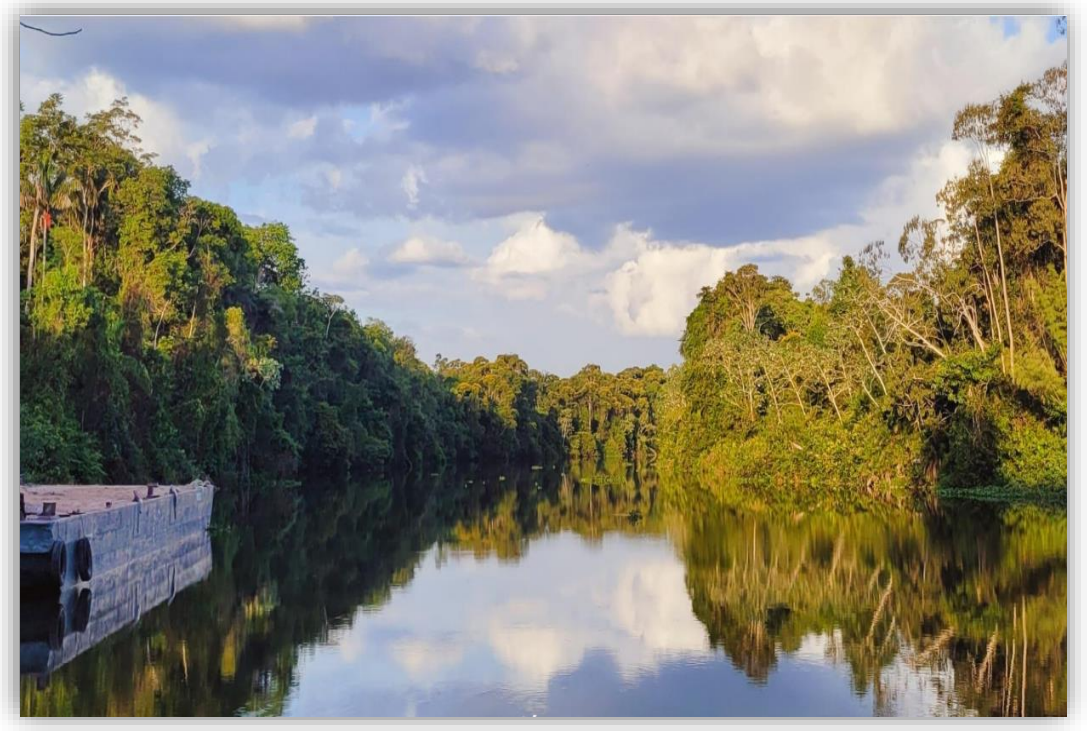
TUERÉ REDD+ PROJECT



Document prepared by Biofílica Ambipar Environmental Investments

Project Title	*Tueré REDD+ Project*
Version	*v.1*
Date of Issue	*06-September-2023*
Project Location	*Pará, Brazil*
Project Proponent(s)	*Biofílica Ambipar Environmental Investments – Plinio Ribeiro (CEO), phone: +55 11 3073-0430 / e-mail: plinio@biofilica.com.br* *Brascomp Compensados do Brasil - Ari Zugman (Director), phone: +55 41 3314-5757 / e-mail: ari.zugman@lavrasul.com.br*
Prepared By	*Biofilica Ambipar Environmental Investments*

Validation Body	*Earthood Services Private Limited "ESPL" – Ricardo Lopes: tel: +55 11 3075-2865 / ricardo.lopes@earthood.in*
Project Lifetime	*August 31, 2022 to August 30, 2052 – 30 years*
GHG Accounting Period	*August 31, 2022 to August 30, 2052 – 30 years*
History of CCB Status	*First validation attempt*
Gold Level Criteria	*GL1 Gold Level – Exceptional Benefits to Climate* *GL3 Gold Seal – Exceptional Biodiversity Benefits*
Expected Verification Schedule	*First Check on CCB every three years after validation/verification.* *Checks on the VCS are expected every three years.*

Table of Contents

1 SUMMARY OF PROJECT BENEFITS

1.1 Unique Project Benefits

Outcome or Impact Estimated by the End of Project Lifetime	Section Reference
1) Expected benefits for the Climate: with the Tueré REDD+ Project, it is expected that after its life cycle, based on the first baseline defined for the Project, it will help to mitigate climate change with a total of avoided emissions of 7,454,030 tCO2eq. The avoided deforestation in the scenario with the Project is 13,337 hectares during the first 10 years of the Project and an average of 745,403 tCO2eq of reduced emissions.	3
2) Benefits to communities: The expected benefits to communities from the activities proposed by the Project include encouraging the development of sustainable economic activities, providing alternative sources of income for local communities, reducing their dependence on deforestation and encouraging practices that preserve the forest. The actions will focus on aspects of promoting regional socioeconomic development through alternative practices to deforestation and the development and strengthening of value chains, promoting social organization and cooperativism, allowing greater access to sustainable planting and environmental techniques, as well as to the final consumer market. In addition, the Project will seek the involvement of local communities in the planning and implementation of activities, promoting active participation and decentralized decision-making, allowing communities to express their needs to improve the quality of life. Thus, it is intended to influence the social issues and living conditions of the communities surrounding the Project, reducing social vulnerability and rural exodus, generating value in adapting to climate change, increasing the level of socioeconomic conditions and the quality of life of families and helping to obtain partnerships that help in the aggregation of generation of goods and services that promote economic and social well-being.	4
3) Benefits to Biodiversity: the activities proposed by the Project are aimed at maintaining the fauna and flora in the Project Area, ensuring the protection and conservation of habitats and local biodiversity, including endemic species and those with some degree of threat according to the RedList of the IUCN. In addition, it seeks to preserve ecosystems with a high concentration of rare and endemic species, given its location in the Xingu Endemism Center.	5

1.2 Standardized Benefit Metrics

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	7,454,030 tCO2eq	3
Forest[1] cover	For REDD[2] projects: Estimated number of hectares of reduced forest loss in the project area measured against the without-project scenario	13,337 hectares	3
	For ARR[3] 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[4] practices are expected to occur 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 occur 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	Potentially 1,335 people and 5 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	Potentially 322	4

[1] Land with woody vegetation that meets an internationally accepted definition (e.g., UNFCCC, FAO or IPCC) of what constitutes a forest, which includes threshold parameters, such as minimum forest area, tree height and level of crown cover, and may include mature, secondary, degraded and wetland forests (*VCS Program Definitions*)
[2] Reduced emissions from deforestation and forest degradation (REDD) - Activities that reduce GHG emissions by slowing or stopping conversion of forests to non-forest land and/or reduce the degradation of forest land where forest biomass is lost (*VCS Program Definitions*)
[3] Afforestation, reforestation and revegetation (ARR) - Activities that increase carbon stocks in woody biomass (and in some cases soils) by establishing, increasing and/or restoring vegetative cover through the planting, sowing and/or human-assisted natural regeneration of woody vegetation (*VCS Program Definitions*)
[4] Improved forest management (IFM) - Activities that change forest management practices and increase carbon stock on forest lands managed for wood products such as saw timber, pulpwood and fuelwood (*VCS Program Definitions*)

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
Employment	Total number of people expected to be employed in project activities,[5] expressed as number of full-time employees[6]	Potentially 10	4
	Number of women expected to be employed as a result of project activities, expressed as number of full-time employees	Potentially 1	4
Livelihoods	Total number of people expected to have improved livelihoods[7] or income generated as a result of project activities	Potentially 1,335 people and 5 communities	4
	Number of women expected to have improved livelihoods or income generated as a result of project activities	Potentially 322	4
Health	Total number of people for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	Potentially 1,335 people and 5 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	Potentially 322	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	Potentially 1,335 people and 5 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	Potentially 322	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	Potentially 1,335 people and 5 communities	4

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

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
	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	Potentially 322	4
Well-being	Total number of community members whose well-being[8] is expected to improve as a result of project activities	Potentially 1,335 people and 5 communities	4
	Number of women whose well-being is expected to improve as a result of project activities	Potentially 322	4
Biodiversity conservation	Expected change in the number of hectares managed significantly better by the project for biodiversity conservation,[9] measured against the without-project scenario	135,342 hectares	5
	Expected number of globally Critically Endangered or Endangered species[10] benefiting from reduced threats as a result of project activities,[11] measured against the without-project scenario	6 species	5

[8] Well-being is people's experience of the quality of their lives. Well-being benefits may include benefits reported in other metrics of this table (e.g. Training, Employment, Livelihoods, Health, Education and Water), and may also include other benefits such as strengthened legal rights to resources, increased food security, conservation of access to areas of cultural significance, etc.
[9] Managed for biodiversity conservation in this context means areas where specific management measures are being implemented as a part of project activities with an objective of enhancing biodiversity conservation, e.g. enhancing the status of endangered species
[10] Per IUCN's Red List of Threatened Species
[11] In the absence of direct population or occupancy measures, measurement of reduced threats may be used as evidence of benefit

2 GENERAL

2.1 Project Goals, Design and Long-Term Viability

2.1.1 Summary Description of the Project (G1.2)

The Tueré REDD+ Project is a partnership between Biofílica Ambipar Environment and Brascomp Compensados do Brasil S.A. and aims to promote forest conservation, maintain carbon stocks and mitigate climate change by reducing Greenhouse Gas (GHG) emissions from land use changes. In addition to climate benefits, the Project also aims to generate social benefits based on sustainable economic development practices and improving the well-being of surrounding communities, in addition to environmental benefits through actions aimed at the conservation of local fauna and flora.

The Project Area has 135,342 ha of Amazon forest, located in the mesoregion of Marajó, in the municipality of Portel, state of Pará, and is located on the banks of the Anapu and Tueré Rivers. Communities have been identified that are directly or indirectly influenced by the Project, and that are geographically close to the Project Area and depend on its ecosystem services.

The region has great relevance in relation to its biodiversity, as it is located in the Xingu Endemism Center, a place with a large concentration of rare and endemic species. 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 21 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 drivers of deforestation and forest degradation in the region are the advance of livestock in riverside areas, illegal logging, land grabbing (invasions and land conflicts), proximity to the BR-230 highway and the practice of slash-and-burn agriculture.

From this context, the activities of the Project were designed to guarantee the conservation and protection of biodiversity and natural resources, through mitigating and preventive measures such as the improvement of the surveillance of the Farms, the monitoring of deforestation by satellite images, regional socioeconomic development through alternative practices to deforestation and the development and strengthening of value chains, the establishment of a biodiversity conservation program, promoting the *in situ* monitoring of fauna and flora in the Project Area, in addition to environmental education as a strategy to discourage predatory hunting and fishing. In addition to these actions, it is intended to strengthen local governance, mainly through stakeholder engagement and involvement.

Thus, the Tueré REDD+ Project hopes to improve the well-being of communities and generate exceptional benefits for local biodiversity, in addition to the climate impact by reducing GHG emissions by 7,454,030 tCO2eq in 10 years, equivalent to an average annual reduction of 745,403 tCO2eq.

2.1.2 Project Scale

Project Scale	
Project	
Large project	X

2.1.3 Project Proponents (G1.1)

Organization name	Brascomp Compensados do Brasil S.A.
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2.1.4 Other Entities Involved in the Project

Organization name	STA Soluções Técnicas e Serviços de Engenharia Ambiental Ltda.
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2.1.5 Physical Parameters (G1.3)

The Tueré REDD+ Project is located in the municipality of Portel, in the state of Pará, Brazil. The municipality belongs to the Marajó Integration Region and, according to the regional geographic division made by the Brazilian Institute of Geography and Statistics (IBGE), the municipality is inserted in the Marajó

mesoregion and Portel microregion (FAPESPA, 2022)[12]. The Project consists of Fazendas Santo Antônio and Terra Alta, located between the parallels 2º35'S and 3º10'S and meridians 51º19'W and 50º42'W.

Access to the location of the Tueré REDD+ Project occurs in three ways:

- By river: leaving Belém (PA) through Guajará Bay, sailing to Portel Bay and then to the farms through the Anapu River;

- By air: going from Belém to the municipality of Breves, for later transport by boat to Portel and to the farms by the Anapu River, or going from Belém to the municipality of Altamira, for later road transport to Anapu and by boat to Fazenda Terra Alta by the Tueré River;

- And by land: leaving Belém through the BR-155, PA-252, PA-475 and PA-263 highways, going to the BR-230 Trans-Amazonian in the municipality of Anapu and later boat transport to Fazenda Terra Alta by the Tueré River.

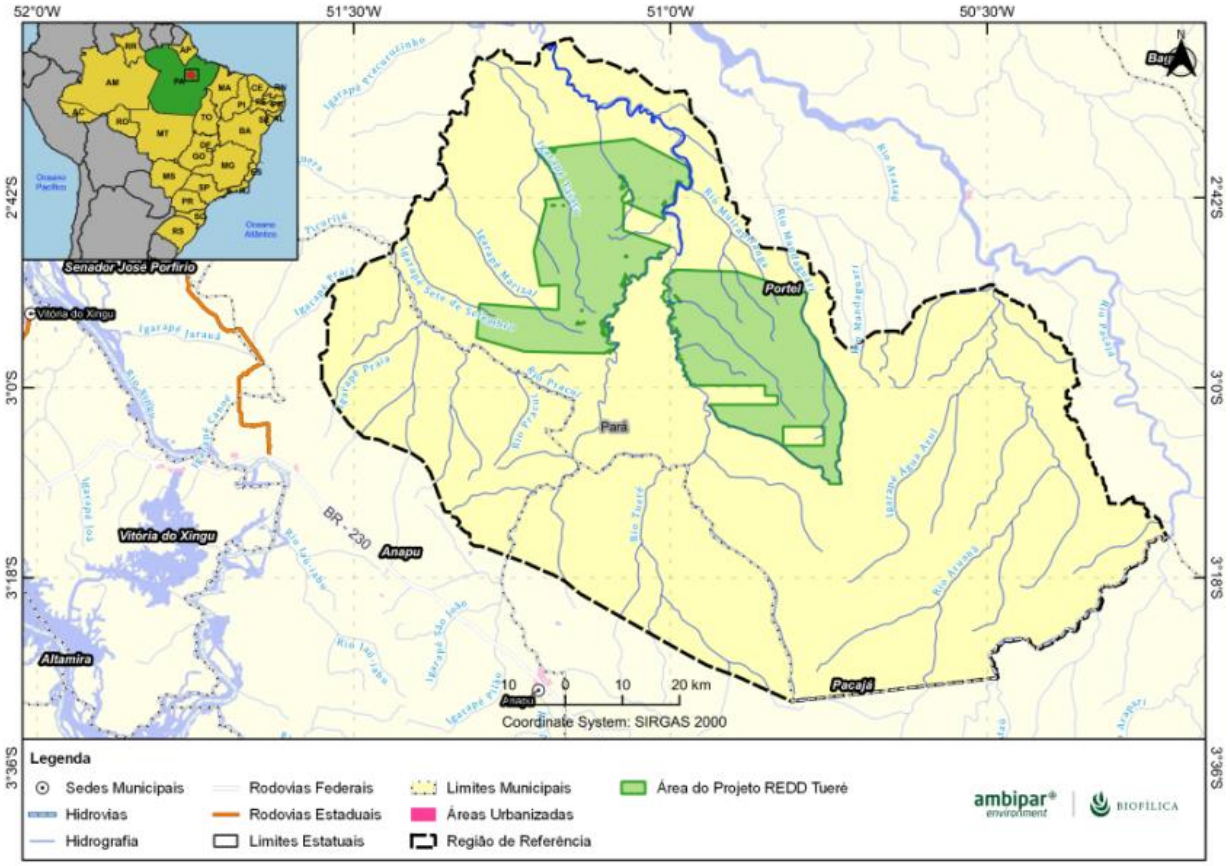


Figure 1 – Location of the Tueré REDD+ Project.

The geological, geomorphological, pedological, mineral, climatic, hydrological and vegetation parameters were evaluated for the region of the Project Area and its surroundings, as shown below:

[12] FAPESPA – Fundação Amazônia de Amparo a Estudos e Pesquisas. Pará Municipal Statistics: Portel. Directorate of Statistics and Information Technology and Management, Belém, 2022.

Geological Aspects

According to the regional division model of Brazil, the municipality of Portel is located in the Jacundá-Pacajá physiographic zone, inserted in the Sedimentary Basin of the Amazon (IBGE, 2017)[13]. Its geological structure is composed mainly of cenozoic sediments of tertiary age and unconsolidated sediments of quaternary age. With regard to cenozoic sediments, lithotypes of the Barreiras Formation can be observed, including sandstones, siltiums and kaolinic algerites with conglomerate lenses. Among the unconsolidated sediments, sands, silts and clays can be observed (PORTEL, 2012)[14].

According to the survey carried out by the Fundação Amazônia de Amparo a Estudos e Pesquisas do Estado do Pará (Fapespa, 2022)[15], the sedimentary basin of the Amazon is characterized by clayey and sandy sediments, where tertiary carbonaceous levels may be present, as well as gravels, sandy soils and shales metamorphosed and reworked in the Paleoproterozoic. Thus, the geological structure of the region refers to the Pre-Cambrian Archean/Paleoproterozoic period and the Mesozoic and Cenozoic era.

Another geological formation very present in the region is the Aluviões unit: recent sedimentary covers of the quaternary period, composed of unconsolidated river deposits of different granulometry. In addition, it presents the Gurupá Arch as a local geological structure, inserted between the Guianas and Guaporé Cratons and also under the Ilha Grande de Gurupá, marked by the predominance of the Vila Nova and Gnaisse Tumucumaque group (BRASIL, 2007)[16].

In a small portion south of the municipality of Portel, there are rocks belonging to the Xingu Complex of Precambrian age, which are part of the waterfalls of the upper courses of the Pacajá and Anapú rivers. This Complex is composed of granites, granodiorites, diorites, migmatites, acidic and basic granulites, quartzites, schists and gneisses (PORTEL, 2012)[17].

About the region surrounding the Project, based on the Environmental Information Database (BDiA) of the Brazilian Institute of Geography and Statistics (IBGE, 2022)[18], it is observed that the northern portion is predominantly composed of lithostratigraphic units of the Alter do Chão Formations and Alluvial Deposits type, the first of which encompasses the entire area of the Terra Alta and Santo Antônio farms and the second is predominant around the masses of water. On the other hand, the region south of the farms has a predominance of the Enderbito-Cajazeiras Complex. (Figure 2).

[13] IBGE – Instituto Brasileiro de Geografia e Estatística [Brazilian Institute of Geography and Statistics]. Regional division of Brazil into immediate geographic regions and intermediate geographic regions. Geography Coordination, Rio de Janeiro: IBGE, 2017.

[14] PORTEL, City Hall of. Municipal Secretariat of Cultural, Sports, Leisure and Tourism – SECELT. Survey of the tourist offer of the municipality of Portel. Portel, 2012.

[15] FAPESPA, *op. cit.*

[16] BRAZIL. Sustainable Territorial Development Plan for the Marajó Archipelago. Government of the State of Pará. Belém, 2007.

[17] PORTEL, City Hall of. SECELT, *op. cit.*

[18] IBGE – Instituto Brasileiro de Geografia e Estatística [Brazilian Institute of Geography and Statistics]. Environmental Information Database – BDiA. Rio de Janeiro: IBGE, 2022.

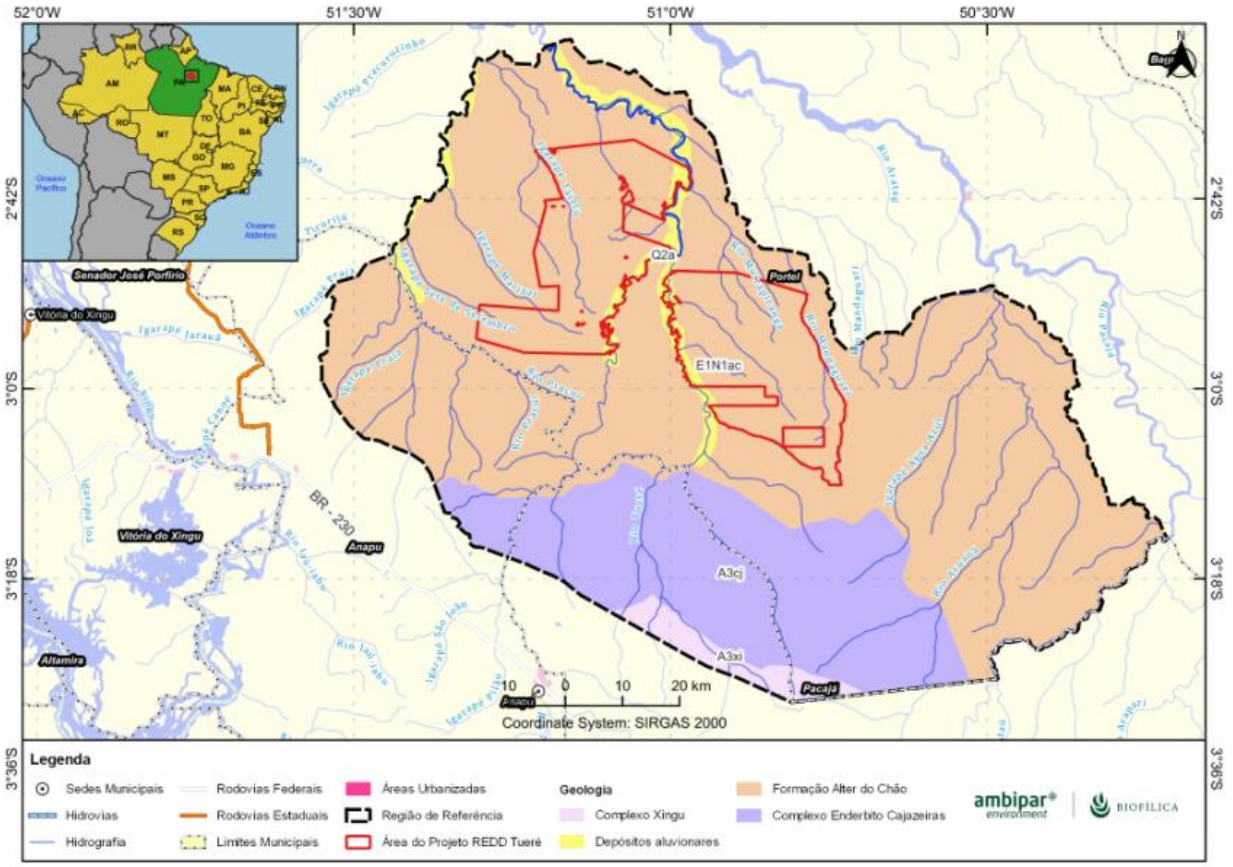


Figure 2 – Geological aspects of the Tueré REDD+ Project.

