in the Project Area: ***A.*** *jacamim-do-xingu (Psophia interjecta),* ***B.*** *tiriba-do-xingu (Pyrrhura anerythra), both endemic.*

In addition, the Project Area is located within an *IBA - Important Bird and Biodiversity* Area (specifically IBA Caxiuanã/Portel)[122] defined by *BirdLife International*. This confirms and demonstrates that the area is of great relevance for the shelter of bird species, including those under threat, and has even more priority for conservation.

- Mastofauna

The systematic sampling of the group integrated complementary methodologies, such as photo trapping and trail transection (NICHOLS and CONROY, 1996[123]; ROCHA and DALPONTE, 2006)[124]. The photographic trapping method was conducted from the installation of photographic traps along the study area. In each of the sample areas, four camera traps were allocated, maintaining a minimum distance of 500 meters between them. The trace transection method, on the other hand, had data collection carried out through the thorough search of direct (sightings, vocalizations and carcasses) and indirect (tracks, feces, burrows and scratches) records along carriers, extensions and roads (main and secondary), preferably with a substrate favorable to footprint printing. This method was applied in each sample area, and in each of them there was a transection (2.5 km long each), totaling a sampling effort of 10 km.

The diagnosis of the medium and large mastofaunistic community included only species with body weight greater than 1.0 kg (BECKER and DALPONTE, 2013)[125]. Exceptions were considered for species which, despite having less than 1 kg, are easily identified by the methods used. These are some species of primates (e.g., genera Mico and Saguinus), marsupials (e.g., genus Didelphis)

[122] BirdLife Data Zone - http://datazone.birdlife.org/site/factsheet/22242
[123]NICHOLS, J.D.; CONROY, M. J. Techniques for estimating abundance and species richness. In: WILSON, D. E.; COLE, F. R.; NICHOLS, J. D.; RUDRAN, R.; FOSTER, M. S. Measuring and monitoring biological biodiversity: standard methods for mammals. **Smithsonian Inst**. **Press**, 409 p. 1996.
[124]ROCHA, E. C.; DALPONTE, J. C. Composition and characterization of medium and large mammalian fauna in a small cerrado reserve in Mato Grosso, Brazil. Viçosa**: Revista Árvore**, v. 30, n. 4, p. 669-678. 2006.
[125] BECKER, M.; DALPONTE, J. C. **Trail of Brazilian Mammals**: a field guide. 2nd ed. Brasilia: University of Brasilia, p. 180, 2013.

and rodents (e.g., genus Guerlinguetus). Other species of small mammals were not considered in the study.

At Fazenda Jutaituba, 23 species of medium and large mammals belonging to seven orders and 14 families were registered, 8 of which are endangered species, such as the marmoset and the red-handed guariba (Figure 25). The orders Carnivora and Primates were the most found, with nine and six species, respectively. Also, complementary data generated from informal interviews with residents and farm workers indicated the presence of nine more species, totaling a community composed of 32 medium and large mammals, distributed in eight orders and 18 families. Regarding the data found in the literature, it is known that at least 47 species may be present in the Reference Region.

*Figure 25 - Primates photographed in the Project Area: **A.** sagui-una (Saguinus niger); **B.** guariba-de-mãos-ruivas (Alouatta belzebul).*

Considering the records made at Fazenda Jutaituba by previous studies (23 species) and the information collected by the interviews (9 species), it can be said that the community has up to 12 endangered species, three of them at the state, national and international level (IUCN): the cuxiú (*Chiropotes utahickae*), the tatu-canastra (*Priodontes maximus*) and the tamanduá-bandeira (*Myrmecophaga tridactyla*); four at the national and international level (IUCN): the guariba-de-mãos-ruivas (*Alouatta belzebul*), the anta (*Tapirus terrestris*), the queixada (*Tayassu pecari*) and the sagui-una (Saguinus niger); two at the state and national level: the onça-pintada (Panthera onca) and the onça-parda (*Puma concolor*); and three at the national level: the gato-mourisco (*Herpailurus hiagouaroundi*), the cachorro vinagre (*Spheotos venaticus*) and the sloth (*Bradypus variegatus*). The species of primates endemic to the Tocantins-Xingu interfluvium, the cuxiú and the marmoset stand out. In addition to these species, six others are endemic to the Amazon biome: macaco-da-noite (Aotus azarae), sagui-branco (Mico argentatus), macaco-prego (Sapajus apella), veado-roxo (Mazama nemorivaga), squirrel (Guerlinguetus aestuans) and gambá (Didelphis marsupialis).

Analyzing the relative frequency graph of records (Figure 26) obtained from the methods of photographic trapping and traces transection, the mammal most recorded in the campaign was the veado (*Mazama sp.*), which had its identification maintained at the genus level because the study area is located at the distributional limit of two morphologically very similar species, the veado-mateiro (M. americana) and the veado-roxo (M. nemorivaga). Even though the identification of

these species by means of systematic methods was not possible, during the displacement, an individual of the genus was seen in due course. Through his direct observation, the individual was subject to identification at the species level, confirming the presence of the veado-mateiro (American Mazama) in the Project Area. Anta (Tapirus terrestris), presented the second highest relative frequency of occurrence (16.5%), being recorded in all sample areas. The species has a herbivorous/frugivorous diet and plays a fundamental role in forest dynamics. As one of the only representatives of large fauna with a rich fruit eating habit, it is considered an important seed disperser, especially those of larger diameter (FRAGOSO and HUFFMAN, 2000[126]), transporting them over long distances.

With regard to large felids, the brown onça-parda (*Puma concolor*) and the onça-pintada (*Panthera onca*) were the fifth and eighth species most recorded by quantitative methods. Highlight for the onça-pintada, considered the largest carnivore in South America and the third largest felid in the world. The presence and permanence of this top-of-the-chain predator in the Project Area must be considered as an indication of high environmental quality, since for the species to persist on site it is necessary that the area maintains the environmental requirements necessary for the greatest possible diversity of prey, in which each of these species has different niches and ecological requirements. Thus, the records reinforce the high environmental quality and importance of Fazenda Jutaituba in the conservation of biodiversity.

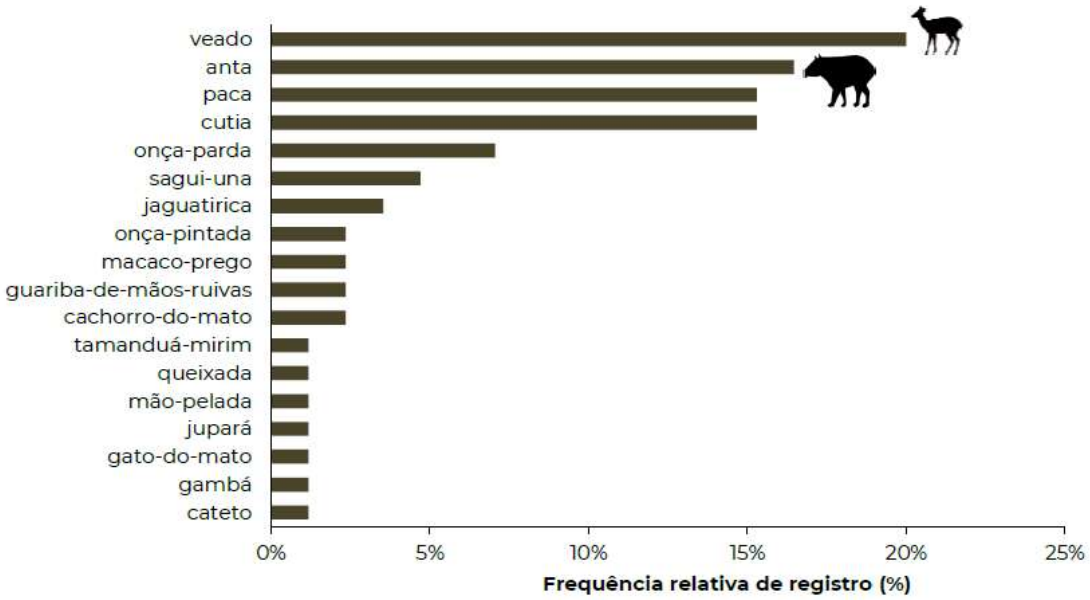


Figure 26 - Relative frequency of mammalian records obtained from quantitative methods in the Project Area.