Geomorphological Aspects

Through the geomorphological survey based on data from the BDiA and the Geological Survey of Brazil (CPRM, 2013)[19], it is noted that the north of the Project region is formed on a larger scale by the Xingu-Tocantins Tablelands, which encompasses the entire territory of the farms, although the bordering region of the Santo Antônio Farm also has a vast extension of the Amazon Plain. To the south, the territory is mostly composed of the Xingu Dissected Level and, to a lesser extent, the Bacajá Depression (Figure 3).

In this way, an expressive diversity of geomorphological components is evident under the constitution of the relief of the project region, with a transition in the North-South direction of more recent geomorphological units of the Phanerozoic Sedimentary Basins and Coverings type, together with fragments of Sedimentary Deposits Quaternary, towards Precambrian period units, in this case Neoproterozoic Cratons that were formed before the Brasiliano Orogenic Cycle (SOARES; MOURA, 2021)[20].

[19] CPRM - Geological Survey of Brazil. Geodiversity of the State of Pará. Organization Xafi da Silva Jorge João, Sheila Gatinho Teixeira, Dianne Danielle Farias Fonseca. Belém: CPRM, 2013.

[20] SOARES; L.P.; MOURA, M. O. Geographic factors and atmospheric circulation systems in the state of Pará, Brazil. In: XIV National Meeting of Graduate Studies and Research in Geography, 2021, Online Edition. Anais. Editora Realize, 2021.

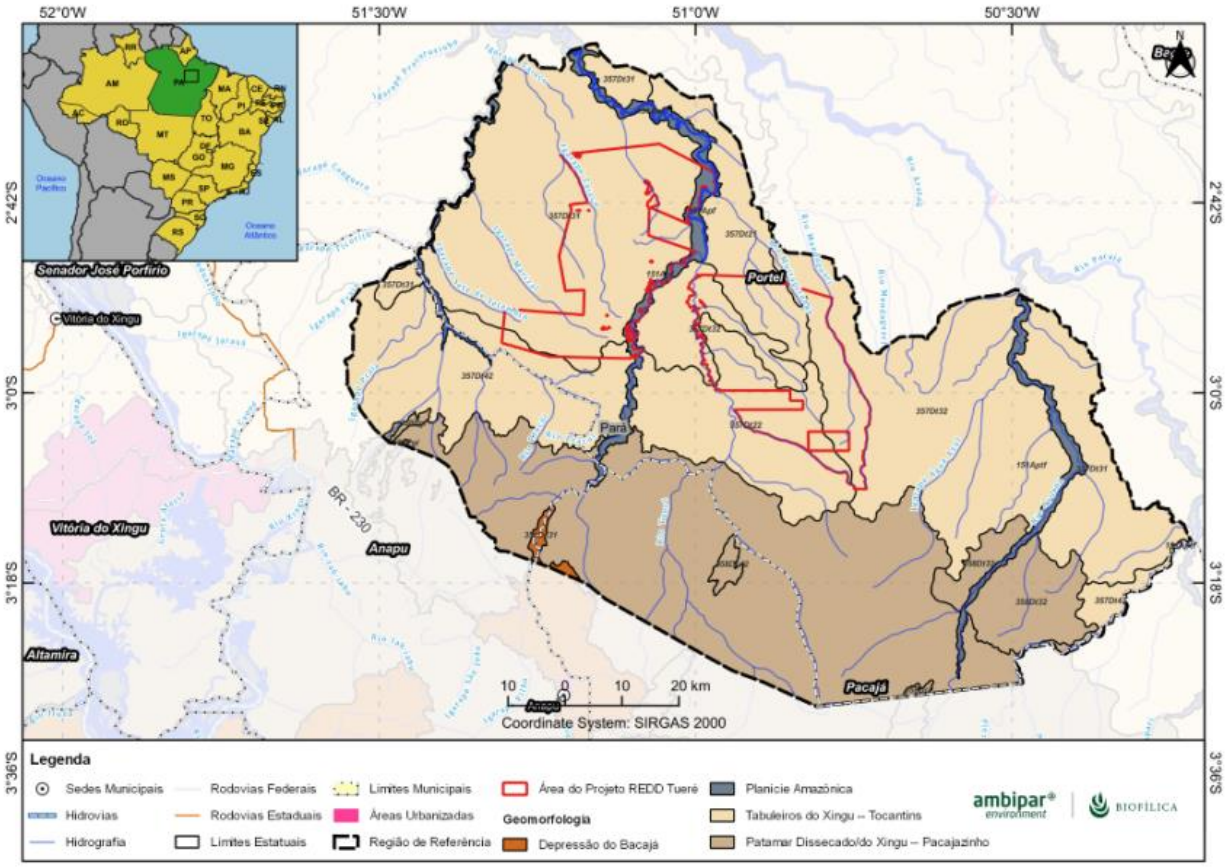


Figure 3 – Geomorphological aspects of the Tueré REDD+ Project.

Pedological Aspects

Regarding the pedological characterization, it was observed that both farms are formed by Yellow Latosol with a small extension of Fluvic Neosol within the limits of their territories. Likewise, the north surrounding the Project area is predominantly composed of Yellow Latosol with some fragments of Fluvial Neosol, while the region south of the farms is mainly formed by Red-Yellow Argisol (IBGE, 2022)[21] (Figure 4).

According to the Brazilian Soil Classification System prepared by EMBRAPA (2018)[22], Oxisols are soils with an Oxisol B horizon of very advanced evolution with a significant expression of the ferralization process. Such a process results in the intense weathering of the primary as well as secondary mineral constituents of less resistance, having a relative concentration of resistant clay minerals and/or oxides and hydroxides of iron and aluminum. Thus, these soils are marked by an inexpressive migration of clay, ferrolysis, gleization or plintitization. In addition, they have a significant depth and thickness generally greater than one meter. In general, they are strongly acidic soils, with low base saturation, dystrophic or aluminic.

[21] IBGE, 2022, *op. cit.*

[22] EMBRAPA – Empresa Brasileira de Pesquisa Agropecuária [Brazilian Agricultural Research Corporation]. Brazilian Soil Classification System. Humberto Gonçalves dos Santos [et al.]. – 5th ed., rev. and ampl. − Brasília, DF: Embrapa, 2018.

On the other hand, Neosols are soils in the process of formation with little pedogenetic development, which may be associated with the soil material itself or with the reduced action of the region's pedogenetic processes. Thus, they are soils whose constitution is formed by a thin mineral or organic material without significant changes in relation to the original material. In this sense, Neosols of suborder Flúvicos derive from alluvial sediments with fluvic character within 150 cm from the soil surface in conjunction with the absence of significant gleization within 50 cm of the soil surface (EMBRAPA, 2018)[23].

Argisols are groups of soils with a textural B horizon that have undergone an intense process of accumulation of clay of low or even high activity, but together with the process of saturation by low bases or with aluminum character. These soils show a high evolution, but with the incomplete action of the ferratilization process. They occur together with kaolinitic-oxidic, virtually kaolinite or vermiculite with Al-hydroxy paragenesis between layers in the presence of clay mobilization from the most superficial part of the soil, with concentration or accumulation in the subsurface horizon (EMBRAPA, 2018)[24].

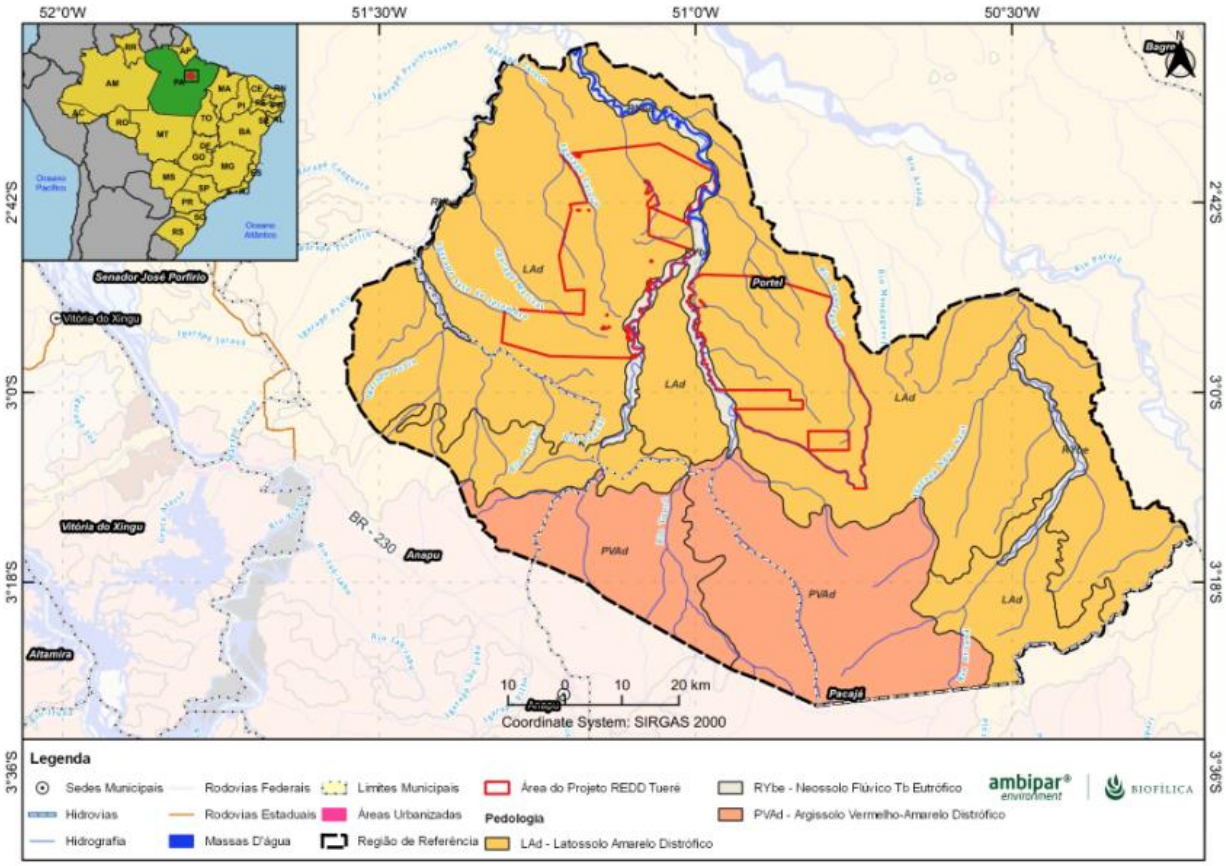


Figure 4 – Pedological characterization of the Tueré REDD+ Project.

Mineral Resources

In order to characterize the mineral resources in the region of the Tueré REDD+ Project, a survey was carried out in the Mining Geographic Information System (SIGMINE) of the National Mining Agency (ANM,

[23] EMBRAPA, *op. cit.*

[24] EMBRAPA, *op. cit.*

2022)[25], in which it was possible to verify the existence of 449 active mining processes of 15 different substances. Figure 5 shows the location of these processes and substances.

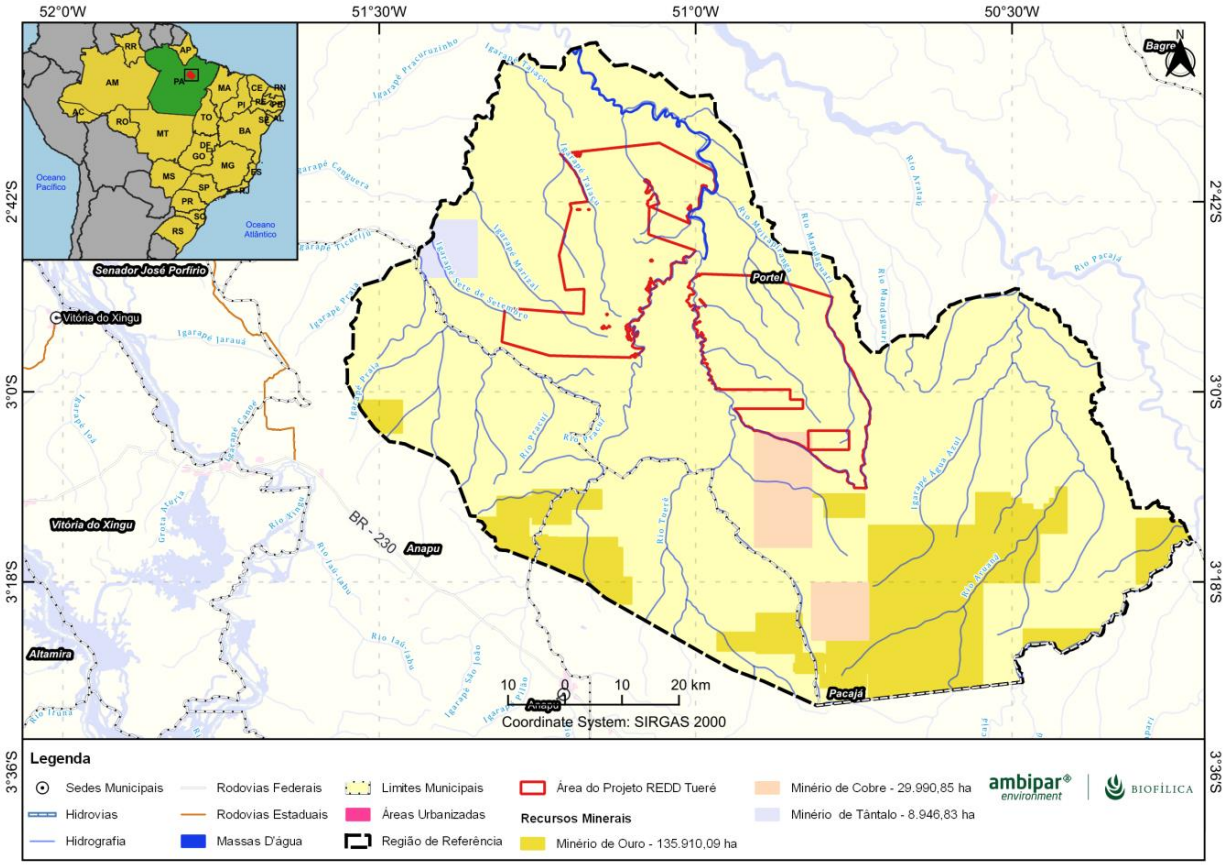


Figure 5 – Distribution of mineral substances in the Tueré REDD+ Project.

Through such information, the presence of mineral substances more frequently to the south of the reference region is clear, with a predominance of gold ore, followed by copper ore and it is observed that to the west of Fazenda Santo Antônio there are fragments of tantalum ore.

Climatic Aspects

Types of Weather

According to the Köppen-Giger International Classification and data provided by the Portel Municipal Secretariat for Culture, Sport, Leisure and Tourism (SECELT, 2012)[26], the municipality predominantly belongs to the Af group with a humid to super humid tropical climate, which is characterized by an annual series with rainy months with monthly precipitation greater than 60 mm without the occurrence of drought in any of the months. In addition, this climate is characterized by average monthly temperatures above 18ºC, with the hottest months between January and February with an average temperature of 24 to 25ºC

[25] National Mining Agency. Geographic Mining Information System – SIGMINE. Ministry of Mines and Energy: Brasília, 2022.

[26] PORTEL, City Hall of. SECELT, *op. cit.*

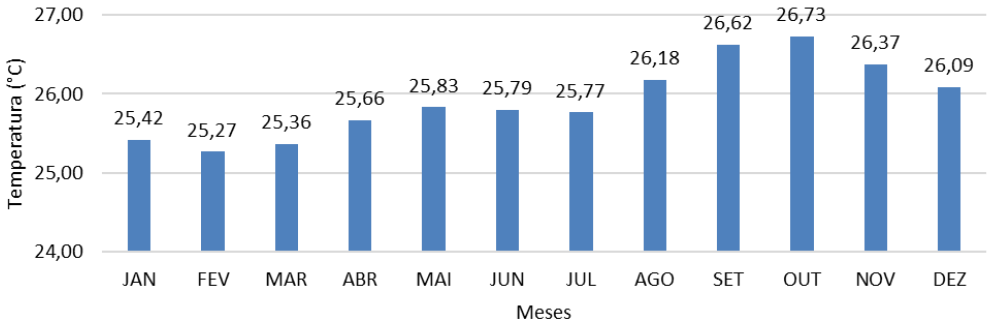
and the rainiest months between March and August with total precipitation above 1,500 mm per year (GOLFARI et al., 1978)[27].

However, through the climate characterization carried out in the region of interest based on data provided by Alvares et al. (2013)[28], the climatic influence of the Am group was observed together with the Af group, although both farms are classified in the Af group, with the exception of a small extremity to the southwest of the Santo Antônio Farm. Thus, all other municipalities adjacent to Portel within the reference region presented the Am type climate, as well as the southeast and southwest regions of Portel. The climate of the Am group is called humid or subhumid tropical climate and consists of a transition between the climatic types Af and Aw. It is characterized by an average temperature always above 18ºC in the coldest month and has a short dry season, which is compensated by high levels of precipitation (GOLFARI et al., 1978)[29].

Temperature

With regard to temperature, the SECELT (Municipal Secretariat for Culture, Sport, Leisure and Tourism of Portel) stated that the minimum value can reach up to 21ºC and the maximum can reach up to 90% above in April and 80% above in October with a heatstroke annual average of 2,200 hours (PORTEL, 2012)[30].

Through the survey carried out in the WorldClim version 2.1 database (FICK & HIJMANS, 2017)[31] for the period from 1970 to 2000, it was possible to evaluate the average accumulated temperature variation in the Project's reference region. Thus, it was observed that the quarter with the lowest temperature values were recorded in January, February and March, with the lowest temperature in February (25.27°C) and the quarter with the highest temperatures in September, October and November, with a maximum in October (26.73°C) (Figure 6).



[Key: Months – Temperature (°C) – Jan, Feb, Mar, April, May, Jun, Jul, Aug, Sept, Oct, Nov, Dec].

[27] GOLFARI, L.; CASER, R. L.; MOURA, V. P. G. Schematic ecological zoning for reforestation in Brazil: second approximation. PRODEPEF technical series, Brasília, n. 11, p. 1 - 66, 1978.

[28] ALVARES, C. A.; STAPE, J. L.; SENTELHAS, P. C.; GONÇALVES, J. L. M.; SPAROVEK, G. Köppen's climate classification map for Brazil. Meteorologische Zeitschrift, v. 22, n. 6, p. 711–728, 2013.

[29] GOLFARI, L.; CASER, R. L.; MOURA, V. P. G, *op. cit.*

[30] PORTEL, City Hall of. SECELT, *op. cit.*

[31] Fick, S.E. and Hijmans, R.J. WorldClim 2: new 1km spatial resolution climate surfaces for global land areas. International Journal of Climatology, v. 37, is.12, p. 4302-4315, 2017.

Figure 6 – Accumulated average temperature of the reference region of the Tueré REDD+ Project. Source: FICK & HIJMANS, 2017[32].

According to Figure 7, there was a greater average temperature range at the Santo Antônio farm, ranging from 25.90 to 26.11°C in the South-North direction, and the Terra Alta farm had an average accumulated temperature between 25.90 and 26.04°C.

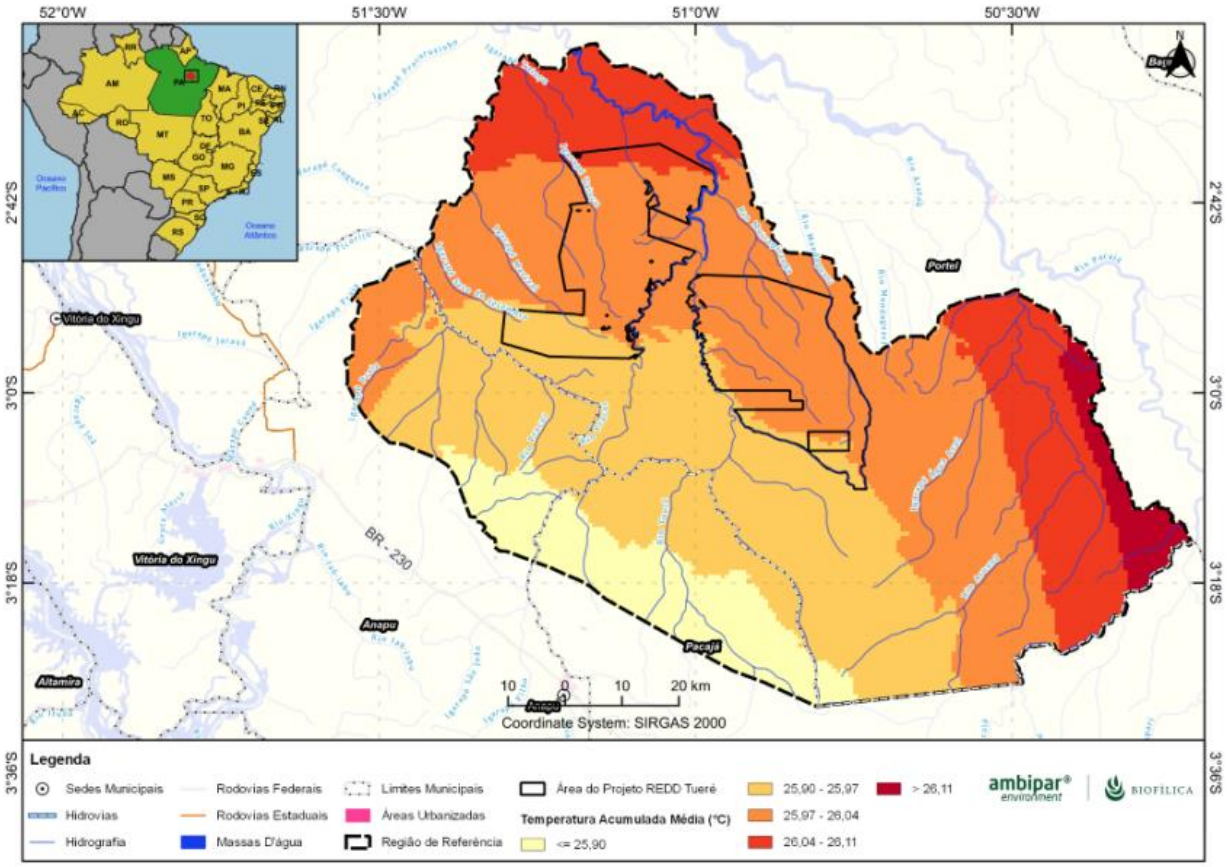


Figure 7 – Average cumulative temperature distribution in the Tueré REDD+ Project.

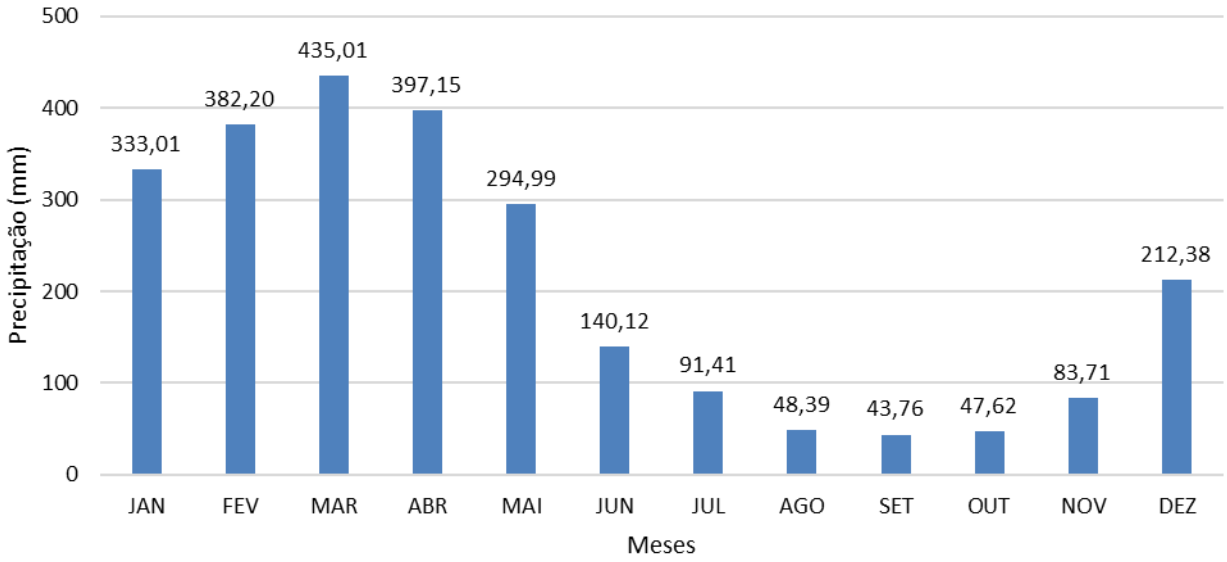
Precipitation

According to SECELT data (PORTEL, 2012)[33], the Project region has the highest rainfall in April with a value of 350 mm and the lowest rainfall in October with a value that can reach up to 60 mm. On the annual scale, there is a total rainfall of 2,200 mm, with the wettest quarter from February to April and the least rainy quarter from August to October.

Likewise, a survey was carried out in the CHIRPS Product database, developed by the United States Geological Survey (USGS) and the Climate Hazards Center at the University of California at Santa Barbara

[32] Fick, S.E, *op. cit*.
[33] PORTEL, City Hall of. SECELT, *op. cit.*

(UCSB) (FUNK et al., 2015)[34], which aimed to characterize the climatic behavior of precipitation in the region of the project area and surroundings. For this, the average accumulated precipitation values were obtained with historical data from 1987 to 2019 (Figure 8).



[Key: Precipitation (mm) – Temperature (°C) – Jan, Feb, Mar, April, May, Jun, Jul, Aug, Sept, Oct, Nov, Dec].

Figure 8 – Accumulated average precipitation of the Tueré REDD+ Project Zone. Source: FUNK et al., 2015[35].

There is a strong seasonality pattern of precipitation, in which the months of December to May are characterized as the wettest period with monthly precipitation above 200 mm. month-1, reaching the maximum in March with 435 mm in the month. The least rainy period comprises the months of June to November with rainfall less than 180 mm. month-1, reaching a minimum of 43.76 mm. month-1 in September.

This precipitation pattern is similar to the regional distribution of rain for the Eastern Amazon (AMANAJAS e BRAGA, 2012[36]; MENEZES et al., 2015[37]; SILVA et al., 2020[38]). The seasonal behavior of the wettest season is related to the Intertropical Convergence Zone (ITCZ), known as one of the main meteorological systems operating in the tropics during the rainy season. The ITCZ is a band of clouds that surrounds the equatorial band of the planet formed by the confluence of the northeastern trade winds of the Northern Hemisphere with the southeastern trade winds of the Southern Hemisphere. It presents accentuated atmospheric instability, inducing the formation of convective clouds with great vertical development,

[34] FUNK, C., PETERSON, P., LANDSFELD, M. *et al*. The climate hazards infrared precipitation with stations – a new environmental record for monitoring extremes. Scientific data 2, 1-21, 2015.

[35] FUNK et al., 2015, *op. cit.*

[36] AMANAJÁS, J. C.; BRAGA, C. C. Spatiotemporal rainfall patterns in Eastern Amazonia using multivariate analysis. Revista Brasileira de Meteorologia [online] 27, 2012.

[37] MENEZES, F. P.; FERNANDES, L. L.; ROCHA, E. J. P. The use of statistics for regionalization of precipitation in the State of Pará, Brazil. Revista Brasileira de Climatologia, v. 16, p. 64-71, 2015.

[38] SILVA, E. R. M.; BARBOSA, I.C.C.; SILVA, H. J. F., *et al*. Performance Analysis of CHIRPS Product Precipitation Estimate for Apeú River Sub-Basin, Castanhal-PA. Revista Brasileira de Geografia Física, v.13, n.3, p. 1094-1105, 2020.

consequently causing the occurrence of abundant precipitation over large oceanic and continental areas (Uvo (1989, apud ICMBio, 2012)[39].

With regard to the less rainy season, this behavior is due to the lack of large-scale precipitating systems, resulting in a free environment for the entry of trade winds and culminating in a scenario of reduced cloud formation. In the period, the sources of rainfall are the local systems and the temperature differences between the surface and the large portion of water that surrounds the region (SANTOS et al., 2017[40]; SILVA, et al., 2020[41]).

From the spatialization of the accumulated average rainfall, it is possible to identify a total amplitude of 25.61 mm throughout the region of interest, ranging from 202.21 to 227.82 mm in the South-North direction (Figure 9).

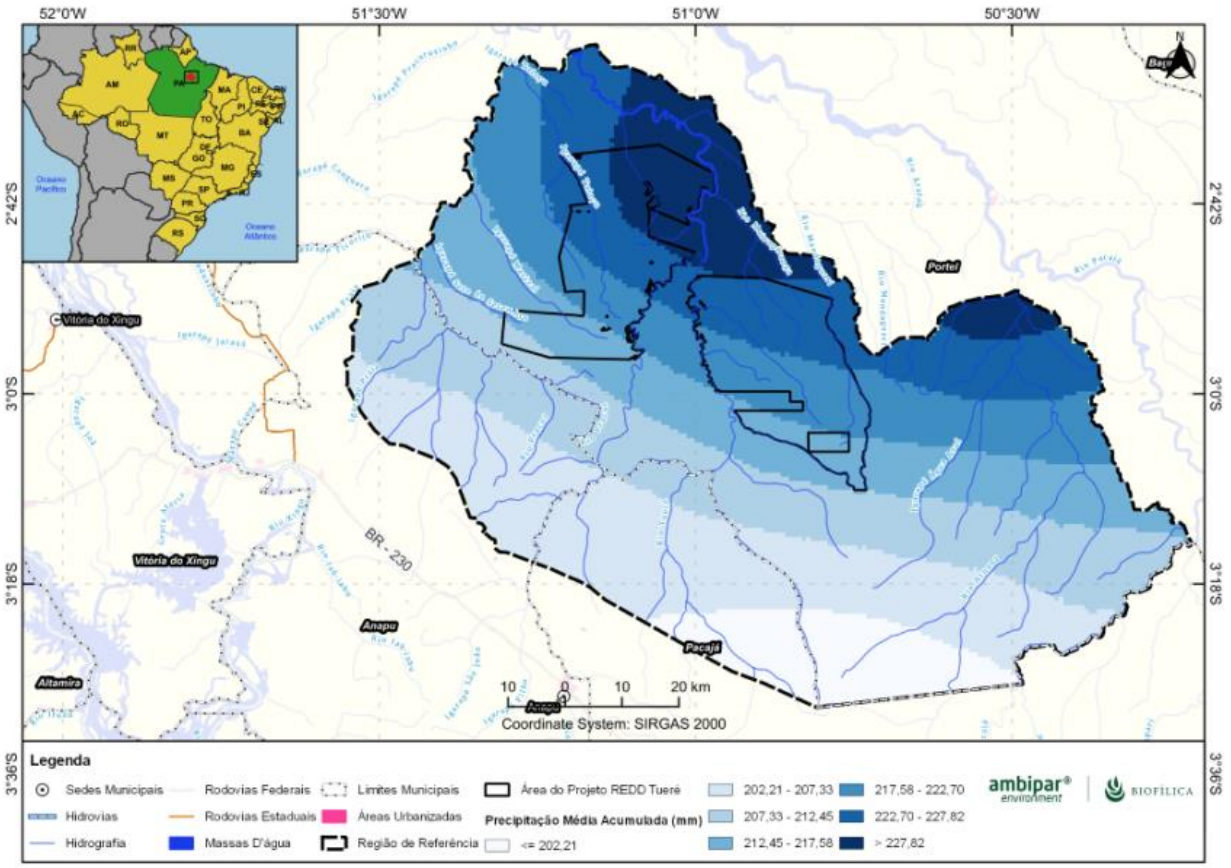


Figure 9 – Average accumulated precipitation in the Tueré REDD+ Project.

[39] Ministry of the Environment (MMA) / Chico Mendes Institute of Biodiversity (ICMBio). Caxiuanã National Forest Management Plan. Brasília, v.1, 2012.

[40] SANTOS, M. R. S.; VITORINO, M. I.; PIMENTEL, M. A. S., *et al.* O. Analysis of the spatio-temporal distribution of rainfall in the metropolitan mesoregion of Belém-Pará: contributions of the remote sensing technique. Paths of Geography, v. 18, p. 49-58, 2017.

[41] SILVA, E. R. M.; BARBOSA, I.C.C.; SILVA, H. J. F. *et al*, *op. cit.*

Hydrological Aspects

Based on Resolutions No. 30/2002 and No. 32/2003 of the National Council of Water Resources, the state of Pará was delimited into seven Hydrographic Macroregions, as follows: Atlantic-Northeast Coast, Tocantins-Araguaia, Xingu, Portel-Marajó, Tapajós, Baixo Amazonas and Calha Norte. Each hydrographic region has a series of attributes that are consistent with each other, respecting the geographical limits of their watersheds, as well as presenting homogeneous characteristics in the geophysiographic and ecosystem aspects of each region, such as geomorphology, geology, hydrography, pedology and hydroclimatic factor (PARÁ, 2012)[42].

The municipality of Portel is part of the Portel-Marajó Hydrographic Macroregion, which is 109,863.79 km² in length and represents 8.8% of the entire territory of the state of Pará, encompassing the municipalities of Portel, Pacajá, Bagre, Novo Repartimento, Anapú, Breves, Chaves, Afuá, Anajás, Curralinho, São Sebastião da Boa Vista, Muaná, Soure, Salvaterra, Cachoeira do Arari, Santa Cruz do Arari and Ponta de Pedras. The Hydrographic Sub-regions that comprise it are: Calha Amazônica, Western Marajó, Eastern Marajó, Pará River and Caxuanã Bay (PARÁ, 2012)[43].

This hydrographic region is made up of the basins of the Anapú and Pacajá rivers and the basins of the western Marajó and eastern Marajó regions, with the main drainages being the Marinau, Tueré, Pracuruzinho, Curió, Pracupi, Urianã, Arataí, Mandaquari, Jacaré-Paru rivers. Grande, Jacaré Paruzinho, Anajás, Aramã, Jacaré, Cururú, Afuá, Jurupucu, Jurará and dos Macacos (PARÁ, 2012)[44].

In Portel, there are three major rivers that are part of the water drainage network of the entire region, the Anapú River, the Pacajá River and the Camarapi River, which move in the South-Northwest direction (Figure 10).

[42] PARÁ. Water Resources Policy of the State of Pará. Secretary of State for the Environment. Belém: SEMA, 2012.

[43] PARÁ, *op. cit.*

[44] PARÁ, *op. cit.*

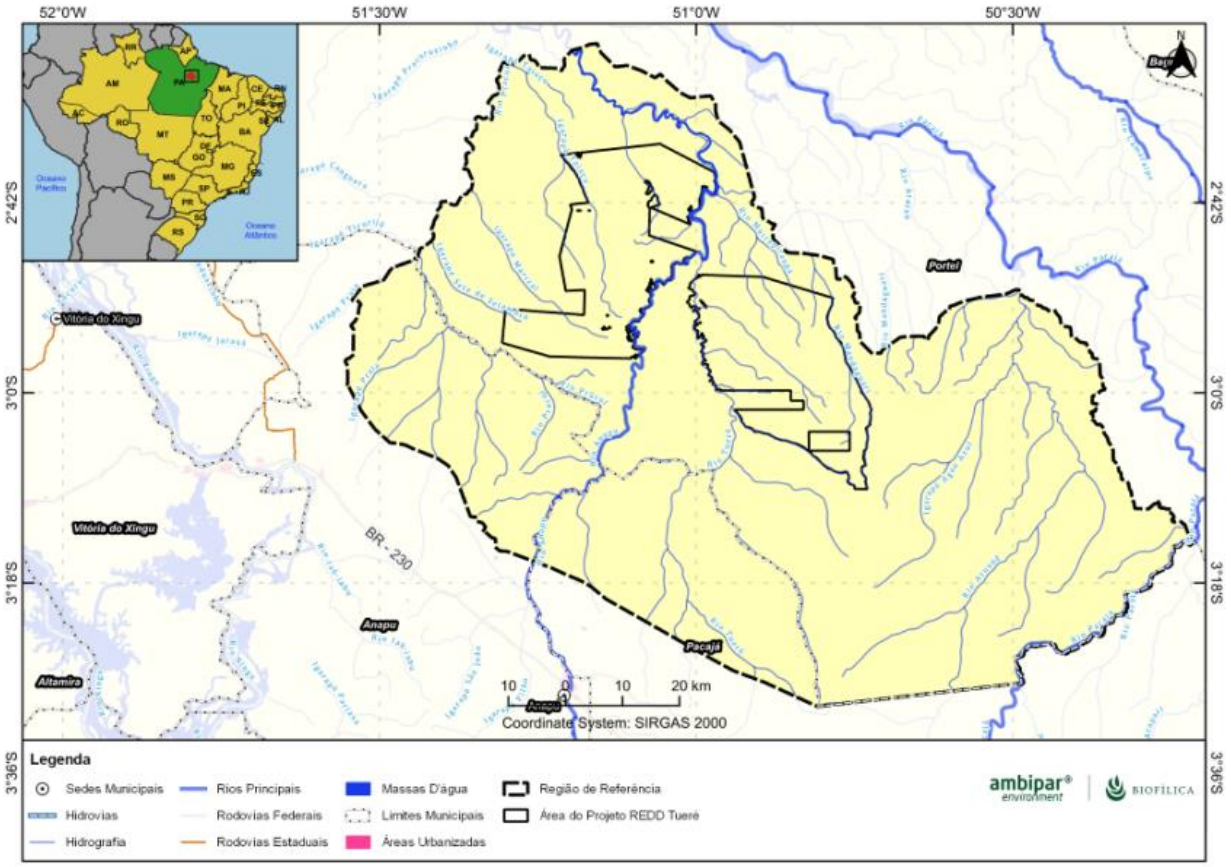


Figure 10 – Hydrographic aspects of the Tueré REDD+ Project.

The Anapú River flows into Pracuí Bay to Caxiuanã Bay and has as its main tributaries on the right bank the Marinaú and Tueré rivers, as well as the Itatira, Merapiranga, Janaú Grande, Umarizal, Maparauá, Atuá and Mojuá streams. The tributaries of the left bank are the Pracuruzinho, Cariá and Pracupi rivers and also the Carumbé, Itatinguinho, Itatingão, Poção, Jacitara, Cocoajá and Itapacú streams (PORTEL, 2012)[45].

The Pacajá River, when it meets the Camarapi River, flows into Portel Bay, located right in front of the municipality's headquarters. Its main tributaries on the right bank are the rivers Acaré-Puru Grande and Jacaré Paruzinho, as well as the streams Vinte e Nove, Angelim, Do Ouro, Pereira, Ana, Tucumanpijó, Mineiro, Candirí, Maratuba, Cajú and Araú. On the left bank, the rivers Ariuanã, Aratai, Mandaquari and Guajará and also the streams Damiana, Capoeirão, Grande, Pajé, Limão (PORTEL, 2012)[46].

Finally, the Camarapi River also flows into Portel Bay and has as its main tributaries on the right bank the Banã and Pirica rivers and the Esmeralda, Macaco, Açaituba, Merituba, Grande and Cariatuba streams. On the left bank are the rivers Pitinga, Acangatá, Pacapotera, Ajará and the streams Taquera, Tamaquerinha, Tanquera, Arumã and Otá. In addition, it has other smaller rivers as tributaries, such as the Acutí-Pereira river and its tributary and also the Laranjal creek (PORTEL, 2012)[47].

[45] PORTEL, City Hall of. SECELT, *op cit.*

[46] PORTEL, City Hall of. SECELT, *op cit.*

[47] PORTEL, City Hall of. SECELT, *op cit.*

It is also noteworthy that the region is located in the Amazon Delta, between the Tocantins rivers to the east and Xingu to the west, this area is significantly impacted by the semidiurnal tides. Tidal variation adds to seasonal variation, resulting in higher water levels in May-June and lower in October-November (Nittrouer et al, 2021)[48].

Non-Forest

Based on IBGE shapes on a scale of 1:250,000 (IBGE, 2012)[49], the vegetation cover in the project area and its surroundings was classified. The project area has only two vegetation types, the Alluvial Dense Ombrophilous Forest and the Lowland Dense Ombrophilous Forest (Table 1).

Table 1- *Area by vegetation type in the reference region and in the Tueré REDD+ Project area.*

Class	Region for Reference (ha)	%	Area of the Project (ha)	%
Water masses	1,266.83	0.13%	10.47	0.01%
Dense Submontane Ombrophyllous Forest	295,438.31	30.98%	0.00	0.00%
Dense Alluvial Ombrophilous Forest with uniform canopy	9,128.02	0.96%	598.346	0.44%
Dense Ombrophilous Forest of lowlands with emergent canopy	631,642.05	66.23%	134,733.40	99.55%
Livestock (pasture)	16,289.57	1.71%	0.00	0.00%
Total	**953.764,78**	**100.0%**	**135.342,21**	**100.0%**

The Tueré REDD+ Project area is covered by the exuberant and famous Tropical Rainwater Forest, name given by Schimper in 1903, also called Tropical Rain Forest, name used by Richards in 1950, or Equatorial Forest, given by Huber in 1943, or Tropical Humid Forest, a name still used today by Puig in 2008. In all these names the effect of rainfall on the environment is already imposed (Richards, 1996[50]; Puig, 2008[51]; IBGE, 2012[52]).