[126]FRAGOSO, JM, & HUFFMAN, JM Seed-dispersal and seedling recruitment patterns by the last Neotropical megafaunal element in Amazonia, the tapir. **Journal of Tropical Ecology**, 16(3), 369-385, 2000.

Figure 27 -. Panthera onca (A) and Puma concolor (B) registered in the Project Area by the photographic trapping method.

- Herpetofauna

Regarding herpetofauna, the main method used in the sampling was the active search (e.g., CRUMP and SCOTT, 1994)[127] visual and auditory. In addition to the active search, secondary data collection that occurs in the reference region of the project was also carried out. Such information was taken from online databases and accessible through the *Global Biodiversity Information Facility (GBIF), SpeciesLink,* Biodiversity Portal – ICMBio, scientific articles, Management Plans (Resex Arióca Pruanã and Flona Caxiuanã) and previous work carried out at Fazenda Jutaituba itself.

In the case of anuran amphibians, the auditory detection method was adopted for a certain time (in places recognized as reproductive sites). The visual searches have a qualitative character and were carried out both during the day and at night, consisting basically of the slow displacement through the areas of interest looking for animals in specific places. On the other hand, active auditory searches help in the recognition and detection of species of anuran amphibians that present reproductive activity (vocalization) during the sampling period. The complementary method of auditory detection for a determined time (listening point), with a qualitative and quantitative character, was used to record the relative abundance of anuran amphibians in reproductive activity during a night. Each sample unit has an auditory detection point, which totaled four listening points scattered throughout the Project Area.

46 species of this group were found within the project region. The 24 species of anuran amphibians recorded on the farm are distributed among seven families, with the Hylidae family being the most numerous, making up approximately 63% of the species inventoried. During the field sampling, 22 species of reptiles belonging to three orders were also recorded: Crocodylia, with one species; Testudines, with two species from different families; and Squamata, with 19 species, among snakes and lizards, belonging to four and five families, respectively. When visualizing the sampling effort used in the eight days of field activities, it is observed that the curve has a strong tendency to rise (Figure 28). Corroborating this finding, the result of the first-order Jackknife wealth estimators

[127]CRUMP, M.; SCOTT, N. Visual encounter surveys. In Heyer, W. and others (eds). **Measuring and monitoring biological diversity-standard methords for amphibians**. Smithsonian Inst. Press, Washington, pp. 84-92; 1994.

predicts the increase of 29 more species for the herpetofauna group (standard deviation=6.67), 13 species for the amphibian group (standard deviation=3.08) and 16 species for the reptile group.

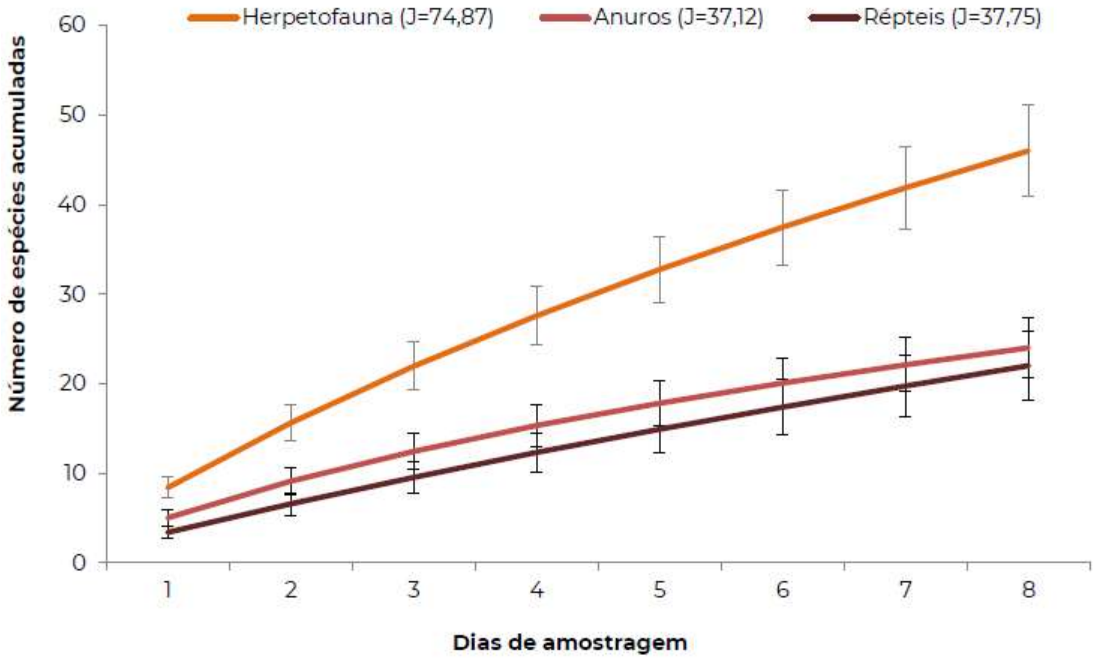


Figure 28 - Sample effort curves for the herpetofauna, and considering separately the community of anurans and reptiles. Each curve has its associated standard deviation

- Ichthyofauna

Part of the Project Area is cut by the Jacundá river and tributaries (Açu and Compartimento rivers) and by tributaries of the Pacajá river. In order to evaluate the condition of the water bodies within the limits of the Project, some sites were visited using a land vehicle. In addition, navigable stretches of the Pacajá, Jacundá and Açú rivers were traveled by boat. In addition, interviews were conducted with some local residents and employees of Fazenda Jutaituba. Information obtained through interviews with communities present in the area of influence was also considered.

24 species of fish were recorded by direct observation or from specimens caught by local fishermen. There is a certain degree of taxonomic uncertainty about the species recorded in the watercourses present in the project area, in which units identified only at the genus or family level predominated. These uncertainties occur in part due to the knowledge gap that exists about the ichthyofauna of the region, making it possible to infer that part of the species listed are new taxonomic units and that have not been properly described. This scenario is a very present condition for South American ichthyofauna, given the high number of species that are described every year (REIS et al., 2016)[128].

[128]REIS, R. E.; ALBERT, J. S.; DI DARIO, F.; MINCARONE, M. M.; PETRY, P.; ROCHA, L. A. **Fish biodiversity and conservation in South America**. Journal of fish biology, 89(1), 12-47, 2016.

Despite the limitations mentioned for the determination of the species composition, the numbers presented indicate that the rivers of Fazenda Jutaituba have the potential to harbor a high richness of fish species. Even when considering only the species registered on the farm and immediate surroundings (secondary data, direct observation, interviews), although with much lower numbers, between 24 and 81 species, considering the species potential for the region described in the literature of at least 307 species.

- Quantitative summary of endangered species of fauna and flora

The Table 51 presents the total number of species of fauna and flora threatened according to the IUCN and registered at Fazenda Jutaituba. In addition to flora, the most threatened groups are avifauna and mastofauna

Table 51 - Total threatened species at the national and international level (IUCN) recorded during the biodiversity diagnosis campaign (Sep/2021) at Fazenda Jutaituba. For flora, the data refer to those collected during the carbon inventory.

Groups	Total species	Degree of Threat					
		IUCN			Brazil		
		VU	EN	CR	VU	EN	CR
Flora	280[129]	**3**	**2**	**1**	**6**	**2**	**1**
Ichthyofauna	24	-	-	-	-	-	-
Herpetofauna (Amphibians)	24	-	-	-	-	-	-
Herpetofauna (Reptiles)	22	-	-	-	-	-	-
Avifauna	272	**8**	**3**	-	**14**	-	-
Mastofauna	32	**7**	-	-	**12**	-	-
Total species	654	**18**	**5**	**1**	**30**	**2**	**1**

5.1.2 High Conservation Values (B1.2)

The concept of High Conservation Values (HCV) was developed by the Forest Stewardship Concil for the certification of timber products from responsible forest management, according to standardized Principles and Criteria that reconcile environmental and ecological safeguards with social benefits and economic viability.

Areas of High Conservation Value (HCVA) are areas that have extreme or critical importance due to some particular characteristic, such as the significant concentration of biodiversity, seasonal concentration of species, endangered and rare ecosystems, presence of endangered species, provision of essential ecosystem services, social, historical and cultural values, among others.

[129]Only 100 taxa were identified at the species level. However, a total of 280 taxa with no defined species level were found in the Project Area

Within this context, as defined by the *HCV Resource Network*, there may be six types of high conservation values. For this section of the project, which refers to biodiversity, the high values 1, 2 and 3 were considered.

In addition to these definitions, within the methodological context used in this process and to guide such identifications, in addition to the relevance for the monitoring of HCVAs, the guidelines for the identification, management and monitoring of high values were considered, as established in the "General Guide for the Identification of High Conservation Values" (BROWN et al.[130], 2013), "Guidelines of good practices for evaluations of High Conservation Value: A practical guide for professionals and auditors" (STEWART et al., 2008)[131] and " Climate, Community and Biodiversity Standards*", from the Climate, Community and Biodiversity Alliance* (CCBA, 2013)[132].

Due to the fact that the area is mostly composed of conserved native vegetation, changing only the period in which forest management activities occur in which it is practicable within the limits of the Fazenda Jutaituba, there are no barriers to most species of fauna. Thus, the farm as a whole is a stronghold of extreme importance for the conservation of biodiversity, standing out as an area of high conservation value (HCVA).

In addition, as described in Section 5.1.1., it was possible to highlight the high potential of the Project Area in the conservation scenario, presenting significant concentrations of endangered and endemic species, both for fauna and flora, corroborating the fact that the farm has attributes of high value for biodiversity conservation.

That said, Fazenda Jutaituba was the holder of the high values 1 and 2, which deal with the concentration of endemic, rare and threatened species (HCVA 1) and extensive ecosystems and mosaics at the landscape level, capable of maintaining viable populations of the vast majority of naturally occurring species (HCVA 2).

High Conservation Value	HCVA1 Areas containing significant concentrations of biodiversity values on a global, regional or national scale: presence of 37 endangered species (19 birds, 10 trees and 8 mammals) and 14 endemic species (12 birds and 2 mammals).
Qualifying Attribute	The conservationist relevance of the region is internationally recognized, as the project is allocated within an Important Bird Area (IBA), defined by BirdLife International. Thus, the Project Area houses significant populations of birds, some of them threatened or endemic, among other interest groups. It also has the potential to integrate with protected areas that are in the vicinity, expanding the refuge and connectivity of the landscape, promoting the maintenance of local biodiversity. In addition to avifauna, it represents an essential space for biodiversity as a whole, due to the high degree of species recorded in the project

[130]BROWN, E., N. DUDLEY, A. LINDHE, D.R. MUHTAMAN, C. STEWART, and T. SYNNOTT (ed.). (October). General guide for identification of High Conservation Values. HCV Resource Network. 2013.
[131]PROFOREST. Christopher Stewart et al. Guide TO good practices for high value assessments for conservation: Practical guidelines for professionals and auditors. 1st Edition. May 2008.
[132] CCBA - ALLIANCE FOR CLIMATE, COMMUNITY AND BIODIVERSITY. **Climate, Community and Biodiversity Standards,** Third Edition. Arlington, 2013.

	area, including flora and fauna species considered endangered, critically endangered (CR) and vulnerable (VU) according to IUCN categories.
Focal Area	Based on the evidence pointed out above, it is understood that the entire Project Area, corresponding to 131,132 ha, must be contemplated in order to ensure the maintenance and improvement of the natural characteristics of its ecosystem for the preservation of its fauna and flora, especially endangered and endemic species. In addition, the Project's biodiversity monitoring plan has as premises in its structure to ensure a monitored environment with regard to biodiversity, guaranteeing the balance and maintenance of natural habitats and taking into account the endemism of the region as well as the threatened species.

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

From the description of the initial conditions of the Project Area, it is known that the diversity of plants and animals is quite high, being one of the characteristics of humid tropical forests such as the Amazon Forest. However, Fazenda Jutaituba is located in a region that has high rates of deforestation, with large areas deforested in the last decade. The historical context of deforestation in the region is described in detail in Section 3.1.4.

Thus, based on the current conditions and the trends observed in its surroundings, it was possible to outline some probable scenarios in the absence of the Jutaituba REDD+ Project.

The main trend would be the advance of deforestation by these agents and drivers, which may cause the loss of structural and functional connectivity between remnants of the region, which would reduce the gene flow between populations, affecting the displacement of fauna and dispersion of propagules. Fragmentation also tends to cause a drastic reduction in populations of species whose density is lower in small fragments, mainly affecting more specialized taxa, many of which are threatened, endemic or have a restricted distribution (LAURENCE and VASCONCELOS, 2009)[133]. In addition to the loss of biodiversity, among the main impacts of deforestation are the reduction of productivity (erosion, soil compaction and nutrient exhaustion) and changes in the hydrological regime, which highlights the need for measures to contain it, with loss of sustainable use of the forest (FEARNSIDE, 2006)[134].