Two types of dense ombrophilous forests (FOD) are found in the project area, distinguishing themselves according to the relief (IBGE 2012): the Alluvial Dense Ombrophilous Forest (FAluvial) and the Lowland Dense Ombrophilous Forest (FTBaixas). The largest portion of the project area is FTBaixas (99.55%), and the FAluvial (0.44%) is found only in the most northeastern part of Fazenda Terra Alta (Figure 11).

[48] NITTROUER, C.A.; DEMASTER, D.J.; KUEHL, S.A., *et al*. Amazon sediment transport and accumulation along the continuum of mixed fluvial and marine processes. Annual Review of Marine Science, 13: 501-536. 2021.

[49] IBGE. Technical manuals in geosciences: Technical manual of Brazilian vegetation - Phytogeographic system; Inventory of forest and grassland formations; Techniques and management of botanical collections; Procedures for mapping. 2ed. Brazilian Institute of Geography and Statistics: Rio de Janeiro, 2012.

[50] Richards, P.W. (1996). The Tropical Rain Forest: an ecological study (2nd. Ed.). Cambridge University Press, Cambridge. 573p.

[51] Puig, H., 2008. The humid rainforest. Unesp, São Paulo.

[52] IBGE, 2012, *op. cit.*

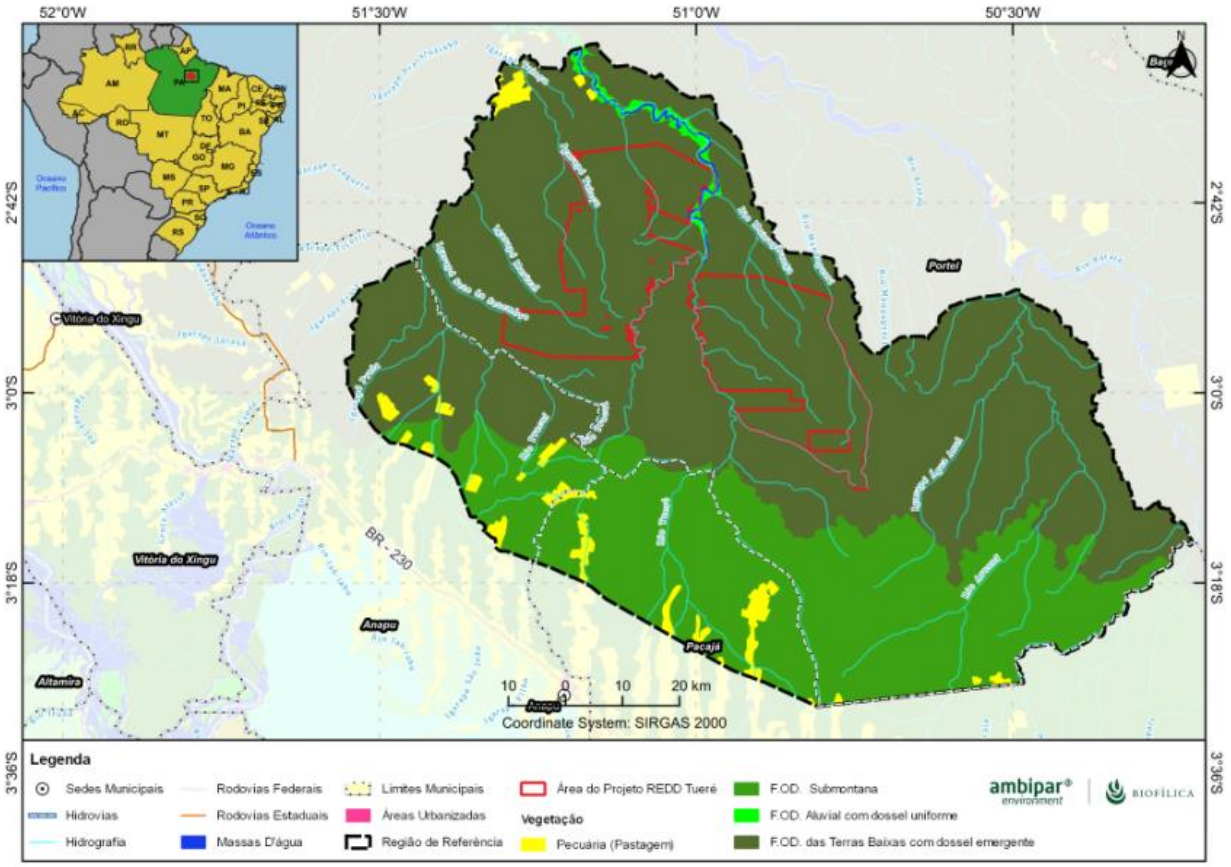


Figure 11 – Vegetation cover of the reference region and Tueré REDD+ Project area, municipality of Portel, Pará.

The Ombrophilous Dense Alluvial Forest is the area of FOD found within the alluvial terraces of the fluvials, that is, in low elevation terrains, close to watercourses that periodically overflow flooding stretches of the forest. It is characterized by the ochlospecies: *Ceiba pentandra* (L.) Gaertn., *Virola surinamensis* (Rol. ex Rottb.) Warb., *Tapirira guianensis* Aubl., *Mauritia flexuosa* L.f., *Euterpe oleracea* Mart. and *Calophyllum brasiliense* Cambess. All these ochlospecies – which are defined as species with a wide geographic distribution, exhibiting morphological variations throughout the area of occurrence that reflect past environmental isolation, in small populations, which occurred in unfavorable periods (IBGE, 2012)[53] – were found in the project area.

On alluvial forests, the IBGE (2012, page 67)[54] defines the following:

> *"This formation consists of fast-growing macro, meso and microfanerophytes, usually of smooth bark, conical trunk, sometimes with the characteristic shape of a cylinder and tabular roots. It often presents a uniform emergent canopy, however, due to logging, its physiognomy becomes quite open. It is a formation with many palms in the dominated stratum and in the understory, and in this nanofanerophytes and some caméphytes occur in the middle of seedlings of the dense natural reconstitution of the dominant*

[53] IBGE, 2012, *op. cit.*

[54] IBGE, 2012, *op. cit.*

> *stratum. In contrast, the formation has many woody and herbaceous lianas, as well as a large number of epiphytes and few parasites. "*

Lowland Dense Ombrophilous Forests are found on terraces, plains and flattened depressions not susceptible to flooding (from 5m to around 100m above sea level), characterized by ochlospecies: *Tapirira guianensis* Aubl. and *Calophyllum brasiliense* Cambess and the ecotypes of the genera *Ficus*, *Alchornea* and *Handroanthus* (IBGE 2012). In the project area, species of these genera were found, such as: *Ficus maxima* Mill., *Ficus paraensis* (Miq.) Miq., *Alchornea discolor* Poepp., *Handroanthus serratifolius* (Vahl) S. Grose (Synonym of *Tabebuia serratifolia* (Vahl) G. Nichols), *Handroanthus impetiginosus* (Mart. ex DC.) Mattos (Synonym of *Tabebuia impetiginosa* (Mart. ex DC.) Standl.), *Handroanthus ochraceus* (Cham.) Mattos (Synonym of *Tabebuia ochracea* Cham.) e *Handroanthus umbellatus* (Sond.) Mattos (Synonym of *Tabebuia umbellata* (Sond.) Sandwith).

Regarding lowland forests, ICMBIO (2012, page 137)[55] says:

> *"This type of vegetation is characterized by phanerophytes, along with macro and mesophanerophyte life subforms, as well as woody lianas and epiphytes in abundance that differentiate it from the other classes of formations ... The vertical structure features a well-visible understory with canopy ranging from 30 to 35 meters high. Emerging trees can reach up to 45 meters in height."*

Although the IBGE (2012)[56] defines lowland forests as 'not susceptible to flooding', the relief can be gently undulating, with water accumulating in the lower portions. For this reason, in the Caxiuanã FLONA, which has vegetation similar to that of the Tueré REDD+ Project Area, as previously mentioned, this type of vegetation was subdivided into two types: those on lower areas (called baixio) and those on flatter areas (called plateau) (ICMBIO, 2012)[57].

Alluvial and lowland forests were, respectively, classified by Pires and Prance (1985)[58] as Flooded Forest and Dense Mainland Forests. For these authors, flooded forests can be divided into floodplains and igapós, depending on the color and type of river water that affects it. Considering this classification, the alluvial forest would be a floodplain, as it is bathed by the Anapu and Tueré rivers. The lower lowland areas of lowland forests also suffer from water accumulation, especially in the rainy season, so these environments share several species. According to Oliveira et al (2021)[59] both the floodplains and the igapós have exclusive species, although the greater proportion of their species composition is shared between them or with Mainland forests.

2.1.6 Social Parameters (G1.3)

The Tueré REDD+ Project is located in forest areas of the Brazilian Amazon, on Ilha do Marajó, state of Pará. Human occupation in the region occurs along the courses of rivers and streams, so the site is

[55] ICMBio. Caxiuanã National Forest Management Plan: Volume I –Diagnostic. Chico Mendes Institute for Biodiversity Conservation: Brasília. 406p, 2012.

[56] IBGE, 2012, *op. cit.*

[57] ICMBio, *op. cit.*

[58] Pires, J.M.; Prance, G.T. (1985). The vegetation types of the Brazilian Amazon. In: G.T. Prance; T.E. Lovejoy (eds.). Amazonia: Key environments. pp. 109-145. Pergamon Press, Oxford.

[59] Oliveira-Filho, A.T.; Dexter, K.G.; Pennington, R.T.; Simon, M.F.; Bueno, M.L.; Neves, D.M. (2021). On the floristic identity of Amazonian vegetation types. Biotropics, 53(3): 767-777.

historically occupied by riverside communities that maintain traditional use of natural resources. Around the Project there are rural communities, mostly riverside, that use areas around the farms for the extraction of timber and non-timber forest products.

The occupation of the municipality of Portel began with Indigenous peoples. Around 1653, the space was reorganized by Father Antônio Vieira, a Jesuit missionary, who introduced the Nheengaíbas Indigenous to the place, brought from other places on the island of Marajó itself, under the direction of the priests of the Society of Jesus, with the denomination of Aricuru (or Arucurá), until the expulsion of the Jesuits, at which time the municipality was already constituted in the category of Parish. The name Vila de Portel began to be used in 1758, when the area was elevated to the category of Village. (PORTEL, 2022). Portel became a municipality in 1758. Between political and legal comings and goings in the period from 1833 to 1988, Portel lost territories several times, originating from these dismemberments other municipalities, namely: Oeiras do Pará, Melgaço and Pacajá (PARÁ, 2021).

According to the Association of Municipalities of the Marajó Archipelago (AMAM, 2022), Portel was formed by several indigenous villages that already inhabited the region and over the years were catechized by Jesuit missionaries. In the colonial period, Portuguese families began to occupy the Marajó region, marking a new cycle in which a large part of the indigenous population was decimated by the Portuguese and the survivors were enslaved by the colonizers, now owners of huge swaths of land granted by means of sesmarias, the historical foundation of the process of land concentration in Brazilian territory (SOUZA, 2014).

The marajoara economy lays its foundations in the exploitation of natural products. This fundamentally extractive economic dynamic, in turn, influenced the modality of territorial occupation. The crisis of the production chain involved with the production of latex, especially from the beginning of the twentieth century, changed the economic dynamics of Marajoara and consequently its social conformation. The second half of the twentieth century brought new social, economic and historical changes to the occupation of the Marajó, the implementation and operation of large timber and palm heart processing companies, financed with public resources from the early 1970s, stimulated occupation in the Marajó region in several locations, shaping the profile of the most recent occupation in the region (post-1970s).

For the demographic characterization, in addition to Portel, data from the municipalities of Anapu and Pacajá were used due to their relationship with the areas surrounding the Project. Since 2000, Portel continues to have the largest population, representing 46.60% of the region's population in 2022, as shown in the table below. Anapu presented the largest population increase in the last census (38.79%), Portel the second largest (22.46%), and Pacajá the smallest increase (8.15%).

Table 2 – Total population share, by municipality and region in 2000 and 2010 and 2022.*

		Anapu		Pacajá		Portel	
Year	**Total**	**Inhabitants**	**%**	**Inhabitants**	**%**	**Inhabitants**	**%**
2000	**76,338**	9,407	12.32	28,888	37.84	38,043	49.83
2010	**112,694**	20,543	18.23	39,979	35.48	52,172	46.30
2022*	**144,381**	33,566	23.24	43,527	30.14	67,288	46.60

Source: PARÁ (2021)[60] and IBGE (2022)[61]. Elaboration: STA, 2023.

The municipalities located around the area of the Tueré REDD+ Project have their economy based on agricultural activities, especially the cultivation of cassava and corn, livestock, wood extraction and açaí collection. Subsistence fishing and hunting for family consumption also occur frequently. The data presented below were taken from the Municipal Statistics base of FAPESPA - Fundação Amazônia de Amparo a Estudos e Pesquisa (PARÁ, 2021)[62].

Cassava is the source for one of the main food-based products, flour, and corn is used as animal feed, mostly in rural areas. Of these crops, the largest harvested area is cassava, with a total of 18,860 hectares in the region in 2020, and of this total Portel has the largest participation with 16,500 ha of harvested area. Maize, on the other hand, accounted for 2,310 ha of harvested area in 2020, with the majority participation of Pacajá, which accounts for 70% of the area.

Regarding livestock, according to Table 3, in 2015 beef cattle represented the largest number of herds in the region, with more than 800,000 heads, and the increase for 2020 was more than 240,000 heads, with the municipality of Pacajá presenting the largest cattle herd. In relation to buffalo, Portel has the largest herd in the region, these relations show that Portel is more linked to the Marajó region, which has the largest herd of buffalo in Brazil, and the municipalities of Pacajá and Anapu with the Transamazônica region, where beef cattle farming has the greatest influence. Comparing the years 2015 and 2020, there was a significant increase in the amount of the chicken herd with an increase of 83,127 animals, with this, there is a change in the agricultural activity of Portel, with the replacement of the production of bovine protein to that of chickens. In the municipalities of Anapu and Pacajá, beef cattle farming is more representative as an economic activity.

Table 3– Flock of municipalities in the region for the years 2015 and 2020.

Herds	2015				2020			
	Anapu	Pacajá	Portel	Region	Anapu	Pacajá	Portel	Region
Bovine	251,681	536,460	14,700	802,841	325,932	698,223	21,534	1,045,689
Equine	3,493	4,663	185	8,341	6,677	11,612	221	18,510
Bubalino	286	270	1,189	1,745	180	321	1,003	1,504
Swine	2,769	2,980	7,200	12,949	5,724	3,054	6,048	14,826
Goat	841	1,384	135	2,360	453	1,242	99	1,794
Sheep	1,798	2,918	116	4,832	1,947	4,476	114	6,537
Chicken	35,571	49,275	35,897	120,743	55,140	68,630	80,100	203,870
Milked cows	2,510	20,536	724	23,770	7,560	16,530	751	24,841

Source: PARÁ (2021)[63]. Elaboration: STA, 2023.

[60] PARÁ. FAPESPA – AMAZON FOUNDATION FOR SUPPORT TO STUDIES AND RESEARCH. Municipal Statistics – ANAPU, PACAJÁ and PORTEL. Belém, 2021. Available at: https://www.fapespa.pa.gov.br/node/201. Accessed on: 01/23/2023.
[61] IBGE. Preview of the population calculated based on the results of the 2022 Demographic Census until December 25, 2022. Research Board. Technical Coordination of the Demographic Census. Available at: <https://ftp.ibge.gov.br/Censos/Censo_Demografico_2022/Previa_da_Populacao/POP2022_Municipios_20230622.pdf> Accessed on 07/03/2023.
[62] PARÁ. FAPESPA, *op. cit.*
[63] PARÁ. FAPESPA, *op. cit.*

Regarding the extraction of food products, açaí has ascendancy over other products. In 2015, the total production in the region was 693 tons, with an increase in 2020 to 1,135 tons. Brazil nuts, on the other hand, had a small drop in production, going from 300 to 249 tons in the period in the region of the municipalities. In logging, the highlight is logging, which also showed a drop in the amount produced, when in 2015 it accounted for 1,056,778 m³ and 447,760 m³ in 2020. Among all these plant extraction products, the municipality of Portel is the one with the highest participation in production.

With regard to the health service, there are 88 establishments registered in the CNES - National Register of Health Establishments in Brazil (2021)[64] for the year 2021 in the region. The Basic Health Units (UBS) and health centers have the largest number of establishments, totaling 28 and 18, respectively. The UBS are the gateway to the SUS, the Brazilian public health system, and serve the general population, with better coverage in basic care.

Regarding the infrastructure, in the period from 2016 to 2020 only Portel presented information on the population served with water supply. In the period, there was a reduction in the population served, from 1,770 to 1,315 inhabitants, a reduction of approximately 25%. Regarding the number of households with electricity, in the total of the three municipalities 22,324 residences had access to the electricity grid.

Regarding information on education, in 2021 there were 99 pre-school schools, 331 elementary school and 8 high school. Of the total, 97% are from the municipal administration and the high schools are all state or private. The performance rates allow us to perceive the dynamics of school success, as well as the permanence in school: for the year 2017, Anapu presented good approval indicators in elementary school (82.9%) and high school (90.0%). When the year 2021 was verified, the approval rate had little oscillation for most municipalities, with the exception of Anapu, which presented a drastic reduction in approval for high school from 90.0 to 50.8%. In addition, the dropout rate increased from 2017 to 2021, especially for high school, which has a higher rate of 20% for all municipalities.

[64] MINISTRY OF HEALTH. CNES. ElastiCNES: 2021 Overview Panel. Available at: <https://elasticnes.saude.gov.br/geral> Accessed on 01/23/2023.

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

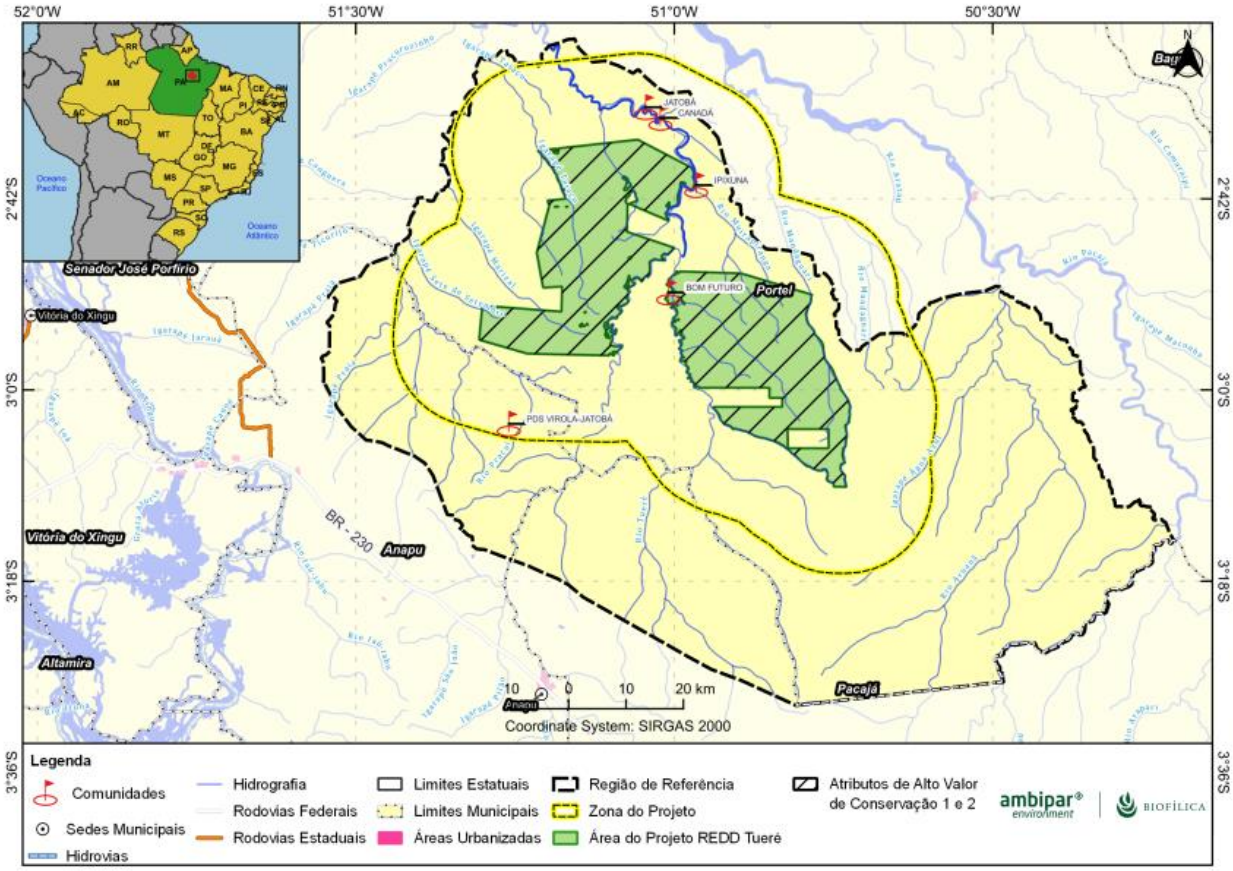


Figure 12 – Boundary of the Tueré REDD+ Project Zone.

2.1.8 Identification of the Players (G1.5)

Initially, through a preliminary survey of secondary data carried out by the company STA (Environmental Technical Solutions) together with the support and knowledge of the region that Brascomp has, communities and residents around the Terra Alta and Santo Antônio farms were identified, as well as other local actors that have a relationship and interaction with the Project Area.

The process of identifying rural communities considered the relationship with the project area, identifying those that have some type of direct or indirect use of the project area and that may be affected by the REDD+ Project. This identification process included the following steps: survey with Brascomp of surrounding residents who already had contact or previous relationships and survey of rural communities mapped around the project area in official databases (IBGE database). The actors were selected considering their rights, interests and relevance to the project, that is, that would have some relationship with Brascomp's farms. In this sense, rural communities (riverside and settlements) located around the project area have the right to be consulted considering the proximity and importance of the area for the subsistence of families, both main and complementary. It was assessed that the Tueré REDD+ Project is of interest to most of the surrounding rural communities because of the incentive to protect the forest, indirectly increasing the protection of the forest areas of the rural communities themselves. It should be noted that no community or family is located within the Project Area.

Based on this preliminary information and the previous mapping of potential stakeholders, field visits were carried out between November 3 and 11, 2022. The objective of this first activity was to establish an initial contact with the previously mapped communities in order to provide a brief contextualization of the Project and consolidate an agenda for carrying out the socioeconomic diagnosis according to the interest and availability of each community.

In the socioeconomic diagnosis, carried out between November 11 and 22, 2022, the communities that voluntarily agreed to participate in the study were again consulted and presented the objectives of the Tueré REDD+ Project. The specific information had the following primary data sources: participatory diagnosis with the surrounding residents, interviews with Brascomp workers and research with public and private agencies and institutions.

In the research with the surrounding residents, the participatory methodology of data collection known as Participatory Rapid Rural Diagnosis (DRP) was used, which uses approaches and methods to enable local communities to share and analyze knowledge of their own lives and plan changes (CHAMBERS, 2001). The approach process took place through conversations, diagrams, drawings, maps and observations made in the field, and thematic groups were also formed to collect information through the exploratory approach, where quality information was obtained, valuing local knowledge and the diversity of relationships. The DRP was carried out with the application of research forms in three communities (Ipixuna, Bom Futuro and Canada) and in the Virola Jatobá Sustainable Development Project (PDS). In the Vila Jatobá community, the participatory diagnosis was not applied because the community did not accept to participate in the study, however, information was collected from a key informant. In addition to the communities, six surrounding residents who did not identify with any community were also interviewed.

For individual interviews with Brascomp workers working in the Tueré project area during the research, a form with open and closed questions was used. The objective of the research was to understand the reality of the people working in the study area, identify the existence of training or other forms of training offered to workers with attention to women, identify the number of inhabitants of rural communities working in the project area, understand whether workers have understanding or access to information about labor rights and explain about the REED+ Project.

Research in public agencies and social organizations in Portel and Anapu aimed to expand the collection of information about the local reality, especially about communities and productive, economic and social activities. Some of the places visited were Casa Família Rural (CFR), Sindicato dos Trabalhadores e Trabalhadoras Rurais (STTR), Agência de Defesa Agropecuária do Pará (Adepará) and Empresa de Assistência Técnica e Extensão Rural (Emater), in addition to the municipal secretariats of the city halls.

2.1.9 Description of Stakeholders (G1.6, G1.13)

Based on the socioeconomic diagnosis made, the following stakeholders were identified:

- Brascomp Compensados do Brasil;

- Biofílica Ambipar Environment;

- Communities and residents around Santo Antônio and Terra Alta Farms;

- Workers at Santo Antônio and Terra Alta Farms;

- Public Agencies;

- Research institutions and organizations.

The communities identified around the Farms are 80% riverside and 20% rural, out of a total of 5 communities, according to Table 4.

Table 4 - Communities identified around the Tueré REDD+ Project area.

No.	COMMUNITY	CATEGORY
1	Vila Jatobá	Riverside community
2	Bom Futuro	Riverside community
3	Ipixuna	Riverside community
4	Canada	Riverside community
5	PDS Virola-Jatobá Settlement	Rural settlement

Source: Field research, 2022.

Around the Farms there are six riverside residents who do not identify with any of the communities, presented according to the name of their properties in Table 5 below.

Table 5 - Rural properties interviewed around the Tueré REDD+ Project area.

No.	NAME RURAL PROPERTY	SIZE	CITY
1	Prainha	Small	Portel
2	Terra Prometida Site	Small	Portel
3	San Francisco Stretch	Small	Portel
4	unnamed	Small	Portel
5	Cajual	Small	Portel
6	Chácara Vitória	Small	Portel

Source: Field research, 2022.

Regarding the workers of Santo Antônio and Terra Alta Farms, more than 100 workers were identified during the harvest period, among the three companies operating in the project area (Brascomp Compensados do Brasil, CS Gomes and Renascer Locação de Máquinas). Table 6 shows the number of workers and the related company.

Table 6 - Distribution of the number of workers by company and period in the Tueré REDD+ Project area.

Company	Activity developed	Number of Workers	
		Harvest period	Off-season
Renascer Locação de Máquinas	Forest extraction	62	0
C. S. Gomes	Forest inventory	24	0
Brascomp	Maintenance and conservation of the farm area	26	From 10 to 15
Total	**-**	**112**	**Varied**

Source: Field research, 2022.

All interested parties are invited to be part of the discussions of the Tueré REDD+ Project, in order to have a space for articulation and communication between Brascomp, the communities and other stakeholders involved in the Project. The assessment of rights, interests and relevance of each group of actors in relation to the Project is specified in Table 7 below.

Table 7 - Description of the actors involved in the Tueré REDD+ Project.

Group of actors involved in the Project	Rights regarding the Project	Interests in their participation in the Project	Relevance of participation in the Project
Brascomp Compensados do Brasil	Holder of the right of credits, responsible for the investments, development and implementation of the Project. Execution and local management of social activities. It is also the organization responsible for managing financial resources.	Ensure the inclusion of communities in the activities of the Project and that the activities of Technical Assistance and Rural Extension also incorporate a look at issues such as education, health, guarantee of human rights, environment, culture and generation of employment and income.	High – Due to its great influence in the region, it becomes a primary component in the containment of deforestation, in addition to the opportunity for the communities of the activities already carried out and those foreseen by the Project.
Communities and residents around the Farms	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 the development of a local economy model based on sustainable and harmonious practices with the forest.
Farm Workers	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.
Public Agencies	Articulate with the other actors in order to improve the implementation and permeability of public policies, support complementary actions for the implementation of the Project.	Bring the government closer to the community demands and strengthen governmental relations, which currently present themselves as fragile. Participate in the monitoring of the development of private and voluntary REDD+ initiatives, cooperate with the development of public policies.	Medium – The actors are officially responsible for developing and implementing socio-environmental and economic public policies.

Group of actors involved in the Project	Rights regarding the Project	Interests in their participation in the Project	Relevance of participation in the Project
Research institutions, organizations public, private and not governmental, associations and others	Not applicable.	Develop partnerships, provide technical assistance, promote job creation, expand activities, improve local governance, conduct research, produce and disseminate knowledge, promote forest management for sustainable production, ensure the permanence of traditional communities, develop and publish scientific works, ensure an area of rich socioeconomic and environmental context.	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 Sector 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)

Theory of Change is a planning model used by social entrepreneurs and organizations to describe the desired impact caused by an intervention or program in a given area.

It brings together attributes of evaluation, measurement and monitoring of the impact of a program, working with a long-term results perspective, analyzed from the sequence of intermediate results.

For the construction of the Theory of Change of the Tueré REDD+ Project, a survey was initially made of the main problems faced in the project area and surroundings, within the scope of the Socioeconomic and Environmental Diagnoses carried out in these areas, which are directly or indirectly related to the project's objectives of generating net benefits for the climate, communities and biodiversity.

Therefore, the activities of the Project were outlined and the actions proposed by it will seek, above all, to ensure the conservation and protection of biodiversity and natural resources, the reduction of unplanned deforestation and the emission of greenhouse gases, local socioeconomic development, social inclusion, 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 for the fulfillment of the objectives mentioned above, as well as allowing its maintenance throughout the life cycle of the Tueré REDD+ Project.

To this end, after validation with stakeholders, the following activities were proposed for the Project: “Strengthening governance”, “Improving infrastructure”, “Fostering sustainable practices”, “Developing and strengthening value chains”, “Improving farm surveillance”, “Biodiversity conservation program”, “Monitoring deforestation via satellite images”.

The defined activities are divided by scope, for better understanding, and the summary of each one of them is described below.

a. Social scope

Strengthening governance

Aiming at the implementation of the activities proposed by the Tueré REDD+ Project, the activity "Strengthening governance" has as its scope the implementation of a working partnership to act in locu, facilitating the day-to-day operationalization of the 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 Project activities, as well as in the monitoring of these activities, corroborating so that in fact the Project is implemented in the best possible way.

The consolidation of a partnership will strengthen the governance of the Project, since the presence of Project representatives is established in the region for constant assistance, being a focal point in the understanding of the local reality. In addition, it is expected that there will be a routine presence of partners in the area, reflecting in a greater power to contain deforestation, since it strengthens the relationship with the communities around the Farms, avoiding illegal entries and activities, in addition to monitoring the effectiveness of the other activities proposed by the Project. In addition, it will help proponents in monitoring and operationalizing the demands and proposed activities.

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 interested parties and co-management with all the 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 must dialogue with what was proposed by the Project's communication plan (Section 2.3.9). 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.

Figure 13, below, presents a summary of the actions and expected results of the activity.

Problems	Activities and actions	Short-term results	Medium-term results	Expected impacts
	Strengthening Governance			
Low social organization within communities	Establish strategic partnerships for the execution of on-site actions	Partnerships established for the execution of activities	Increased collective engagement in claiming basic rights and services	Improvement in quality of life and well-being
Little knowledge about social and labor rights, and about positions and functions	Promote and articulate the organizational strengthening of community institutions Strengthen actions that have already been carried out in the Project Zone and expand the target audience Implement and consolidate a communication channel with stakeholders Establish mechanisms for transparency and consultation between stakeholders and bidders	Meetings, encounters and dialogues held with community leaders and other stakeholders Communication and consultation strategies between stakeholders and bidders defined	Engagement and adherence to the proposed activities to reduce deforestation in the Project Zone	

Figure 13 - Actions and expected results of the activity 'Strengthening governance'.

Infrastructure improvement

Infrastructure improvement is an essential process for the economic, social and environmental development of a region. It refers to the enhancement and expansion of physical and organizational systems that underpin human activities and community functionality. The Socioeconomic Diagnosis of the Tueré REDD+ Project raised general aspects of the infrastructure of the communities studied, covering a variety of sectors, including education, health, water, basic sanitation, communication and means of transport.

In general, the region's infrastructure services are precarious, with few schools (and few resources to maintain them properly), difficult access to health services, non-existent basic sanitation, and limited means of communication and transportation. This situation even led families to move from the region mainly due to the difficult access to health and education, according to reports verified during the Diagnosis field research. Taking into account the main drivers of deforestation identified in the scope of the Diagnosis, namely the advance of livestock in riverside areas and the deforestation caused by the BR-230 highway (Transamazônica Highway), associated with illegal logging and land invasions and conflicts in the PDS Virola Jatobá, the abandonment of the lands by the families surrounding the Project Area becomes

especially worrying because it leaves such areas unprotected and more vulnerable to deforestation, and can eventually reach the Project Area.

In view of this scenario of precarious infrastructure services and social vulnerability of the interviewed families, the activity proposed by the Project aims to promote and articulate investments in community infrastructure, considering environmental and social aspects, as well as public participation, to ensure that actions are sustainable and meet the real needs of the population.

Also, it is intended to mitigate some urgent problems identified in the Diagnosis by establishing strategic partnerships to carry out technical training courses for, for example, construction of filters for water treatment to improve the quality of water consumed by some families, mainly from the Bom Futuro community, which collects directly from the river and assessed that the water quality is not satisfactory for consumption.

Throughout the development of this activity, it is expected to achieve a solid infrastructure that improves people's quality of life, providing better access to basic services, contributing to the health and well-being of the population, as well as reducing the rural exodus of the traditional communities.

Figure 14, below, presents a summary of the actions and expected results of the activity.

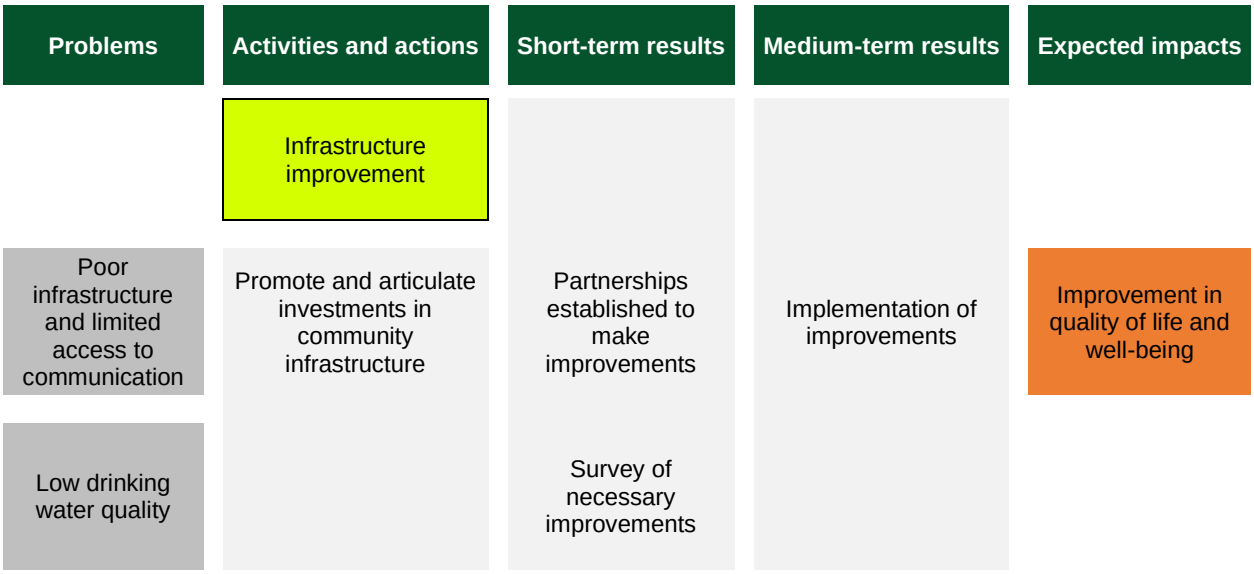


Figure 14: Actions and expected results of the 'Improvement of infrastructure' activity.

Fostering sustainable practices

Still in relation to what was mapped in the Diagnosis, with regard to family farming, it was found that the main product cultivated is cassava for the production of flour, both for own consumption and for marketing the surplus. This is therefore the main source of income for most households. There was also a report of cattle breeding for milk production in the PDS Virola Jatobá. But overall, there is little variety in what families in communities plant for trade and even livelihoods.

There is also the sale of wooden stakes (Tarugo), which are sold by some families from two communities, Ipixuna and Canada. This wood used for the manufacture of cuttings is taken from forest areas, still existing near the houses, in addition to areas close to the families' fields, where there are still species that serve

this purpose. But even though there are no nearby forests available, families search in more distant areas, from third parties. It is known that the riverside communities of Portel, near the project area, do not have any registered forest area, nor forest management projects.

The cassava cultivation system adopted by the communities uses the traditional technique of cutting and burning, progressively wearing down the land. With the consequent future depletion of agricultural areas and the need for new areas for planting, it is believed that there may be an advance to the surrounding forest areas, increasing young capoeira areas and decreasing native forest areas.

Allied to such productive difficulties, there is also the absence of technical assistance and rural extension services in the communities close to the Project Area. In the surrounding municipalities, there are local offices installed by Emater, a public company for technical assistance and rural extension in the state of Pará, however, these public services rarely reach the most distant areas of the municipalities, due to the institution's limited resources to ensure continuity of service, such as the maintenance of regular displacements of servers to the most distant and difficult to access areas, thus, there is no effective and continuous service.

Communities also face problems related to the disposal of domestic waste, since they do not have a solid waste collection service, therefore burning their lots or leaving them in the open.

Therefore, the promotion of sustainable practices is extremely important to face environmental challenges and ensure the preservation of natural resources in community areas. The promotion of sustainable practices will take place through the establishment of strategic partnerships for the execution of on-site actions; technical assistance and rural extension networks; the promotion of diversified, sustainable and adaptive agricultural production systems and models; and the implementation of alternatives to the burning of solid waste.

By combining these strategies and adopting an integrated approach, it is expected that degrading environmental and agricultural practices will be replaced by sustainable practices, as well as the possibility of increasing income for communities due to increased productivity and mitigating the advance of deforestation.

Figure 15, below, presents a summary of the actions and expected results of the activity.

Problems	Activities and actions	Short-term results	Medium-term results	Expected impacts
	Fostering sustainable practices			
Lack of technical assistance and rural extension services	Establish strategic partnerships for the execution of on-site actions	Partnerships established for the execution of activities	Income diversification	Improvement in quality of life and well-being

Problems	Activities and actions	Short-term results	Medium-term results	Expected impacts
Illegal logging in the Project Area	Structure technical assistance and rural extension networks	Place of meetings and exchange of knowledge defined	Reduction of deforestation in the Project and Leakage Belt areas	Climate regulation benefit
Use of fire in the deforestation chain	Structure community spaces for meetings and exchanges of knowledge	Technical visits to rural properties carried out	Adoption of sustainable practices	
	Promote diversified, sustainable and adaptive agricultural production systems and models	Trainings carried out related to waste management	Decrease in fires	
	Implement alternatives to solid waste burning		Decreased rural exodus	

Figure 15: Actions and expected results of the activity 'Fostering sustainable practices'.

Development and strengthening of value chains

A value chain represents all the steps a product or service goes through, from the supply of raw materials to final delivery to the consumer. Strengthening these chains involves improving the efficiency, quality and sustainability of each step, benefiting all parties involved.

Most of the communities surrounding the Project Area are family farmers, who present problems intrinsic to this social group, mainly related to planning, both territorial and production, as well as problems related to marketing, such as product pricing and market access difficulties. The latter is even more problematic for riverside dwellers, since the location of the communities is in a remote area that is difficult to access, which is done only by river, making them highly dependent on middlemen (Regatão) for the commercialization and disposal of family farming products.

Thus, the activity seeks to promote actions focused on training for the management of family agricultural production units, especially in the process of planning, production, valorization and commercialization of agricultural and forestry products. For this, the structuring of technical assistance and rural extension programs will be fundamental to promote the efficiency and diversification of production through the adoption of integrated production systems, an action that will be reinforced by the activity of 'Fostering sustainable practices'.

Another front of action is the formation and/or strengthening of associations and cooperative dynamics as a means of facilitating access to resources, whether financial or physical, which make it possible to increase small rural enterprises and enable access to different marketing channels. In view of this, the activity will also seek to promote the construction of relationships of trust between family farmers and local institutions, as well as to structure and consolidate collective organizations, such as associations and cooperatives, interventions that will also be strengthened by the activity of 'Strengthening governance'. Thus, it is expected that the proposed initiatives will facilitate access to different channels of marketing and disposal

of products, reduce dependence on the middleman (Regatão), promote the appreciation of local production and increase the income of community members.

Thus, the medium and long term objective of this activity is to increase the proportion of producers with mastery of information on prices, markets and marketing channels, the higher level of cooperativism and associativism in communities and increased productivity in family farms.

Figure 16, below, presents a summary of the actions and expected results of the activity.