In general, without the Jutaituba REDD+ project and in a more pessimistic scenario, deforestation pressure in the Reference Region tends to increase and progress gradually towards the limits of Fazenda Jutaituba. The socioeconomic characteristics of the region may favor the increase in deforestation, especially considering some agents and drivers, such as: i) the practice of itinerant agriculture that consists of opening forest areas by the method of cutting and burning, cultivation for a short period, followed by abandonment of the degraded area. Thus, due to soil depletion, new areas are opened, promoting deforestation; ii) beef cattle, a very common economic activity in the region, being a driver of deforestation by promoting the conversion of forest areas to new pasture

[133] LAURANCE, W.F.; VASCONCELOS, H.L. **Ecological consequences of forest fragmentation in the Amazon. Oecologia Brasiliensis** v.13, no. 3, p. 434-451, 2009.
[134] FEARNSIDE, P.M. Deforestation in the Brazilian Amazon: history, indexes and consequences. **Megadiversity**. v.1, n.1, 2006.

areas and iii) the presence of illegal sawmills that can influence community forest exploitation, which can seek these resources within the Project Area.

That said, project initiatives such as REDD+ are one of the few alternatives for the conservation of the biome and the biodiversity associated with it (PAVAN; CENAMO, 2012)[135]. With the REDD+ mechanism, resources from the sale of carbon credits will contribute to the promotion of activities aimed at reducing the loss of forest habitat, which guarantees the permanence of the forest standing and consequent conservation of fauna and flora species, keeping its populations viable, since, with the advance of deforestation, the forest environment tends to be replaced by anthropized areas over time (FEARNSIDE, 2006).

Also, the opening of new roads and the absence of monitoring in which it will be promoted by the Project, could allow the advance of degradation and deforestation of natural areas of the surroundings (leaks). From the opening of these new places, the easy access would also allow the increase of fishing and predatory hunting in these areas destined for conservation in addition, of course, the unrestricted access of bad intentions, favoring illegal activities, such as logging.

Finally, the permanence of natural environments in the Project Area is extremely important for conservation, because in addition to promoting the conservation of biodiversity, it ensures the maintenance of ecosystem services, such as pest and disease control, pollination, water quality, climate regulation and maintenance of resources for traditional communities. It is important to say that all activities designed for the Project, as well as its actions, results and impacts, were structured and designed to avoid unplanned deforestation in the Project Area and, each of them, will play a fundamental role in this mission, being linked to the perpetuation of this environment too sensitive to human actions.

5.2 Net Positive Biodiversity Impacts

5.2.1 Expected Biodiversity Changes (B2.1)

Expectations of changes to biodiversity as a result of the Project were estimated using the theory of change method, also known as causal model, better defined in Section 2.1.11 in which all activities were described. From this definition, we can better glimpse the cause and effect relationship between the Project activities defined so far, the actions involved, their expected results and impacts in the short, medium and long term.

That said, all activities were defined with a view to promoting the long-term preservation of forest cover in the Project Area and, consequently, promoting changes in the future expectation of the region. For biodiversity, it is evident that the greatest changes, based on the scenario without a Project, are associated with the preservation of natural habitats, providing the maintenance and improvement of floristic and faunal species, in which they would be threatened by unplanned deforestation, and which, without the intervention of a REDD+ mechanism, tend to increase for the Amazon region as a whole.

[135]PAVAN, M.N.; CENAMO, M.C. REDD+ in the states of Amazonia: Mapping of initiatives and challenges for integration with the Brazilian strategy. Instituto de Conservação e Desenvolvimento Sustentável do Amazonas (Idesam), 2nd ed., 2012.

Thus, it is clear that ensuring the protection of the forest through activities and the REDD+ mechanism will enable the expected changes in biodiversity to be positive. Also, as an essential tool for this, the biodiversity monitoring plan will make it possible to verify and ascertain whether any change is negatively impacting biological diversity, portraying the photography of the local biota throughout the Project's life cycle, providing greater clarity on the population dynamics of species, including endemic and vulnerable ones, as well as the conflicts generated by human and nature coexistence.

Thus, the expected changes to the Project's biodiversity are:

- Maintenance and addition of species identified in the scenario without Project;

- Ensure the conservation of habitats and species of the Brazilian Amazon;

- Reduce illegal activities through Project activities;

- Increase awareness of environmental issues in local communities by reducing the pressure for hunting and fishing;

- Ensure the conservation of endangered and endemic animal and plant species;

- Promote an ecologically balanced environment;

- Maintain landscape connectivity to biological diversity.

Biodiversity Element	Jutaituba REDD+ Project Activities – General Scope
Estimated Change	Strengthened management and monitoring of Project implementation
Justification of Change	Partnerships to support biodiversity conservation, identification of bottlenecks, threats and negative impacts of the Project, iteration and mutual collaboration between all stakeholders in favor of biodiversity and joining efforts between various actors to maintain biodiversity in the region.

Biodiversity Element	Jutaituba REDD+ Project Activities – Climate Scope
Estimated Change	Reduction of deforestation and forest degradation
Justification of Change	Maintenance of forest cover, monitoring of deforestation by satellite image, improvement of the conditions of workers responsible for patrols, increased surveillance of patrols, maintenance of carbon stocks, reduction of the loss of landscape connectivity and promotion and maintenance of ecologically balanced habitats and environment.

Biodiversity Element	Jutaituba REDD+ Project Activities – Community Scope
Estimated Change	Resource alternatives and environmental awareness

Justification of Change	Increased environmental awareness about hunting, fishing and illegal activities for local communities, courses and training increasing the educational base, improvement and development of more sustainable practices applied to production bases, exploitation of non-timber forest products in a conscious way, improvement of the management of natural resources by local communities and reduction of human activities that do not comply with biodiversity conservation.

Biodiversity Element	Jutaituba REDD+ Project Activities – Biodiversity Scope
Estimated Change	Biodiversity maintenance
Justification of Change	Monitoring of population dynamics, greater long-term knowledge of regional megadiversity, identification of abnormal patterns and more assertive interventions if necessary.

5.2.2 Mitigation Measures (B2.3)

The data collected for studies related to biodiversity were satisfactory in order to evaluate the current context of biodiversity conservation in the Project Zone, surrounding, and focusing on the Project Area. However, longer studies are necessary to elucidate the variations that occur in the biotic community throughout forest modifications, whether arising from the decrease in forest area in the Project Zone and external to the Project Area, climate change or management activities, in order to better understand its dynamics (HENRIQUES et al., 2008)[136].

Also, according to the Brazilian Biodiversity Diagnosis & Ecosystem Services[137], the main vectors of threat to biodiversity are climate change, which changes the configuration and functioning of ecosystems, and changes in land use — in other words: deforestation, or any activity that involves the conversion of native vegetation areas to other uses, such as agriculture, livestock or mining.

In order to seek improvement in the population conditions of the species and mitigation of the impacts caused by internal and external factors exposed above, all activities of the Project, especially the "*in situ* monitoring of biodiversity", were designed and structured to act as mitigating measures of the main threats to biodiversity, in addition to mitigation against negative adverse factors in the conservation and maintenance of HCVAs.

With this in mind, no negative impacts on biodiversity are expected, and the Project's activities have been specifically designed and will be implemented to reinforce the protection of the Project's biological diversity and, therefore, mitigating and biodiversity protection measures.

[136] HENRIQUES, L.M.P.; WUNDERLE JR., J.M.; OREN, D.C.; WILLIG, M.R. **Effects of low-impact logging on a community of understory birds in the Tapajós National Forest, Pará, Brazil**. Acta Amazonica, v. 38, n. 2, p. 267-290, 2008.
[137] BPBES (2018): **Summary for decision makers of the evaluation report of the Brazilian Platform of Biodiversity and Ecosystem Services.** Campinas, SP. 24 pages

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

The activities proposed by the Jutaituba REDD+ Project seek to generate several benefits for the climate, communities and biodiversity. The main benefits generated to biodiversity are linked to the reduction of deforestation and forest degradation and the conservation of biodiversity and habitats. In other words, the activities were designed primarily to reduce deforestation and forest degradation in the Project Area region and therefore most of the positive impacts on biodiversity will be assessed based on safe and preserved forest cover.

In a simplistic way, the quantification of net positive benefits for biodiversity can be done over time, through a robust and adequate monitoring plan (see Section 5.4.1). From these expeditions, in which they will provide a robust database throughout the implementation of the Project, the conditions at the beginning of the Project with biodiversity conditions of a subsequent monitoring period can be compared as well as controlled and monitored.

Furthermore, it is evident that in order to measure and quantify the positive impacts on biodiversity as a result of the Project, all activities are monitored using a set of indicators that are intended to measure the effectiveness of the Project's activity at different stages of implementation, with the indicators defined in this document being an important instrument to assess the positive impacts.

It is important to highlight that the Project, through the theory of change, outlined two activities that will be conducted in all scopes, being defined as general: "Implementation, monitoring and evaluation of the activities developed by the Project" and "Strengthening of governance". These activities will allow the Project to implement an iterative and continuous process based on an "adaptive management", which consists of a management approach of the Project developed to increase the degree of adaptability, seeking to offer means to increase the speed of response to environmental pressures and improve the quality of this response, becoming crucial to maintain strong relationships with stakeholders in the Project, as well as increase the effectiveness of actions and mitigate any potential risks to biodiversity and, consequently, maintain over time the net positive impacts.

Adaptive management is the process by which the results of a Project activity and the impacts will be implemented and monitored, their effectiveness assessed and finally the activity itself can be reviewed if the desired impacts are not being achieved. In general, these activities will help to concentrate the resources that are effective, providing a better alignment of the Project's priorities throughout its implementation, as well as seeking, throughout this process, the contribution of several stakeholders, enhancing efforts to maintain the expected positive benefits.

5.2.4 High Conservation Values Protected (B2.4)

The Project Area has two attributes of High Conservation Value related to biodiversity, which have already been described in Section 5.1.2 and is related to i) areas that contain significant concentrations of biodiversity values on a global, regional or national scale and ii) large areas on a global, regional or national level, in which there are viable populations of most, if not all naturally occurring species, in the natural patterns of distribution and abundance.

The measures proposed to ensure the integrity of HCVAs and thus maintain and improve these attributes, ensuring that they are not negatively affected by the Project, were considered and incorporated by the activities defined in the Theory of Change (Table XX). Therefore, no negative

impact was foreseen for these areas and, also, the proposed activities as well as their implementation throughout the life of the Project will allow to generate positive impacts on these attributes.

Thus, the attributes of HCVAs are not expected to be negatively affected by the Project. On the contrary, by reducing deforestation and forest degradation in the Project Area, what is expected is the preservation of healthy and appropriate habitats for the entire biotic community, even providing the recovery of ecological niches for endemic, vulnerable or endangered species

5.2.5 Species Used (B2.5)

The main economic activities of the region, encompassing the Project Zone, are subsistence agriculture, forestry and livestock. The rural communities that live in these places are mainly dedicated to agroextractive activities such as the management of non-timber forest products (NMF) of species native to the region, such as Brazil nuts, açaí, bacaba, bacuri, uxi and piquiá. Other species are also used and cultivated, such as black pepper and cassava.

However, there is no activity of this nature, as well as resident communities within the Fazenda Jutaituba and, therefore, these species are not used and it is not planned, based on the proposed activities, to incorporate species of any type in the Project Area. Consequently, the Project Area will not be affected by the introduction of species, whether invasive or not, and will not result in any threat or increment as a result of the Project.

5.2.6 Invasive Species (B2.5)

In the diagnosis carried out in the Project Area, showing the scenario without a Project for biodiversity, described in the Section 5.1.1 of this document, it is possible to infer the non-occurrence of invasive exotic species in the area, since there was no record of exotic species of consolidated popular name such as eucalyptus, pine, Australian acacia, leucena, among others, associated with the fact that the remaining evaluated has a well-preserved forest structure, which works as a filter, preventing the entry of opportunistic exotic plant species.

In addition, it is not foreseen, as well as the previous section and based on the proposed activities, to incorporate exotic species in the Project Area, since they are globally known as the second main threat to biodiversity and may compromise the balance of the ecosystem in which they are inserted. Therefore, in the same way as Section 5.2.5.**Erro! Fonte de referência não encontrada.**, Project activities will not foster the inclusion of alien species and the Project Area will not be affected by the introduction of this type of species, resulting in no threat or increment as a result of the Project.

It is worth mentioning that, within Fazenda Jutaituba, there are some areas dedicated to beef cattle in which there is the use of non-native grasses. Such species, without proper management, can act as invasive species. Due to the premises of the Project, such areas were removed, but it is evident that they are very close to the forest massifs that make up the Project Area. To date, there is no evidence or evidence that such species affect and or act as invasive species beyond the areas destined for livestock within the boundaries of Fazenda Jutaituba.

5.2.7 Impacts of Non-native Species (B2.6)

As specified in Section 5.2.5, the Jutaituba REDD+ Project Zone has communities in which it uses non-native species for subsistence. However, the main food crops and producers' sources of income are mostly based on the development and exploitation of non-timber forest products of native species (Brazil nuts, açaí, cassava, bacaba, among others).

The few non-native species are, however, used by local communities, that is, on a small scale and do not have an adverse impact on the environment. These species have been cultivated for years, being part of the cultural history of the region and serving as a source of livelihood for these communities and, until then, even without the insertion of a REDD+ Project, did not result in negative implications for the area, given the great resilience of the forest. In addition, the use of non-native species will not be encouraged by the Jutaituba REDD+ Project. It is worth mentioning that this applies only to the Project Zone, and exotic and invasive species are not foreseen or incorporated in the Project's activities.

However, as reported in Section 5.2.6, the Jutaituba farm has some areas intended for beef cattle, in which non-native grass species are used, but which are managed correctly, not extending beyond their limits. Nevertheless, throughout the implementation of the Project this should be monitored and, if there is the identification and adverse effects of these species on the forest component, they will be reported in the monitoring report

Therefore, it can be said that no impact is foreseen in relation to non-native species.

5.2.8 GMO Exclusion (B2.7)

Through the Jutaituba REDD+ Project it is guaranteed that no genetically modified organisms (GMOs) will be used. Reducing or removing greenhouse gas emissions will be achieved by reducing deforestation and forest degradation.

5.2.9 Inputs Justification (B2.8)

For the Project Zone of the Jutaituba REDD+ Project, where the activities are intended, there is no intention to use any chemical pesticide, biological control agent or other types of inputs in the activities implemented.

If there is the application of any chemical compound, or the use of biological control agents or any other type of input by the responsible parties, they will be reported in the monitoring report.