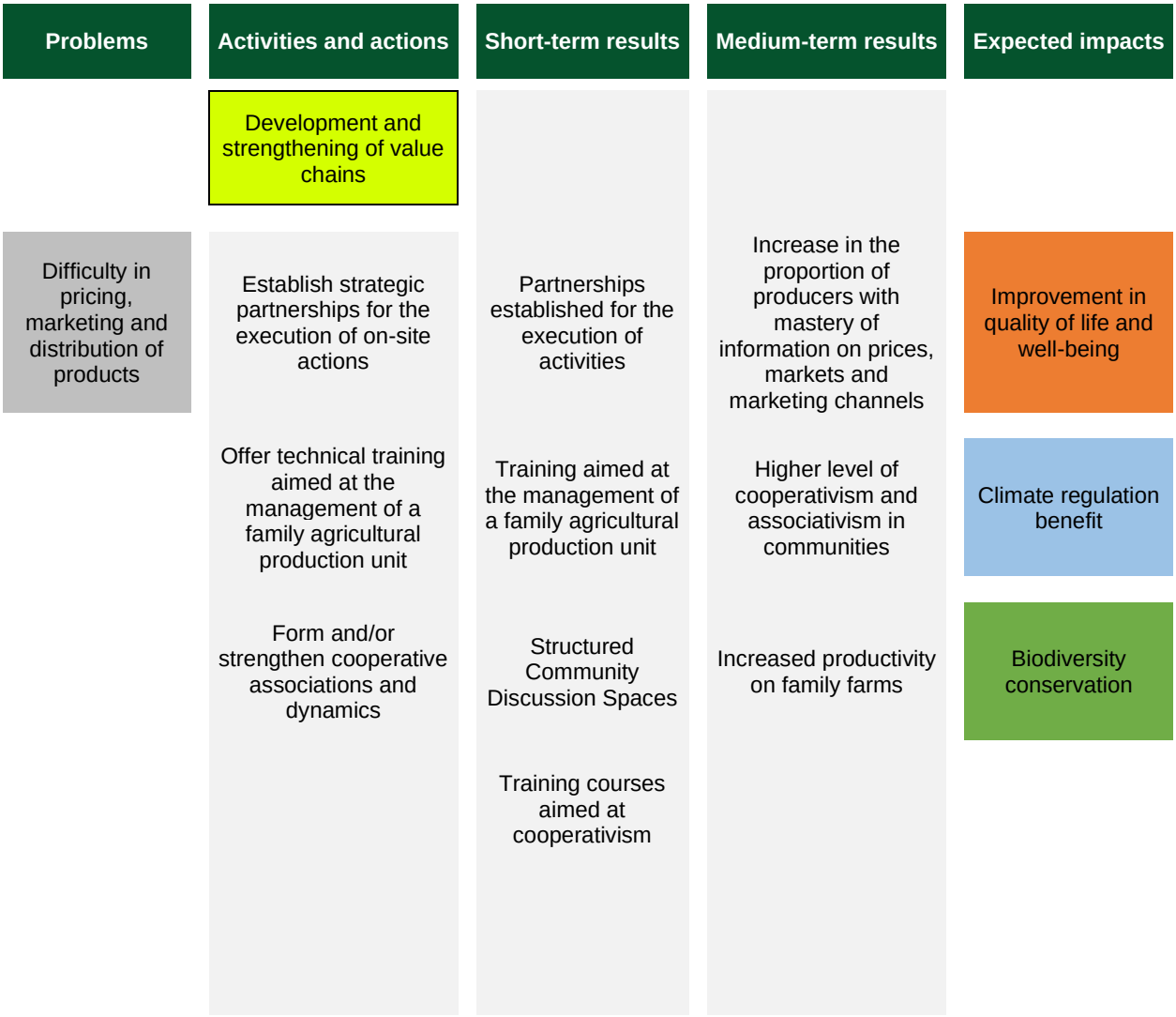


Figure 16: Actions and expected results of the activity 'Development and strengthening of value chains'.

b. Climate scope

Improved Farm Surveillance

Improving Farm Surveillance is an ongoing effort that requires cooperation between proponents and local communities. It is an essential measure to prevent illegal activities such as deforestation, land invasion and wildlife hunting. Adequate surveillance can also contribute to the protection of biodiversity and conservation of natural ecosystems.

Currently, surveillance actions are carried out through rounds made by Brascomp's own workers, both by land and by river. However, procedures and conduct are not structured and standardized. In addition, during the round, there is no communication between the surveillance employees and the headquarters of the Farms, which can be a risk to the health and integrity of the worker, in addition to impairing the efficiency of the work. Thus, the purpose of the activity is to establish surveillance procedures and improvements; structure and train surveillance teams; structure efficient communication channels between the ground surveillance team, proponents and stakeholders; and improve the general infrastructure conditions of farms.

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

Figure 17, below, presents a summary of the actions and expected results of the activity.

Problems	Activities and actions	Short-term results	Medium-term results	Expected impacts
	Improved Farm Surveillance			
Maintenance of endangered species in a scenario of legal and illegal logging	Establish surveillance procedures and improvements	Structured and validated surveillance procedures	Protection of HCVAs	Improvement in quality of life and well-being
Lack of training or qualification to carry out their professional activities	Structure and train surveillance teams	Training with surveillance teams	Increased efficiency in field surveillance operations	Climate regulation benefit
Insufficient general conditions of farm infrastructure	Structure efficient communication channels between the ground surveillance team, tenderers and stakeholders	Communication and consultation strategies between surveillance team, stakeholders and proponents defined	Maintenance of forest cover in the Project Area	Biodiversity conservation
	Improve the general infrastructure conditions of farms	Improvements made to farm infrastructure		

Figure 17: Actions and expected results of the 'Improving Farm Surveillance' activity.

Monitoring deforestation via satellite imagery

Satellite imagery monitoring of deforestation is one of the most effective and widely used tools for tracking changes in land use, especially in dense forest and vegetation areas. This approach enables large-scale monitoring, allowing rapid and accurate identification of deforested areas, assisting in decision-making and actions to combat illegal deforestation and promote forest conservation.

Currently, no satellite monitoring is carried out in the Project Area. However, it is intended to implement such activity, which will result in bulletins with the possible points of deforestation that will be forwarded to the surveillance teams and patrols and in this way this remote monitoring will compose a better support for the strategic field patrolling plan. In addition, throughout the project this activity can be improved with the use of new technologies that may emerge in the market, which are efficient and improve the containment of deforestation and land use changes.

In addition, this activity provides for the monitoring of hot spots using an official database, which also aims to improve the monitoring carried out by field teams, such as fire detection and control.

These actions are directly related to the containment of deforestation and invasions, maintenance of forest cover and, consequently, improvement of adaptations to climate change, as well as the maintenance of the benefits for the climate, community and biodiversity foreseen by the scenario with the Project.

Figure 18, below, presents a summary of the actions and expected results of the activity.

Problems	Activities and actions	Short-term results	Medium-term results	Expected impacts
	Monitoring deforestation via satellite imagery			
Deforestation in the Project Zone	Continuously and remotely monitor deforestation and forest fires in the Project Area and Leakage Belt	Deforestation and forest fire bulletins carried out for the Project Area and Leakage Belt	Decrease in invasions, wood theft and forest degradation in the Project Area	Climate regulation benefit
		Analysis of new deforestation and forest fire monitoring tools	Dimension of fires and burnings in the Project Area	
			Increased efficiency in field surveillance operations	
			Protection of HCVAs	

Figure 18: Actions and expected results of the activity 'Monitoring deforestation via satellite images'.

c. Biodiversity scope

Biodiversity conservation program

The Project Zone is located in the Xingu Endemism Area, a region that concentrates a high wealth of exclusive species and is among the most threatened in the Brazilian Amazon. In recent years, the advance of livestock, the expansion of grain production and the massive incentive to monoculture, as well as the implementation of large infrastructure projects, have caused deforestation and increasingly transformed the region's landscape.

In this context, the 'Biodiversity Conservation Program' is a coordinated initiative that aims to protect and preserve the diversity of life in all its forms - from animal and plant species to the ecosystems in which they live, being a key activity to address the growing threats to biodiversity caused by deforestation, pollution, climate change, habitat degradation, illegal hunting and other human activities.

Through environmental education actions with guidelines related to the protection of the region's biodiversity, as well as *in situ* monitoring of biodiversity, it is intended to increase the level of awareness of the need to protect fauna and flora, conserve endangered species and key species in the Project Zone, in addition to ensuring the maintenance of fauna and flora species in the Project Area.

Environmental education initiatives will be carried out through communication, guidance and awareness campaigns, as well as through the use of participatory methodologies for monitoring biodiversity in forest areas outside the Project Area, promoting active participation of stakeholders and reinforcing change in perception regarding the importance of the local fauna and flora.

In addition to encouraging environmental education initiatives and systematic *in situ* monitoring of biodiversity, it is understood the importance of promoting activities that enable food security and income generation, such as diversified and sustainable agricultural production and small-scale animal production, being alternative activities that discourage hunting. The results of this action will be mutually influenced by the activities of 'Fostering sustainable practices' and 'Developing and strengthening value chains'.

Figure 19, below, presents a summary of the actions and expected results of the activity.

Problems	Activities and actions	Short-term results	Medium-term results	Expected impacts
	Biodiversity conservation program			
Subsistence and predatory hunting and fishing in the Project Zone	Promote environmental education actions with guidelines related to the protection of the region's biodiversity	Partnerships established for the execution of activities	Increased level of awareness of the need to protect fauna and flora	Biodiversity conservation
	In situ monitoring of biodiversity	Environmental awareness and education actions and campaigns carried out	Conservation of endangered species in the Project Area	Improvement in quality of life and well-being
		In situ monitoring in the Project Area performed	Conservation of key species in the Project Zone	
			Maintenance of fauna and flora species in the Project Area	

Figure 19: Actions and expected results of the activity 'Biodiversity conservation program'.

Table 8 provides a description of the activities and key outcomes and impacts that will contribute to achieving the anticipated Project benefits for the Climate, Community and Biodiversity.

Table 8 – Description of activities and main results and impacts of the Tueré REDD+ Project.

Description of Activity	Expected climate, community, and/or biodiversity			Relevance to project's objectives
	Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
Strengthening Governance	- Partnerships established for the execution of activities; - Meetings, encounters and dialogues held with community leaders and other stakeholders;	- Increased collective engagement in claiming basic rights and services; - Engagement and adherence to the proposed activities to reduce	Improvement in quality of life and well-being	Very high. In view of the advance of livestock in riverside areas and the deforestation caused by the BR-230 highway (Transamazônica Highway), the

Description of Activity	Expected climate, community, and/or biodiversity			Relevance to project's objectives
	Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
	- Communication and consultation strategies between stakeholders and proponents defined.	deforestation in the Project Zone.		strengthening of governance with the institutional presence in the area strengthens the relationship with the communities surrounding the Farms, avoiding illegal entries and activities in the Project Area.
Infrastructure improvement	- Partnerships established to the implementation of improvements; - Survey of necessary improvements.	- Implementation of improvements.	Improvement in quality of life and well-being	High. Given the scenario of low social organization within communities and precarious infrastructure services, this activity is highly relevant to assist in the articulation of public policies and services with greater ease, such as health, education, communication (telephony and internet) and transportation.
Fostering sustainable practices	- Partnerships established for the execution of activities; - Place of meetings and exchange of	- Income diversification; - Reduction of deforestation in the Project Area and Leakage Belt;	- Improvement in quality of life and well-being; - Climate regulation benefit.	Very high. Given the degrading agricultural and environmental practices carried out by the surrounding communities,

Description of Activity	Expected climate, community, and/or biodiversity			Relevance to project's objectives
	Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
	knowledge defined; - Technical visits carried out to rural properties; - Training carried out related to waste management.	- Adoption of sustainable practices; - Decrease in fires; - Decreased rural exodus.		associated with the absence of technical assistance and rural extension services, this activity may lead to greater diversification of production and, consequently, of community income, reducing economic dependence on illegal activities, such as logging from third party areas, and reducing rural exodus.
Development and strengthening of value chains	- Partnerships established for the execution of activities; - Training aimed at the management of a family agricultural production unit; - Structured community discussion spaces; - Training courses aimed at cooperativism.	- Increase in the proportion of producers with mastery of information on prices, markets and marketing channels; - Higher level of cooperativism and associations in the communities; - Increased productivity in family farms.	- Improvement in quality of life and well-being; - Climate regulation benefit; - Biodiversity conservation.	Very high. Due to difficulties faced by family farmers in the communities, mainly related to commercializatio n, such as the pricing of products and difficulties in accessing the market, together with the high dependence of the Regatão to distribution of production, in the case of riverside dwellers, this activity has very

Description of Activity	Expected climate, community, and/or biodiversity			Relevance to project's objectives
	Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
				high relevance since it intends to increase the level of cooperativism and associativism in the communities as well as productivity in family farms, enabling an increase in the generation of income for families.
Improved Farm Surveillance	- Structured and validated surveillance procedures; - Training with surveillance teams; - Communication and consultation strategies between surveillance team, stakeholders and proponents defined; - Improvements performed to farms infrastructure.	- Protection of HCVAs; - Greater efficiency in field surveillance operations; - Maintenance of forest cover in the Project Area.	- Improvement in quality of life and well-being; - Climate regulation benefit; - Biodiversity conservation.	Very high. The activity is essential to prevent illegal activities, such as deforestation, land invasion and predatory wildlife hunting, in addition to contributing to the protection of biodiversity and conservation of natural ecosystems.
Monitoring deforestation via satellite imagery	- Deforestation and forest fire bulletins carried out for the Project Area and Leakage Belt; - Analysis of new tools for monitoring	- Decrease in invasions, wood theft and forest degradation in the Project Area; - Decrease of fires and burns in the Project Area;	- Climate regulation benefit.	High. Considering that no type of satellite monitoring is currently carried out in the Project Area, this activity will allow the rapid and

Description of Activity	Expected climate, community, and/or biodiversity			Relevance to project's objectives
	Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
	deforestation and forest fire.	- Greater efficiency in field surveillance operations; - Protection of HCVAs.		accurate identification of deforested areas, assisting in decision-making and actions to combat illegal deforestation and promote forest conservation.
Biodiversity Conservation Program	- Partnerships established for the execution of activities; - Environmental awareness and education actions and campaigns carried out; - *In situ* monitoring in the Project Area performed.	- Increased level of awareness about the need to protect fauna and flora; - Conservation of endangered species in the Project Area; - Conservation of key species in the Project Zone; - Maintenance of species of fauna and flora in the Project Area.	- Biodiversity conservation; - Improvement in quality of life and well-being.	High. Given the location of the Project Area in the Xingu Endemism Area, the activity becomes fundamental to face the growing threats to biodiversity caused by deforestation, pollution, climate change, habitat degradation, illegal hunting and other human activities.

2.1.12 Sustainable Development

The Tueré 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 Brascomp, are the drivers of net benefits for the climate, biodiversity and local communities. Based on this support and in line with the expected impacts, the project will contribute to the following United Nations Sustainable Development Goals (SDGs):

SDG 2 – END HUNGER, ACHIEVE FOOD SECURITY AND IMPROVE NUTRITION, AND PROMOTE SUSTAINABLE AGRICULTURE

Goal 2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen the capacity to adapt 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 for more resilient economic activities, through "Fostering sustainable practices". To this end, the project enables training and technical development actions aimed at communities, in association with different partners and extension agents, in order to promote knowledge about the importance of reconciling good production practices with the preservation and maintenance of natural resources and encourage the adoption of sustainable and adaptive production systems.

SDG 4 – ENSURE INCLUSIVE, EQUITABLE AND QUALITY EDUCATION AND PROMOTE LIFELONG LEARNING OPPORTUNITIES FOR ALL

Goal 4.4 By 2030, substantially increase the number of young people and adults who have relevant skills, including technical and vocational skills, for employment, decent work and entrepreneurship.

Goal 4.7 By 2030, ensure that all learners acquire the knowledge and skills necessary to promote sustainable development, including, inter alia, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation 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 area, especially on resilient agricultural production practices, sustainable extraction of non-timber forest products, development and strengthening of value chains, encouragement of social organization and environmental education for the preservation of endemic and endangered species. In addition, it provides specific training aimed at Brascomp workers involved in surveillance activities, as well as establishes procedures and seeks greater efficiency in field patrol operations. For this, it has the support and collaboration of specialized partners, in order to guarantee the effectiveness and engagement of stakeholders. These training activities promoted by the project enable the strengthening of human capital, the consolidation of the feeling of belonging, access to information, better employment conditions and income diversification; mainly for small rural producers, consequently resulting in the maintenance of the forest and its resources.

SDG 6 – ENSURE THE AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION FOR ALL

Goal 6.6 By 2030, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.

The main objective of a REDD+ Project is the conservation of forest cover and their respective carbon stocks by curbing deforestation and forest degradation. An

important activity of the project is the improvement of the surveillance of the Farms, ensuring the protection of the forest cover of the Project Area, in addition to other activities that encourage the adoption of sustainable production practices as alternatives to deforestation. The maintenance of forests is essential for the provision of water ecosystem services and, consequently, for the availability of water for all, since forests are part of the process of regulating the hydrological cycle, influencing some factors such as precipitation, water availability and purification, soil protection, lakes and watercourses.

SDG 12 – ENSURE SUSTAINABLE PRODUCTION AND CONSUMPTION STANDARDS

Goal 12.2 By 2030, achieve sustainable management and efficient use of natural resources.

Goal 12.8 By 2030, ensure that people everywhere have relevant information and awareness for sustainable development and lifestyles in harmony with nature.

The Project encourages the "Promotion of sustainable practices" with actions aimed at identifying potential activities related to resilient subsistence agriculture and promoting diversified, sustainable and adaptive agricultural production systems and models according to the demand and profile of local communities. In this sense, the project works to disseminate knowledge, instructions and experiences focused on the efficient use of natural resources and environmental preservation. The “Development and strengthening of value chains” activity encourages sustainable business chains through greater integration between stakeholders and regional markets, thus generating income, well-being and cultural identity for the residents surrounding the Project. Thus, the learning, engagement and predisposition of these families to activities to improve productive and extractive practices, in order to achieve the efficient use of natural resources and sustainable development, increase the governance of the project and help maintain forest cover and preserve its ecological aspects.

SDG 13 – TAKE URGENT MEASURES TO COMBAT CLIMATE CHANGE AND ITS IMPACTS

Goal 13.3 Improve education, increase awareness and human and institutional capacity on mitigation, adaptation, impact reduction and early warning of climate change.

Goal 13.b Promote mechanisms for building capacity for climate change-related planning and effective management, in least developed countries, including with a focus 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 greenhouse gas emissions. In this sense, in addition to stakeholder engagement and strengthening governance, the project also promotes satellite deforestation monitoring and improved surveillance within Brascomp's farms. For this to occur, the project works to improve the procedures for recording the identified care situations and invests in training workers to make adequate decisions, allowing for a refinement in actions to prevent, combat illegal activities and maintain the forest. As a result, the project has the potential to reduce 7,454,030 tCO2e of greenhouse gas emissions in 10 years.

SDG 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

Goal 15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in accordance with obligations under international agreements.

Goal 15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally.

Goal 15.5 Take urgent and meaningful action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of endangered species.

Goal 15.a Mobilize and significantly increase, from all sources, financial resources for the conservation and sustainable use of biodiversity and ecosystems.

The main objective of a REDD+ Project is the conservation of forest cover and their respective carbon stocks through the containment of deforestation and forest degradation. The Project is inserted and protects a large part of a region classified by the Ministry of the Environment (Ordinance No. 463, of 12/18/2018) as a Priority Area for Conservation, Sustainable Use and Sharing of the Benefits of Brazilian Biodiversity; it is also inserted in the Xingu Endemism Center, a region with a large concentration of endangered and endemic species, serving as an ecological corridor for preserved areas in the region. In this way, the Tueré REDD+ Project aims to minimize habitat loss, landscape changes, over-exploitation of species and climate change. To this end, it seeks to engage, involve and sensitize all stakeholders about the importance of biodiversity in the provision of ecosystem services, the maintenance of landscape connectivity, the control of environmental degradation and the limitation of the unsustainable use of natural resources. In addition, systematic in situ monitoring of fauna and flora, studies on natural and socioeconomic resources carried out and necessary to meet the CCB certification, will also contribute to integrating the values of ecosystems and biodiversity into national and local planning in development processes and biodiversity conservation strategies.

2.1.13 Implementation schedule (G1.9)

Date	Milestones in project development and implementation
1 year to 1.5 year prior to validation and first verification	Activities planning meeting
	Articulation between institutions and identification of partnerships
	Consolidation of the schedule of activities
	Conducting socio-economic and environmental diagnoses
	Estimate of carbon stock
	Baseline determination and crediting potential

	Planning and workshops to design the project
	Feedback and stakeholder consultation
	Consolidation of the design, action plan and draft of the project conception document
	Review and translation of the project design description (PDD)
	Elaboration of the monitoring report
In the year of validation and first verification	Selection and Hiring of the Validation/Verification body and the Credit Registry platform
	Production of follow-up bulletins for validation/verification audit
	Field audit follow-up
	Project and Credit Registration
From year 3 to year 30	Development and Monitoring of socio-environmental management activities
	Monitoring of deforestation and emissions
	Monitoring Biodiversity (fauna and flora) and High Conservation Value Areas (HCVA)
	Verification of credits (selection and hiring of the verification body; production of follow-up bulletins for verification; monitoring of the field audit; recording of credits)
	Conducting the credit marketing process

2.1.14 Project Start Date

The proponents started the first negotiations for the development of the project in 2021, after which there were several negotiations until the submission of the final proposal and signing of the contract on July 14, 2022. Thus, the start date of the Tueré REDD+ Project was set at August 31, 2022, represented by the first action carried out by the project, being the contracting of machinery to carry out improvements in the port, on existing roads and on the bridge over the large stream, aiming to improve the infrastructure and access for forest watchmen, management teams and to carry out the initial diagnoses of the Project.

2.1.15 Evaluation of Benefits and Crediting Period (G1.9)

The accreditation period of the Tueré REDD+ Project will refer to the complete period of 30 years, starting on August 31, 2022, and ending on August 30, 2052.

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

2.1.16 Differences in Project Evaluation/Accreditation Periods (G1.9)

With the formalization of the partnership between Brascomp Compensados do Brasil and Biofílica Ambipar Environmental Investments, the Project crediting period begins from the contracting of machinery to carry

out improvements in accesses and infrastructures in the Project Area, as mentioned in Section 2.1.14. After that, other major investments began for the development of technical studies to support the writing of the PDD, such as the determination of the baseline and socioeconomic and environmental diagnoses.