5.2.10 Waste Products (B2.9)

Martins Agropecuária, proponent of this Project, establishes standards and criteria for the identification, classification and management of waste in all its areas and activities and, from the construction of the Solid Waste Management Plan – PGRS, aims to meet the requirements of Environmental Laws, in particular Law 12.305 of August 2010[138], which deals exceptionally with

[138] BRASIL, Lei N° 12.305 de 02 de agosto de 2010 - Política Nacional de Resíduos Sólidos (PNRS).

the "National Solid Waste Policy". The criteria for classification, disposal and transportation of the waste generated by the Martins Group are determined according to NBR 10.004, called environmental procedure "Waste management", which establishes conditions for classification in relation to dangerousness, proper disposal, transportation, operation of the intermediate disposal area and packaging of waste. Still, its waste management is guided within a context of continuous improvements applied to the concepts of the "3 R's", reduce, reuse and recycle.

Specifically in the Project Area, garbage is collected once a week in the houses and guardhouses, initially packed in separation boxes, in which they are sent to the garbage shed. The site has a landfill, where it is surrounded and covered to prevent the ingress of water and pollution of the environment in which it is. Waste from sinks, showers and toilets is directed to the septic tanks in which they are built of masonry following all environmentally correct standards.

In all guardhouses of Fazenda Jutaituba there are bins suitable for the separation of garbage suitable for selective collection. In addition, there is an additional local construction project to carry out the separation of waste so that not all the waste generated is destined only to the landfill.

For the activities proposed by the Project, there is no provision for any additional generation of waste that is different from those described above. However, if there is the production of any material that is necessary for its correct destination, the PGRS will be followed, and all environmental laws will be considered.

5.3 Offsite Biodiversity Impacts

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

In general, a REDD+ Project, based on the premises of the VM0015 methodology, has as its central objective the reduction of emissions from unplanned deforestation and forest degradation. That said, it is undeniable that the conservation provided by this mechanism is considered the largest mitigating measure, benefiting the Project Zone as a whole.

Specifically, to the Jutaituba REDD+, the promotion of greater control in the occurrence of anthropogenic disorders that would negatively impact biodiversity, such as hunting and predatory fishing and habitat loss due to deforestation for the practice of predominant economic activities in the region, such as agriculture, livestock and logging, would act even more representatively in mitigating negative adverse effects. However, from the strengthening of measures aimed at the conservation of the forest and its resources, it may be that these disturbances and activities naturally occur to areas outside the Project Zone, in which they are more vulnerable to such events. On the other hand, the negative effects on the biodiversity of the surroundings should be mitigated by the existence of Conservation Units (CUs) nearby, as they are protected areas and less susceptible to changes in land use.

In relation to the mitigation measures arising from the Project, one can mention the permanence and strengthening in the Project Zone of alternative economic activities that generate income and employment, such as the promotion of sustainable practices, management of non-timber forest products and education and awareness for hunting and fishing, that is, the social activities of the project were designed in order to mitigate possible negative impacts, with emphasis on environmental education, the valuation of the forest and the sustainable use of forest resources for local communities.

It is valid to say that all Project activities have been discussed and refined in discussions (Section 2.3.7) with adjacent communities and landowners to potentially expand forest and conservation efforts. Furthermore, it is valid to say that all activities will extend to all interested parties located in the Project Zone, enhancing the effects, even beyond these limits.

In addition, although negative impacts on off-site biodiversity are unlikely, the Project will seek mitigation through the articulation of proponents, in which they should practice adaptive management and collectively address any additional negative impact on off-site biodiversity that is subsequently identified, articulating and promoting partnerships that increase such efforts.

5.3.2 Net Offsite Biodiversity Benefits (B3.3)

The main positive impact expected outside the Project Zone is the favoring of biodiversity by maintaining an ecological corridor, which will serve as a refuge and protection for threatened species and ecosystems and ecological processes can occur without any human intervention or only from sustainable use. Thus, despite the possible displacement of activities and disturbances outside the Project Zone, which can cause occasional negative impacts, landscape connectivity and favoring gene flow between forest areas, habitat maintenance and *in situ* monitoring of endangered species are benefits that justify the presence of the Jutaituba REDD+ Project in the region.

5.4 Biodiversity Impact Monitoring

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

Biological diversity, or biodiversity, is characterized by the variety of life on Earth, covering all species of plants, animals and microorganisms, all genetic variability among species and also all the diversity of terrestrial and aquatic ecosystems – continental and marine – and the ecological complexes of which they are part (*Secretariat of the Convention on Biological Diversity* 2010)[139].

Although Brazil, especially the Amazon biome, has a rich biodiversity, exact knowledge and identification of all species is still quite scarce. That said, monitoring the entire biodiversity of a given region or location is impossible in logistical, financial and knowledge terms available and adequate. According to the "Proposal for a Brazilian Biodiversity Monitoring System"[140], a reasonable way to remedy this problem, making biodiversity monitoring more practical and feasible, is to monitor specific groups of animals and plants in which they respond in a calculable way to environmental changes. These groups of animals and plants that have such potential are called biological indicators and, for them to be considered good indicators of fact, three characteristics are taken into account: high rationality, high performance and high possibility of implantation.

The methodological script considers four reasonable groups of biological indicators to be monitored: tree plants, selected groups of birds, medium and large mammals and frugivorous

[139]Secretariat of the Convention on Biological Diversity (2010) Global Biodiversity Outlook 3. Montreal.
[140] COSTA-PEREIRA, R.; ROQUE, F. O.; CONSTANTINO, P. A. L.; SABINO, J.; UEHARA-PRADO, M. **In situ monitoring of Biodiversity: Proposal for a Brazilian Biodiversity Monitoring System.** 1. ed. Brasília: ICMBio. v. 1, 2013. 61p.

butterflies. It is important to remember that to define such groups, their sensitivity to climate change issues was taken into account.

a) Technical description of monitoring tasks

Taking the roadmap mentioned above into account and the effectiveness of the monitoring aimed at biological diversity, the biodiversity monitoring plan of the Jutaituba REDD+ Project will focus only on the monitoring of some biological indicators, that is, focused on the megadiversity (woody plants, avifauna and mastofauna) found in the Project Area. In addition, these indicators should be monitored and evaluated in the face of forest changes, whether arising from the decrease in the forest area in the Project Zone, climate change or forest management activities on the farm, in order to better understand its dynamics, being able to track the impact of these elements on biological diversity.

Although forest management is the most sustainable way to preserve the forest and also promote financial returns, including mitigation of climate change and conservation of socio-biodiversity, there are possible negative impacts of this activity on biological diversity and the Project may take advantage of the biodiversity monitoring plan to supervise such harmful aspects.

In the scenario without the Project, described in Section 5.1, the diagnosis considered four different sampling areas. In other words, we sought to diagnose biodiversity in places where they went through different stages of forest management exploration and a control area. Through this, this plan will seek, whenever possible, to carry out the expeditions to monitor biodiversity considering the same methodology used to diagnose the scenario without a Project or seeking to establish a similar sampling methodology, in which it is possible to compare, observe and measure the effects of forest management on the biological indicators selected throughout the Project's life cycle.

Therefore, another measure projected and expected for the biodiversity monitoring plan is to generate more data on the conservation status in loco, comparing the forest management areas with the unmanaged areas, with a more faithful estimate of the abundance and population trend of the identified species. Through the knowledge of these data, it is possible to have an overview of the availability of species, generating information about the level of exploitation, as well as if there are sequels of this activity for the local megadiversity or not.