Subsequently, there is the development of activities related to climate, community and biodiversity scopes, along with the monitoring of attributes related to these scopes. At that moment, the collection of the first carbon credits commercialized takes place, which come from the first verification of the Project by VCS certification in order to financially encourage the development of these activities and monitoring.

In this way, the assessment of changes related to climate, community and biodiversity benefits begins in a period shortly after the start of the crediting period of the Project.

2.1.17 Estimated GHG Emission Reductions or Removals

Table 9 shows the emission reductions and removals estimated by the Project.

Table 9 - Estimated reductions or removals of GRR emissions for the Tueré REDD+ Project

Years	Estimated GHG emission reductions (tCO2e)
2023	370227
2024	561734
2025	710582
2026	699585
2027	726895
2028	793037
2029	721905
2030	925360
2031	886999
2032	1057707
Total estimated Ers	7,454,030.28
Total number of credit years	30
Average annual Ers	745,403.03

2.1.18 Risks to the Project (G1.10)

Through the "AFOLU Non-Permanence Risk Tool v4.0" tool, the probable natural and human-induced risks to climate benefits were verified, reported in the Non-Permanence Risk Report of the Tueré REDD+ Project, as summarized 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 Tueré REDD+ Project.

CATEGORY	SCORE
Internal Risk	0.00
External Risk	0.00
Natural Risk	1.00
General punctuation (a + b + c)	10

2.1.19 Permanence of Benefits (G1.11)

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

That said, in order to maintain and improve the benefits for the climate, community and biodiversity during the 30 years of validity and beyond, the Project's actions are focused on improving local governance and management capacity, improving human capital and decision-making and increasing awareness and capacity for sustainable resource management for all stakeholders. These activities will have short-, medium- and long-term results and will therefore help empower and guide local actors in self-determining sustainable pathways to achieve benefits for climate, community and biodiversity well beyond the life of the Project. The strategies associated with the activities so that the benefits occur during the life cycle of the Project and after this period are:

I) Improvement of surveillance of Santo Antônio and Terra Alta farms, from field patrol activities in order to avoid invasions, deforestation and any type of degradation in forest areas. The Project aims to increase the efficiency of asset surveillance operations, with structuring of procedures, training with teams and improvements in infrastructure and communication. In this way, surveillance operations will have a great 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.

II) Strengthening governance, empowering local leaders and encouraging social organization to foster the search for basic rights and services and increase collective engagement to discuss and resolve environmental, structural, social and land demands of collective interest.

III) Promotion of sustainable practices, by promoting with family farmers agricultural and environmental practices aimed at sustainable production, diversification of production and income, reduction of fires and economic dependence on illegal activities such as logging. This activity seeks to guarantee the income and food security of families, encourage the permanence of these areas and reduce rural exodus.

IV) Development and strengthening of value chains, through community spaces for discussions and exchanges and training in cooperativism and management of the family agricultural production unit, in order to bring more information about pricing, markets and marketing channels, as a way to encourage the autonomy and socioeconomic development of the parties involved.

V) Structuring a biodiversity conservation program, promoting environmental education actions and campaigns to raise awareness of environmental issues, in addition to the continuous monitoring of the biodiversity of Brascomp's Farms. 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.

Thus, through the strategies described the Tueré REDD+ Project aims to promote the socioeconomic development of the region and the empowerment of communities, consequently, bringing knowledge about these themes by promoting the mitigation and prevention of deforestation and proposing alternatives to unsustainable activities, seeking to reduce the pressure on local biodiversity and GHG emissions. Therefore, the results of the proposed activities will be assimilated by local actors throughout the life of the Project, providing lessons learned and direct and indirect impacts on climate, biodiversity and communities beyond the term of the Project.

2.1.20 Financial Sustainability (G1.12)

The proponents of the Project have a solid partnership signed in 2022 with the objective of enabling investments in conservation in Santo Antônio and Terra Alta Farms through the commercialization of environmental assets. The Tueré REDD+ Project will be an initiative that should enable, in the medium and long term, the continuous investment of resources focused solely on conservation and sustainable development in the region.

Considering current assumptions of the carbon market and the potential to generate GHG Emission Reductions, the financial flow of the Tueré REDD+ Project presents very attractive results. In this model, proponents expect to recover the investment made in the Project when the commercialization of GHG Emissions Reductions begins.

Other information related to the financial analyses of the Tueré 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)

The land use scenarios in the absence of the project were determined using the approved methodology VCS VM0015 version 1.1 and the 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 probable scenarios, as well as the deforestation analysis and the drivers and agents, were based on the baseline scenario and more details are found in Section 3.1.4.

2.2.2 Most-Likely Scenario Justification (G2.1)

The Reference Region has an area of 953,767 hectares and a historical deforestation rate of 15,092.00 hectares per year (2.1% per year), calculated between 2012 and 2022. The data was used in conjunction

with the realistic and credible alternative land use scenarios that would occur within the Project boundaries in the absence of the AFOLU Project activity recorded in the VCS. Scenarios (I), (II) and (III) are detailed in Section 3.1.5.

I) Continuation of land use prior to the Project: deforestation is caused, in short, by illegal logging and unsustainable agricultural practices. Between August 2012 and August 2022, 149,816.40 hectares of the reference region were deforested and it is estimated that between 2023 and 2032, the next 10 years, 137,675 hectares will be deforested. Of these, 15,046 hectares are within the project area and, if land use remains the same, the projection is that deforestation in the reference region will reach 339,080 hectares by 2052, the final year of the project. This perspective demonstrates the need for effective measures to contain deforestation in the region, such as the implementation of the REED+ project.

II) Timber Forest Management without REDD+ activities and without registration as a VCS AFOLU Project: In this scenario, there are sustainable and legalized timber forest management activities, but without additional initiatives and investments focused on communities and local biodiversity to contain and monitor deforestation caused by agents. Although management assists in maintaining carbon stocks, it is not effective against the pressure of deforestation in forests. Economic viability is low because it is a volatile market and a very costly activity, especially when compared to agriculture and illegal logging. Thus, additional investments and activities are required.

III) Timber Forest Management with REDD+ activities and without registration as a VCS AFOLU Project: For this scenario, there is the reality presented in scenario (II) added to the activities of the REED+ project without the financial incentive of the VCS registration. The project proposes strengthening governance, improving infrastructure, fostering sustainable practices, strengthening value chains, improving surveillance, conserving biodiversity and monitoring deforestation, activities that become impractical without the additional revenue generated by the sale of verified credits.

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)

Without the REED+ Tueré project, the trend is for scenarios of illegal practices such as deforestation, invasions and land grabbing to continue and advance even further. These practices, associated with the use of land by slash and burn agriculture and the advancement of extensive cattle breeding, do not generate benefits to the community, the climate or biodiversity. Pressure from deforestation agents does not generate positive local impacts, it only increases climate, social and economic risks. The context without the project for the communities is detailed in Section 4.1.4 and for biodiversity in Section 5.1.3.

With the implementation of the REED+ Tueré project, its proposed activities and the financial investment from the sale of verified credits, the generation of social, environmental and economic benefits are naturally associated. The strengthening of governance, with the consolidation of a partnership present in the region, in addition to reinforcing and strengthening the relationship with the surrounding communities, seeks to monitor and operationalize the proposed demands and activities. Improving infrastructure can develop the region socially, environmentally and economically, provide access to basic services and reduce the rural exodus of traditional families, adding a higher quality of life for residents.

Within this reality, the activity of promoting sustainable practices becomes important to face social and environmental challenges and ensure the preservation of natural resources. The promotion of technical assistance and rural extension networks, sustainable agricultural production systems and models and the

implementation of alternatives to solid waste burning will bring more sustainability to the production process and greater environmental balance, increasing the income of communities. Support and promotion of the process of planning, production, valorization and commercialization of agricultural and forestry products produced by the community can also help in this process, and actions focused on training for the management of family agricultural production units will develop and strengthen value chains.

From the point of view of biodiversity, the activities of monitoring via satellite images and improving the surveillance of farms, proposed by the project, are intended to ensure the existing natural heritage in the area, seeking to ensure the conservation and preservation of the forest. Together, the biodiversity conservation program aims to monitor local biodiversity and use environmental education actions to engage stakeholders in favor of the biodiverse system in which the project is located.

Thus, the REED+ TUERÉ project, through a set of activities aimed at environmental conservation and sustainable social and economic development, seeks to ensure the preservation of the forest, generating benefits for biodiversity conservation, maintenance of ecosystem services, climate regulation and local development. The positive impacts arising from the project are due, in short, to its proposed activities, generating the net benefits for the community and biodiversity, which would not occur in the absence of the project, as follows:

For Communities:

- Training and qualification, offered by partners hired by the project, on sustainable agricultural and extractive practices;
- Strengthening social organization and improving joint work;
- More efficient communication;
- Strengthening human skills, knowledge and capacities on economic productivity and sustainable use of resources;
- Improvement in agricultural and livestock productivity through the introduction of new techniques.
- Improvement in land quality through the sustainable use of resources;
- Promotion and generation of new sustainable businesses, increasing the value chain;
- Increase and diversification of income in communities and integration with new markets;
- Environmental awareness and permanence of families on their lands;

For Biodiversity:

- Creating obstacles to local deforestation, preventing habitat loss and forest fragmentation;
- Promoting the conservation of the biodiversity of fauna and flora;
- Intensification of the conservation of species considered attributes of high conservation value (HCVA), including those that present some degree of threat, in line with the Forest Management Plan;

- Guarantee of genetic diversity, reduction of extinction risks;
- Inciting, deepening and refining 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.

There are laws and decrees that address environmental conservation and defend the rights of traditional peoples and communities, presented in section 2.5.7, however, as it is possible to verify in the scenario of common practice, their applicability is not effective. There is a lot of weakness and legal inefficiency regarding issues of protection of biodiversity and communities, mainly related to land use and access, highlighting the need for more efficient control and conservation actions.

2.2.4 Benefits to be Used as Credit (G2.2)

As described in Section 2.2.3, additionality for the community and biodiversity scope has been fully demonstrated. It should be noted that the benefits generated will not be used in other compensation programs; the Tueré REDD+ Project aims to produce only offsets related to Reduced Emissions by Avoiding Deforestation, as described in the Section 3 - Climate.

2.3 Stakeholder Engagement

2.3.1 Stakeholder Access to Project Documents (G3.1)

The communication of the Tueré REDD+ Project with stakeholders will be done through three main means: virtual, written and oral. 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 links to access it, relevant information to stakeholders, monitoring reports and other relevant documents, will be available through virtual means on the Biofílica Ambipar and Verra websites. News and news about the Project will also be released on the social media of Biofílica Ambipar (LinkedIn: https://br.linkedin.com/company/biofilicabr and Instagram: https://www.instagram.com/biofilica_br/).

Written communication: a printed version of the summary of the Project design document, monitoring reports and other relevant documents will be made available at the headquarters of Brascomp's farms for consultation by all interested parties.

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

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

2.3.2 Dissemination of Project Summary Documents (G3.1)

The documents referring to the Tueré REDD+ Project will be made available and disseminated to all interested parties through virtual means on the official website of Biofílica Ambipar Environmental and on the website of the Verra registration platform. In addition, a printed summary of the Project Design

Document will be made available at the headquarters of Brascomp's farms, as well as monitoring reports for consultation by communities and other stakeholders.

As mentioned in the previous topic, news and news will be made publicly available through Biofílica Ambipar's social networks, on its 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 actors.

2.3.3 Informational Meetings with Stakeholders (G3.1)

Meetings, meetings and workshops between the proponents of the Tueré REDD+ Project and stakeholders for dialogue on the planning, structuring and reporting of carbon project initiatives will take place throughout all phases of design, development, execution and monitoring of activities. These events will happen more intensely in the early years of the project.

Whenever necessary, informative meetings and workshops will be held with Project proponents and local actors, depending on local demand and availability. All meeting planning will be disclosed in advance through the delivery of invitations and letters in hand to interested parties, and possibly via email, WhatsApp and calls.

To implement appropriate social actions with the surrounding communities, the Socioeconomic Diagnosis was carried out by the proponents of the Project together with STA, in which the Tueré REDD+ Project was presented in an effective and accessible way and the necessary information was gathered for the construction of the Project. The approach used was through secondary data collection, dialogues, interviews and questionnaires (primary data). The survey was conducted with stakeholders already described in Section 2.1.9.

In addition, between August 5th and 8th, 2023, as part of the Project design and validation process, feedback was carried out with local actors to bring the results of the diagnosis, present the next stages of the Project and the communication channels , validate the proposed activities described in the Section 2.1.11 and collect further information and suggestions from stakeholders.

2.3.4 Costs, Risks and Benefits to Communities (G3.2)

As described in the previous topic, the socioeconomic diagnosis involving the communities selected for the Tueré REDD+ Project was carried out, in which the local scenario and context of the communities were analyzed through the application of interviews, and the possible positive and negative impacts on the communities that the Project has the potential to generate were identified.

Based on this, the Project's activities were designed with a focus on the social and economic development of these local actors, seeking to protect natural resources and reduce and avoid deforestation in the region. In order to validate the proposed activities, present the Project again and collect more information from the actors, the feedback event was held, which, in addition, sought to transparently present the potential risks, costs and benefits relevant to the stakeholders. This information was also described in the posters and folders delivered to the participants.

It has been clarified from the outset and should be reinforced throughout the Project that participation is voluntary and the decision to participate or not is not final or results in some kind of restriction. Throughout the project, more adequate and relevant information on potential costs, risks and benefits to communities

should be provided at Project meetings, consultations on the development of activities and during follow-up meetings.

2.3.5 Information to Stakeholders about the Validation and Verification Processes (G3.3)

Brascomp workers, potentially participating communities and other Project stakeholders will be informed about the CCB validation and verification through the available means of communication (Section 2.3.8) prior to the event.

Virtual channels such as Biofílica's website and social media and Brascomp's communication channels will also be used to inform stakeholders and the general public.

In addition, as stated in the previous sections, information on the validation and verification process was disclosed during the Participatory Rapid Rural Diagnosis (PRD) and the return event of the results collected and presentation of the proposed activities to interested parties.

2.3.6 Site Visit Information and Auditor Communication Opportunities (G3.3)

The auditor's visit to the Project site will be informed to communities, Brascomp workers, proponents, partners and other stakeholders of the Tueré REDD+ Project by sending emails and/or letters, WhatsApp messages, calls, in person and others means of communication available (Section 2.3.9) in good time before the event.

In addition, as mentioned in the previous topic, in the feedback to stakeholders, the event of return of the results of the Socioeconomic Diagnosis and validation of the activities proposed by the Project, the next steps of the Project were mentioned and the audit event was explained.

The communication of local residents and other actors with the auditor, as well as the dissemination of information, will be facilitated through the distribution of posters and folders and disclosure on Biofílica channels, in addition to the entire communication structure described in Section 2.3.9, directed to the parties Project stakeholders. During the audit event, all stakeholders will have broad access and availability to communicate with the auditor.

In addition, the VERRA public consultation event will be widely publicized for interested parties to leave their comments and questions as described in the section 2.5.8.

2.3.7 Consultation with Interested Parties (G3.4)

The articulation between the stakeholders of the Tueré REDD+ Project began in 2021, with the beginning of the first negotiations through the submission of a commercial proposal. The final proposal was revised on June 1, 2022 and the signing of the agreement between the bidders (Biofílica Ambipar and Brascomp) was finalized on July 8, 2022. After the formalization of the agreement, the next step was the identification of local actors and partnerships to assist in the development of technical studies for the implementation of the project. The process of defining partnerships for technical studies began in the second half of 2022. With the technical partner defined, which is the company STA (described in section 2.1.4), the diagnostics began in November 2022 and were concluded in May 2023. The project initiation workshop was held on August 9, 2022 and the preliminary results presentation workshop on March 21, 2023, both with the objective of sharing knowledge and information between the parties, aligning the main problems encountered and describing the scope of activities and their casual relationships.

In the workshops, technical and descriptive points were discussed about the certification standards and their requirements in relation to fauna, flora, socioeconomics, physical environment, carbon inventory and baseline determination. 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 were defined.

Subsequently, in November 2022, 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 STA (Section 2.1.6 for more details) in which the information derived from the interviews and participatory workshops “in loco” was gathered”. As a result, the strengths and weaknesses of the interested parties (communities, isolated residents of the surroundings and Brascomp workers) were listed, aligned and related to their potentialities and opportunities, which originated 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, as described in Section 2.1.11 and Table 8, with the main objective of stimulating sustainable economic development.

With the conclusion of the technical studies, the feedback was made with the interested parties from August 5 to 8, 2023. During these meetings, the participants were presented with the results of the socioeconomic diagnosis and the proposed activities that will be conducted by Brascomp and Biofílica Ambipar throughout the project. The contact with the communities was made through invitations made in person with the community leaders, it is noteworthy that the participation was voluntary and the decision to participate or not is not definitive or results in some kind of restriction.

The purpose of the feedback event was to present the Project and serve as an open space 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 relation to the local context. In addition, the existing communication channels and the proposed channels to be structured and used throughout the project were also presented.

Photos and attendance lists were made and a voluntary questionnaire was applied 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 about the dynamics followed in the feedback (the documents were made available to the VBB TEAM). In addition, participants received a poster and folder with relevant information about the Project to distribute in their respective communities.

The outcome of the stakeholder feedback event was that participants demonstrated an interest in involvement in the activities and a commitment to tracking the progress of the Project. No suggestions were made to change the proposed Action Plan, reinforcing that the diagnoses were efficient in reporting the social context and in assisting the developers in the elaboration of the project activities in an assertive manner.

In addition to this event, the expansion of stakeholder consultation was reinforced by the sending of letters to 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), State Public Ministry 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.

2.3.8 Ongoing Consultation and Adaptive Management (G3.4)

As described in the previous items, communication with stakeholders to prepare the project was done in person, through invitations and through WhatsApp. In addition, during the feedback, the contact kennels with the bidders (email and telephone) and website and social pages were disclosed, where you could have more information and contact with the bidders.

In addition, it is intended to create a communication plan to improve and continue communication and consultation between project proponents and stakeholders following the structure presented:

Communication channels: communication must be carried out through the Project's e-mail, in person through meetings, lectures, other face-to-face events and visits to communities, in addition to suggestion boxes in strategic places on the farm and in the communities themselves.

Social mobilization strategy: social mobilizations will be carried out to carry out meetings, activities, lectures, training, among other meetings. The mobilizations will be made through email, telephone, WhatsApp, in person and other means of communication that may be necessary. For each event, it will be defined which parties will be mobilized depending on the theme and negotiations.

Communication procedures: through a defined structure, the demands of interested parties will be received by the described means of communication, recorded in a standard form, analyzed and resolved in a predetermined time by the parties involved. Responsibility for the response depends on the complexity of the demand and may be the person responsible for communicating the Project, each specific area or Brascomp's management.

Conflict management: conflict management will be based on the peaceful resolution of opposing interests directly linked to the Tueré REDD+ Project, seeking all possible means of negotiation so that the decision to be taken harmoniously meets all parties involved, taking into account the well-being of be everyone. Dialogues will be held and any means of communication that the parties feel more comfortable and with shorter resolution time will be used.

The communication plan of the Tueré REDD+ Project can be adapted 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 designed and implemented taking into account the desires, characteristics and limitations of each community, as verified and defined in the interviews and workshops of the Socioeconomic Diagnosis and in the validation meeting of the proposed activities with the interested parties.

As described in Section 2.3.4, workshops (Participatory Rural Diagnosis) and meetings were held between communities, Brascomp workers and Project proponents and, in addition, the feedback event to interested parties was held, as described in Section 2.3.7, which guarantees the information sharing and increases the level of knowledge about the Project. This communication and accessibility for discussion on the progress of Project activities between local actors and proponents will occur continuously throughout the duration of the Project through the available communication channels, as described in Section 2.3.8.

2.3.10 Participation of the Players in Decision Making and Implementation (G3.6)

Engagement in the design, implementation, monitoring and evaluation of the Project takes place through available communication channels (Sections 2.3.8 and 2.3.9) and informational meetings, in which all interested communities have the opportunity to participate. As shown in Section 2.3.7, participatory events were held with stakeholders for the design and development of the Project.

The processes related to decision making and implementation, as well as the various activities related to the Project, are open to community participation. In addition, the project will seek the equal participation of youth and women in decision-making and implementation of the Project's activities.

2.3.11 Anti-Discrimination Guarantee (G3.7)

Brascomp has a policy related to human rights and social responsibility, relying on the code of ethics and conduct drawn up by the Group, as well as an occupational health and safety program. 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, promoting the dissemination and sharing of values, stimulating the improvement of behaviors and not admitting attitudes of discrimination or prejudice of any nature (race, religion, age, sex, political conviction, origin, marital status, sexual orientation or physical condition). The Tueré REDD+ Project communication channels (Section 2.3.8) will be available to report any attitude that goes against Brascomp's values.

Biofílica Ambipar Environment, belonging to the Ambipar Group, has a code of ethics and conduct based on strict ethical principles and respect for the laws that represent all companies in the Group. The document serves as a primary instrument to guide the conduct of all parties involved in the adoption of good practices in relationships and business, in order to achieve the highest standards of integrity, transparency and reliability, guiding attitudes of respect for diversity and to combat any form of prejudice.