In addition, monitoring biodiversity, taking into account all aspects contained in this plan, will be fundamental to understand and moderate the extent of climate change and reduce its negative impacts throughout the Project's life cycle. With actions guided by monitoring, it is possible to create strategies to mitigate pressures on ecosystems. Such mechanisms can also help to reduce threats to the human species. A fundamental tool, biodiversity monitoring will make it possible to measure the impacts of the possible activities caused by the Project on biodiversity, providing relevant adjustments and repairs in the pursuit of the desired objectives. This possibility will be evaluated and articulated by the Project activity defined as "Implementation, monitoring and evaluation of the activities developed by the Project". Another point that deserves to be highlighted is that this plan must be able to involve the mapped and future stakeholders of the Project in the monitoring.

That said, for the monitoring of fauna, the Project will carry out expeditions (to be established), considering the monitoring of periods of low and high rainfall in order to evaluate the seasonal dynamics of the species, so that the presence of migratory species and reproductive periods are considered. As for the flora monitoring, considering that the dynamics and floristic changes occur more slowly, the expeditions will be made one year before the CCBA verification of the Project in

order to evaluate any changes that may arise in the structure and composition of the floristic species.

It is evident that, in the collection of data from megadiversity as a whole, species of relevance, whether endemic, threat and rare, are prioritized in expeditions and collected during monitoring campaigns. A special highlight will be given to the Xingu jacamim species *(Psophia interjecta*) considered a subspecies of *Psophia dextralis*, which is classified as "In Danger" by the IUCN list. In addition to this classification, the xingu jacamim is an exceptionally endemic species of the region, with restricted distribution (Interflúvio Tocantins-Xingu). Also, the family "Psophiidae) (jacamins) have great pressure for hunting by traditional quilombola families in the region. That said, a sharp population decline is expected in a short time for the species due to massive habitat loss, that is, extensive and mature forests (SOMENZARI, 2018) in[141] addition to predatory hunting.

Finally, the plan will seek to protect High Conservation Value Areas (HCVA) by stimulating and improving knowledge about local biodiversity through this long-term monitoring, since knowledge about the flora and, more specifically, the fauna of the region can still be considered scarce (SILVA et al., 2005)[142]. The evaluation of the effectiveness of the measures adopted to maintain and improve HCVAs will be incorporated within these tasks, since HCVA1 is linked to the monitoring of relevant species.

a) Data to be collected

Table 52 - Data to be collected for the monitoring of biodiversity activities.

Date / Parameter	Number of reports
Data unit	Number
Description	This parameter will be responsible for accounting for the quantity of all material produced, in the form of a report, designed to implement and monitor the biodiversity scope of the Project
Source of data	Calculated through reports, meeting minutes, monitoring guides and memos, focused on issues related to the biodiversity scope of the Project (biodiversity monitoring)
Description of measurement methods and procedures to be applied	All documents that can be read as "reports" produced for the Project will be stored in digital files throughout the Project's accreditation period. In this way, these reports from the activity of "In situ monitoring of biodiversity" will be monitored and accounted for
Frequency of monitoring/recording	Annual
Value applied	To be accounted for after Project registration

[141] SOMENZARI, M. Pyrrhura lepida (Wagler, 1832), **In: Red Book of Brazilian Fauna Threatened with Extinction, vol. III: Birds**. Brasília, DF: ICMBio/MMA. 2018. p. 268-270
[142] SILVA, JMC; RYLANDS, AB; DA FONSECA, GA **The fate of the Amazonian areas of endemism. Conservation Biology**, v, 19, p. 3, 689-694, 2005.

Monitoring equipment	Not applicable
QA/QC procedures to be applied	The information systematized in the reports will be validated between the bidders, allowing greater reliability and quality of the data. In addition, the Project will undergo continuous evaluation of the information generated, allowing the identification of improvements in the collection and registration processes, and the incorporation of these in the strategic planning of the Project when they are identified
Purpose of date	Not applicable
Calculation method	Not applicable
Comments	-

Date / Parameter	Number of animal species monitored
Data unit	Number
Description	Number of animals (mastofauna and avifauna) monitored on each shipment
Source of data	Field worksheets, photographs, monitoring reports, additional records
Description of measurement methods and procedures to be applied	To be established (ideally similar to what was done in the initial diagnoses)
Frequency of monitoring/recording	To be established.
Value applied	To be accounted for after project registration
Monitoring equipment	Not applicable
QA/QC procedures to be applied	To be established
Calculation method	Datasheet
Comments	-

Date / Parameter	Morpho-species richness of the monitored plant community
Data unit	Number
Description	Number of morphospecies found in the monitoring being the fundamental unit for the evaluation of the homogeneity of the monitored environment. Due to the great difficulty of identifying an individual at a specific level, the parameter is focused on morpho-species, in which they are defined by morphological similarity.
Source of data	Field sheets, forest inventories, monitoring reports, additional records
Description of measurement methods and procedures to be applied	To be established (ideally similar to what was done in the initial diagnoses)
Frequency of monitoring/recording	One year before a verification event
Value applied	To be accounted for after Project registration
Monitoring equipment	Not applicable
QA/QC procedures to be applied	To be established
Calculation method	Datasheet
Comments	-

Date / Parameter	Percentage of species of relevance on the red list of IUCN endangered species monitored
Data unit	Percentage
Description	Monitoring the species of relevance of the Project's fauna in relation to its status on the IUCN List of Endangered Species, with an emphasis on the species mentioned as critically endangered (CR) or endangered (E)
Source of data	Field worksheets, photographs, monitoring reports, additional records
Description of measurement methods	Systematization and comparison of data and information collected on fauna expeditions with the IUCN Official List, available at: https://www.iucnredlist.org/

and procedures to be applied	
Frequency of monitoring/recording	To be established.
Value applied	Not applicable
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Comparison of the different sources of information available: empirical survey, secondary data, official lists and traditional knowledge
Calculation method	Datasheet
Comments	-

5.4.2 Biodiversity Monitoring Plan Dissemination (B4.3)

The Biodiversity monitoring plan and its results will be publicly disclosed on the official website of the Biofílica Ambipar Environment. Relevant information, the summary of the monitoring plan and its results, will be made available to the community, proponents, partners and other stakeholders through meetings, lectures, and physically on the premises of Fazenda Jutatituba

5.5 Optional Criterion: Exceptional Biodiversity Benefits

5.5.1 High Biodiversity Conservation Priority Status (GL3.1)

Described in more detail in Section 5.1.1 the Project Zone can be considered a high priority area for biodiversity conservation, both nationally and globally. In addition, the Project Area of the Jutaituba REDD+ Project is home to a high rate of biological diversity, many of which are found with some degree of endemism and threat. The territorial extension with intact forest of the farm Jutaituba as well as its variety of phytophysiognomies justifies the high biodiversity found in the area.

That said, the presence of endangered species of flora and fauna found in the scenario without Project, were verified according to the IUCN Red List of Threatened Species:

Flora

- **Critically Endangered (CR)** - I'm going to *the American*

- **Endangered (EN) -** Manilkara elata; Euxylophora paraenses

- **Vulnerable (VU)** - Couratari guianensis; Bertholletia excelsa; Mezilaurus itauba

Fauna

- **Endangered (EN)** - Ramphastos vitellinus ariel[143]; Psophia interjecta[144]; Pionites leucogaster

[143] Subspecies of *Ramphastos vitellinus.* In the IUCN database it is registered as *Ramphastos ariel*
[144]Subspecies of *Psophia* dextralis which is categorized as “Endangered” by IUCN

- Vulnerable (VU) - Aburria cujubi; Pyrilia vulturina; Tinamus tao; Penelope pileata; Patagioenas subvinacea; Guaruba guarouba; Pyrrhura anerythra[145]; Touit huetii; Leopardus sp.; Tayassu pecari; Tapirus terrestres; Alouatta belzebul; Saguinus niger; Chiropotes utahickae**.**

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

The key species and their respective population trends for the Jutaituba REDD+ Project can be found in the table below (Table 53).

Table 53 - Identification and description of key species and population trend for scenarios without and with Jutaituba REDD+ Project.

- Avifauna

Trigger Species	*Psophia interjecta (subspecies of Psophia dextralis)*
Population Trend at Start of Project	The species is considered endangered by IUCN (2018) and has a restricted distribution (Interflúvio Tocantins-Xingu), in which it meets the criteria defined by the CCB standard. Currently, its population has a downward trend.
Without-project Scenario	In a scenario without a Project, it is expected that deforestation will increase, and forest cover will be converted into non-forest areas. The species is very sensitive to habitat changes and much sought after by hunters. Thus, the trend is the population decrease and the worsening of the threat situation of the subspecies *Psophia interjecta.*
With-project Scenario	The Jutaituba REDD+ Project with its purpose of mitigating, reducing deforestation and forest degradation, will promote the increase or at least the population maintenance of the species. The conservation of the forest massif should also contribute to the connectivity of the landscape, favoring the gene flow between the forest areas in the vicinity. In addition, the biodiversity monitoring plan as well as the indicators established in this Project will take into account the monitoring of this species, being chosen to reflect the results of the Project. Therefore, it is expected with the scenario with Project, that there will be improvements in the trend of the population of *Psophia interjecta*.

Trigger Species	*Pionites leucogaster*
Population Trend at Start of Project	The species is considered Endangered by IUCN (2018), which meets the criteria defined by the CCB standard. Currently, its population has a downward trend.
Without-project Scenario	In a scenario without a project, an increase in deforestation and the conversion of forest cover into non-forest areas is expected. The loss of habitat compromises the availability of food and breeding

[145] *Pyrrhura lepida* subspecies

	sites, since this species depends on tall trees for nesting. Thus, the trend is the population decrease and the worsening of the threat situation of the species *Pionites leucogaster*
With-project Scenario	The Jutaituba REDD+ Project with its purpose of mitigating, reducing deforestation and forest degradation will promote the increase or at least the population maintenance of the species. The conservation of the forest massif should also contribute to the connectivity of the landscape, favoring the gene flow between the forest areas in the vicinity.

Trigger Species	*Ramphastos vitellinus ariel (R. ariel according to IUCN)*
Population Trend at Start of Project	The species is considered Endangered by IUCN (2016), which meets the criteria defined by the CCB standard. Currently, its population has a downward trend.
Without-project Scenario	In a scenario without a project, an increase in deforestation and the conversion of forest cover into non-forest areas is expected. Thus, the trend is the population decrease and the worsening of the threat situation of the subspecies *Ramphastos vitellinus ariel*
With-project Scenario	The Jutaituba REDD+ Project with its purpose of mitigating, reducing deforestation and forest degradation will promote the increase or at least the population maintenance of the species. The conservation of the forest massif should also contribute to the connectivity of the landscape, favoring the gene flow between the forest areas in the vicinity.

- Mastofauna

Trigger Species	*Saguinus niger*
Population Trend at Start of Project	The species is considered vulnerable (VU) by IUCN (2020) and is endemic to the region. It was found the presence of at least 34 individuals of the species in the Project Area, which meets the criteria defined by the CCB standard. Currently, its population has a downward trend.
Without-project Scenario	In a scenario without a project, an increase in deforestation and the conversion of forest cover into non-forest areas is expected. The species has relative tolerance to degraded areas, but should be greatly impaired by excessive deforestation that occurs in the region. Thus, the trend is the population decrease and the worsening of the threat situation of the species *Saguinus niger.*

With-project Scenario	The Jutaituba REDD+ Project with its purpose of mitigating, reducing deforestation and forest degradation will promote the increase or at least the population maintenance of the species. The conservation of the forest massif should also contribute to the connectivity of the landscape, favoring the gene flow between the forest areas in the vicinity.

- Flora

Trigger Species	*Euxylophora paraensis*
Population Trend at Start of Project	The species is considered Endangered by IUCN (2020) and its registration in the area meets the criteria defined by the CCB standard.
Without-project Scenario	In a scenario without a project, it is expected an increase in deforestation, conversion of forest cover into non-forest areas and consequently a population decline of the species. In addition, its high commercial value and the possible absence of surveillance and control of the area may encourage illegal incursions causing impacts to fauna and flora as a whole.
With-project Scenario	The Jutaituba REDD+ Project with its purpose of mitigating, reducing deforestation and forest degradation will promote the increase or at least the population maintenance of the species. The conservation of the forest massif should also contribute to the connectivity of the landscape, favoring the gene flow between the forest areas in the vicinity

Trigger Species	*Vouacapoua americana*
Population Trend at Start of Project	The species is considered Critically Threatened (CR) by IUCN (1998) and its registration in the area meets the criteria defined by the CCB standard.
Without-project Scenario	In a scenario without a Project, an increase in deforestation is expected, conversion of forest cover into non-forest areas and consequently a population decline of the species. In addition, its high commercial value and the possible absence of surveillance and control of the area may encourage illegal incursions causing impacts to fauna and flora as a whole.
With-project Scenario	The Jutaituba REDD+ Project with its purpose of mitigating, reducing deforestation and forest degradation will promote the increase or at least the population maintenance of the species. The conservation of the forest massif should also contribute to the connectivity of the landscape, favoring the gene flow between the forest areas in the vicinity.

APPENDICES

Appendix 1: Additional Information

Appendix 1 – List of species of CITES Appendix I,II and III[146]

Species	Popular Name
Potamotrygon orbignyi	arraia de rio
Potamotrygon scobina	arraia de rio
Arapaima gigas	pirarucu
Pristis pectinataCR	peixe serra
Sarcoramphus papa	urubu-rei
Harpy harpyja	king hawk
Pteroglossus aracari	araçari-de-bico-branco
Ramphastos tucanus	tucano-de-papo-branco
Ramphastos vitellinus ariel	tucano-de-bico-preto
Guaruba guarouba	ararajuba
Dicotyles tajacu	catetus
Tayassu pecari	queixada
Cerdocyon thous	cachorro-do-mato
Speothos venaticus	cachorro-vinagre
Herpailurus yagouaroundi	gato-mourisco
Leopardus pardalis	Jaguatirica
Leopardus sp.	gato-do-mato
Panthera onca	onça-pintada
Puma concolor	onça-parda
Bradypus variegatus	preguiça-comum
Myrmecophaga tridactyla	tamanduá-bandeira
Cuniculus paca	paca

[146]https://cites.org/esp/app/appendices.php