Thus, the project proponents ensure that they followed all the guidelines applied in their codes of ethics and conduct throughout the project.

2.3.12 Complaint Feedback and Redress Process (G3.8)

Brascomp, together with Biofílica Ambipar, created an accessible procedure for conflict resolution, in which the processes and means of communication for conflict management and the feedback procedure are described (as described in the Communication Plan, Section 2.3.8) and intends to implement throughout the life of the project. The process includes receiving questions, complaints, suggestions and requests from interested parties through the described means of communication that will be recorded in a standard form, analyzed and resolved in a predetermined time with the parties involved.

Proponents, upon becoming aware of demands related to the Tueré REDD+ Project, will consider the following procedures within the process of feedback and redress of complaints: receipt, analysis, response and attempted resolution within a reasonable time, using whenever possible the traditional methods used by local actors for conflict resolution. In cases where there is no initial resolution, there will be an attempt at mediation and, if this is not effective to resolve through neutral consultation with the parties involved, there will be arbitration as a last resort, applied in extreme cases with judgment.

Upon receiving a demand, the person responsible for communicating the Project records the information on the form and forwards it to the area manager responsible for the investigation, who must analyze the demand and respond in a predetermined time with the parties involved. In the event that the form is

completed directly by the complainant, it must be inserted in the suggestion box and collected by the person responsible for communicating the Project. In the most serious cases, it must be forwarded to the bidder's board.

The response to the demands will be made through the availability of a document close to the suggestion boxes or through the other established means of communication.

It is noteworthy that the means of communication proposed for the project were presented and validated in the feedback event with local actors and that any interested party can submit comments, suggestions and complaints.

2.3.13 Accessibility to the Feedback and Complaint Redress Process (G3.8)

As mentioned in the previous topic, the Tueré REDD+ Project will adopt the receipt of requests and complaints, in addition to the conflict management and feedback procedure (Communication Plan Section 2.3.8 and Section 2.3.12), through the described means of communication. Proponents will ensure that the entire history of complaints, doubts, suggestions, compliments and requests, and their respective developments and decision-making, are disclosed and accessible in a clear and transparent manner to all interested individuals, both in physical files (for example, form records folder) and in virtual files.

It is worth mentioning that, in all channels for receiving feedback, complaints and reports, the records may be anonymous, except in cases where individuals need identification.

2.3.14 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 and ensure the permanence of results and positive impacts in the long term. It is understood that, to ensure the effectiveness in the implementation of the Tueré REDD+ Project, it is essential to work on the generation of local human capital focused mainly on the responsible management of natural resources. Thus, among the various actions proposed by the Project (Section 2.1.11) one part involves the training and engagement of local players. The main proposals aimed at promoting the training of local actors, income generation and direct and indirect jobs are described below.

- Improvement of farm surveillance: the activity must involve training and qualification of employees who work in the surveillance of Brascomp farms. The training aims to improve the surveillance techniques that already occur, also improving working conditions and helping to contain invasions and illegal activities;

- Strengthening of local governance: involves strengthening and expanding Brascomp's action in the region, attracting investments and partnerships mainly for on-site operations. The Project, with the purpose of strengthening social capital and community engagement in relation to the search for basic rights, should stimulate the generation of indirect jobs and attract investments to the region through the formation of partnerships;

- Promoting sustainable agricultural practices: involves carrying out training within the lines mapped by the Project, which may be related to the demands of the community, and mapping actors with the potential to participate in actions to promote sustainable practices and technical development. The activity seeks to improve agricultural practices developed by communities in order to strengthen and stimulate human capital as one of the means for sustainable development;

- Development and strengthening of value chains: the activity involves improving the efficiency, quality and sustainability of each stage of the value chain, benefiting all parties involved, promoting sustainable development. The Project proposes to map the main opportunities and establish partnerships for the development of activities, promoting actions focused on training for the management of family agricultural production units, especially in the process of planning, production, valorization and commercialization of agricultural and forestry products, as well as forming and/or strengthening cooperative associations and dynamics as a means of facilitating access to resources, whether financial or physical, which make it possible to increase small rural enterprises and enable access to different marketing channels;

- Biodiversity conservation program: includes on-site monitoring of biodiversity carried out by local partners with the engagement and participation of interested parties and with environmental education actions, promotion of technical development and environmental awareness, in addition to strengthening the management of the territory and promote the conservation of biodiversity.

In order to ensure the efficiency and permanence of the listed actions, proponents must seek the best techniques and procedures to conduct training with the people involved in the activities, always seeking to ensure a good qualification of the team that will work with the communities and a good involvement of the team to meet the project schedule and goals, with the objective of optimizing investments and avoiding the loss of human capital due to staff turnover. These processes will follow all relevant laws and regulations relating to worker rights as described in Section 2.3.16.

Other measures adopted to avoid the loss of acquired capacity will be the constant recording and reporting of procedures and monitoring of results obtained, since, in the event of staff turnover, the procedures can be easily reproduced, mitigating impacts on the implementation of the project plan.

All activities are open to the participation of all residents of the communities surrounding Fazendas Santo Antônio and Terra Alta. The participation of women, youth and marginalized people is strongly encouraged by proponents.

2.3.15 Employment Opportunity for Communities (G3.10)

The employment opportunities offered by Brascomp are equal in relation to the surrounding communities, including management positions if the requirements for the vacancy are met. All work positions generated locally by the Project follow a recruitment and selection process that Brascomp performs 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, considering criteria such as logistics and experience in the area.

It should be noted that Brascomp has residents of the region in its fixed and temporary teams and the Project will work to reinforce the actions already taken in this regard. Currently, around 30% of Brascomp's permanent staff is made up of people from the surrounding communities.

2.3.16 Relevant Laws and Regulations Related to Labor Rights (G3.11)

It is ensured that all employees who are part of Brascomp, Biofílica Ambipar 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, compliance with the labor standards and laws applied by Biofílica Ambipar is verified by an audit, this is due to the fact that it is a company S.A. 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.

Brascomp Compensados do Brasil closely follows the Code of Ethics and Conduct established by Lavrasul, a company of the same group, which determines a set of guidelines to guide the behavior of all employees and managers regardless of their duties and responsibilities, in order to respect the laws, ensure a dignified and respectful work environment, promote equal treatment and opportunities and ensure that there is no discrimination, privileges and attacks on the rights of others.

Brascomp executes, whenever necessary, the Technical Report on Environmental Working Conditions (LTCAT), the Risk Management Program (PGR) and the Occupational Health Medical Control Program (PCMSO) in order to analyze the activities carried out by employees , carry out inspections in the workplace and maintain safety conditions in the work environment in order to preserve the health and physical and mental integrity of employees, meeting the requirements set forth in the Decrees, Service Orders and Normative Instructions of the Ministry of Social Security Social and the Ministry of Labour. In addition, Brascomp values the regularization of workers, complying with the requirements of the Ministry of Labor guaranteeing the FGTS, INSS AND Rais.

Listed 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, of May 1, 1943: Approves the Consolidation of Labor Laws.

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

International agreements ratified by Brazil

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

- 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 June 18, 1965: Provides for the abolition of forced labor.

- 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 February 02, 2000: Provides for the prohibition of the worst forms of child labor and immediate action for its elimination.

2.3.17 Occupational Safety Assessment(G3.12)

An important component of the Project involves strict and effective care for the safety of workers, taking into account the internal regulations and official norms established by the federal and state governments. Considering that work processes and the work environment can cause damage to health, it is necessary to establish and implement a series of measures related to the assessment of existing risks, promotion and maintenance of the physical and social well-being of workers, prevention of occupational diseases, protection against risks arising from adverse health factors and placement and conservation of workers in a work environment appropriate to their physical and mental abilities.

In this context, Brascomp has three complex, didactic and mandatory programs that aim to prevent, track and diagnose work-related health problems early, namely: the Risk Management Program (PGR), the Occupational Health Medical Control Program (PCMSO) and the Technical Report on Environmental Working Conditions (LTCAT), 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.

The PGR aims to identify, evaluate and classify occupational risks, based on an inventory of risks of activities, and define actions to minimize, eliminate and control risks in the work environment, based on the preparation of an action plan, in accordance with Regulatory Standard No. 01 of the Special Secretariat for Social Security and Labor, of the Ministry of Labor. The PCMSO seeks to protect and preserve the health of employees in relation to occupational risks through the study of the risks that work offers and its effects on worker health, which results in the planning of health actions, for example training, lectures and examinations, according to Regulatory Standard No. 07 of the Special Secretariat for Social Security and Labor, of the Ministry of Labor.

In addition, Brascomp executes, whenever necessary, the LTCAT that meets the requirements set forth in the Decrees, Service Orders and Normative Instructions of the Ministry of Social Security and the National Institute of Social Security and aims to carry out inspection in the workplaces and analyze whether the activities developed by the employees expose them to harmful agents with the potential to cause damage to physical integrity. All Programs and their devices are reviewed and updated in accordance with the requirements of labor legislation.

2.4 Management Capacity

2.4.1 Project Governance Structures (G4.1)

The management of the Tueré REDD+ project will be the responsibility of Biofílica Ambipar and Brascomp Compensados do Brasil. The obligations and commitments of the parties are described below:

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

Brascomp Responsibilities: investments necessary for Project implementation and validation (Capex), project co-management, as well as development of all activities related to the environmental and social scopes and infrastructure and logistics support 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, another organization (mentioned in Section 2.1.4) was involved in carrying out the diagnostic studies. Accordingly, the responsibilities are described below:

Technical Solutions and Environmental Engineering Services – STA: development of environmental studies to characterize the physical environment and biodiversity in the region (flora and fauna), development of the study to estimate the carbon stock and development of the socioeconomic diagnosis of the Tueré REDD+ Project.

As presented, the Tueré 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 Tueré REDD+ 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 communities, implementation of effective land security and patrimonial surveillance. All proponents involved in the project have the necessary technical skills for the successful completion of the Tueré REDD+ Project.

Biofílica Ambipar is a Brazilian company that promotes the management of forest areas in the Amazon and Atlantic Forest biome. The company has a specialized team and is a reference in the development of forest conservation projects, guaranteeing the quality and effectiveness of the REDD+ activities carried out. Biofílica aims to make environmental conservation an economically interesting activity for forest owners,

communities and investors. It aims to reduce deforestation and carbon emissions in the atmosphere, conserve biodiversity and water resources and promote social inclusion and the 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.

Brascomp Compensados do Brasil is a family company that is part of a timber conglomerate composed of the companies Lavrasul, Lavrama and Agro Pastoril Novo Horizonte, all part of the group founded by the Zugman family in 1948, with Lavrama and Agro Pastoril Novo Horizonte being shareholders of Brascomp. Brascomp aims at the industry, trade and export of laminated, plywood, sawn and processed wood, vegetable extraction industry, afforestation and reforestation and breeding, cutting and dairy livestock. However, starting in 2011, it gradually reduced part of its industrialization operations, deactivating the plywood factory and the sawmill and maintaining only the sale of in natura goods arising from sustainable forest management processes with reduced impact.

In the early 1980s, Brascomp, a traditional logging company in the south of the country, was invited to settle in the Amazon through FINAM (Amazon Investment Fund), which encourages development projects in the Legal Amazon. Through this Fund, Brascomp installed a branch in Belém, Pará, until, in 1986, it acquired land in the municipality of Portel, Pará, through a public auction. Brascomp established its first sustainable forest management project in the region in 1994, starting activities in 1997 after the approval of a 30,000-hectare project at Fazenda Terra Alta. Subsequently, the company expanded its projects to the total area of 65,000 ha of Fazenda Terra Alta and to the more than 70,000 ha of Fazenda Santo Antônio.

The Santo Antônio and Terra Alta farms are located in the municipality of Portel, state of Pará, accounting for about 136,000 hectares, with more than 135,000 hectares of native forests. The region presents a frontier reality, with the expansion of agricultural activities added to the high incidence of illegal activities and weak government action, which results in a scenario of increased pressure for deforestation and unplanned exploitation of natural resources, characteristic for the implementation of REDD+ projects.

In addition to generating jobs for the region's residents through forestry activities, Brascomp operates locally through social responsibility projects. Two schools were built through an agreement with the City of Portel for the teaching of children and adult literacy, in which appropriate infrastructure, school materials, lunch and fuel are offered to pick up students by boat. Brascomp also implemented and funds a health center to identify malaria and other diseases, aiming to invest in the health and education of residents of the region.

In this sense, Brascomp's owners want 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 project management team members:

Proponent: Biofílica Ambipar Environment

Plínio Ribeiro – Executive Director

Plínio Ribeiro holds a degree in Business Administration from the 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 has participated in several conservation projects on the lower Negro River, through the Institute of Ecological Research – IPÊ since 2005 and was one of the producers of the documentary

"Retorno à Amazônia", by Jean Michel Cousteau. He has been working at Biofílica since 2008, where he has led Projects, Operations and Business Management. Currently, he is Executive Director and shareholder of the company.

Cláudio Pádua – Scientific Director

Cláudio Pádua holds a degree in Business Administration and Biology, a Master's in Latin American Studies and a PhD in Ecology from the University of Florida in Gainsville (USA). Retired professor at the University of Brasilia, Pádua is currently dean of the Superior School of Conservation and Sustainability and vice-president of the Institute of Ecological Research (IPÊ). He is also a Senior Research Associate at the Center for Environmental Research and Conservation 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. Pádua represents Brazil before the International Advisory Group (IAG) of the G7 Pilot Program. In 2003, together 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, he won six conservation awards, three national and three international, and, throughout his life, published two books and more than 30 articles in national and international scientific journals. Since 2008 he has directed Biofílica's involvement and scientific production as Scientific Director and advisor.

Paula Conde – Administrative and Financial Manager

Paula Conde has 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, most of it 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 for the team and projects.

Soraya Pires – Director of Operations

Agronomist Engineer graduated from ESALQ/USP with specialization in strategic management and finance from FGV. She has 15 years of experience in management and development of agro-industrial businesses and a career developed in large multinational companies in the sugar-energy sector (Adecoagro, BP and BP Bunge). At Biofílica, she performs activities related to business development, operational management, financial modeling, strategic planning and AFOLU project management.

Caio Gallego – Intelligence Manager

Caio Gallego is a Forest Engineer graduated from the University of São Paulo (USP/ESALQ) and a specialist in geoprocessing and remote sensing focused on environmental conservation, mapping and analysis of changes in land use. He has advanced knowledge in sustainable forest management, environmental modeling and use of GIS software for forestry and agribusiness, such as ArcGIS, QuantumGIS and DinâmicaEGO. He has more than 8 years of experience working with the development and implementation of AFOLU projects for voluntary carbon markets. Acted in the implementation of one of the first REDD+ projects within the VCS program in the Brazilian Amazon. His main expertise has always been focused on the technical development of projects, having been responsible for more than 10 validation/verification processes, acting in the application of socio-environmental safeguards, ensuring the generation of positive net impacts on climate, community and biodiversity, in addition to ensuring the maintenance of exceptional criteria applicable to each of these scopes.

Laion Pazian – Commercial Manager

Laion Pazian is an Economist from the University of São Paulo (USP/ESALQ) and an MBA in Commercial Management from Fundação Getúlio Vargas. At Biofílica, he manages the commercial team of carbon credits, key-accounts and Biofílica's commercial policy and strategy. In addition, he monitors and directs the analysis of carbon market intelligence, being responsible for the area's pricing and planning policy.

Luana Geraldini – Project Coordinator

Luana Geraldini is a Forestry Engineer, graduated from Universidade Estadual Paulista (Botucatu Campus) and postgraduated in Project Management from USP/ESALQ. During graduation she worked with environmental education projects and research on forest restoration. She has extensive experience in the environmental area as an environmental analyst in environmental licensing and geoprocessing projects. At Biofílica she works in the development, implementation and monitoring of AFOLU projects. Responsible for the validation and verification of 3 REDD+ projects in the Brazilian Amazon with extensive experience in project management with co-benefits for climate, communities and biodiversity.

Ricardo Cordeiro – Communication Coordinator

Ricardo Cordeiro is an advertiser, On and Offline art director with more than 10 years of experience, worked in digital agencies, trade and live marketing, UX experience, digital planning and strategies. Specialization in Digital Marketing and Web Project Management. At Biofílica, he acts as communication coordinator, responsible for digital marketing, branding and institutional communication actions.

Raphael Ramiro – FP&A Specialist

Administrator graduated from Universidade Estadual Paulista and Postgraduate in Corporate Finance from Universidade Federal de São Carlos. Professional with more than twelve years of experience in analysis and evaluation of projects from an economic-financial point of view. At Biofílica, he performs activities related to the Financial Evaluation and Modeling of Carbon Projects, Business Evaluation (M&A), Financial Addition Analysis - Carbon Projects, Executive Board / Board of Directors Presentations, Financial Performance Analysis/ KPIs.

Rafael Costa – Legal Support

Rafael Costa holds a PhD in International Law from the University of São Paulo, a master's degree in Political and Economic Law from Universidade Presbiteriana Mackenzie and a specialist in Public and Tax Law with an MBA in Business Management (USP). He has 17 years of experience, practice in litigation and advisory in the promotion of lawsuits, as well as extrajudicial resolutions of conflicts in civil, business, tax matters. Acting in international investigations in the field of Compliance (Anti-Corruption) and has been teaching for 9 years, as a Professor of undergraduate and graduate law.

Fabio Souza – Geoprocessing Coordinator

Fabio is a Geographer, Master in Use and Conservation of Natural Resources, specialized in Climate Analysis and technologist in Big Data and Analytical Intelligence. He worked in environmental diagnostics, development of geotechnology services and management of the geoprocessing team. Specialist in PostGIS database modeling, webgis platform development, business intelligence and automation of geoprocessing processes. Currently, he is part of Biofílica's operational team as geoprocessing coordinator.

Nathanael Campos – Project Analyst

Nathanael Campos is a Forestry Engineer and has a degree in Agricultural Sciences both from the University of São Paulo (USP/ESALQ). He also completed an inter-university exchange project in Environmental Quality and Resource Management at the École Nationale Supérieure Agronomique de Toulouse (ENSAT/Inp). During his studies, he worked with public policies for family farming and institutional inventory of greenhouse gas emissions. He has professional experience with GIS tools and remote sensing, with emphasis on environmental analysis. At Biofílica he works in the development, implementation and monitoring of REDD+ projects meeting the requirements of the VERRA standard, in addition to contributing to establish procedures and develop project intelligence.

Nayra Santos – Project Analyst

Nayra Gomes Nicolau dos Santos is a Forestry Engineer graduated from the Federal Rural University of Rio de Janeiro (UFRRJ), with a postgraduate degree in Forestry Management from the Federal University of Paraná (UFPR). She is currently a student in the Professional Master's Degree course in Environmental Engineering at the Polytechnic School of the Federal University of Rio de Janeiro (Poli / UFRJ). She has extensive experience in the preparation, management and execution of environmental projects and studies, technical coordination of environmental programs, as well as institutional management with federal and state environmental agencies in the process of prior licensing and installation of projects related to the infrastructure sector. She works at Biofílica producing technical reports and reporting activities of AFOLU Projects, as well as evaluating reports and products delivered by suppliers regarding the socio-environmental diagnoses made.

Carolina Cauzzo – Project Analyst

Carolina Corrêa Cauzzo is an Environmental Manager graduated from the University of São Paulo (USP/ESALQ) and held an interuniversity exchange at the Institut Agro Montpellier in France, where she did the programs of Sustainable Management of Natural Resources and Agroecology. During her studies, she worked with forest restoration techniques of the Atlantic Forest and socio-environmental studies in rural settlements. She has experience with ecological restoration projects and geoprocessing tools and in Biofílica works in the monitoring and support of REDD+ and ARR projects, preparation of technical reports, evaluation of supplier diagnostics, development of project intelligence and communication with stakeholders.

Réginal Exavier – Geoprocessing Analyst

Réginal Exavier is an Environmental and Sanitary Engineer, graduated from Centro Universitário Metodista Izabela Hendrix, Master in Geography from the Federal University of Mato Grosso (UFMT) and PhD student in Physical Geography from the University of São Paulo (FFLCH-USP). He has experience in the area of Land Use and Coverage changes using geoprocessing and remote sensing tools, geocomputation, data analysis and environmental monitoring. At Biofílica, he is responsible for the baseline analysis and feasibility study of projects.

Jaderson dos Santos Monge – Geoprocessing Analyst

Jaderson is an Environmental and Sanitary Engineer and a geoprocessing technologist. As a geoprocessing analyst, he has worked with the creation and management of GIS, standardization and quality control of georeferenced data, publication of geographic data in a web environment, spatial analysis,

data analysis, PostGIS database, geodatabase, topological rules, remote sensing and multipurpose technical registration. As an environmental engineer and sanitarian, he has worked with environmental studies for environmental licensing of public and private enterprises (RAP, EAS, EIA-RIMA, PGR), reports, environmental projects and environmental licensing. At Biofílica, he acts as a geoprocessing analyst.

Proponent: Brascomp Compensados do Brasil

Ari Zugman – CEO

Civil Engineer from the Federal University of Paraná, graduated in Psychology in 2014 and holds a postgraduate degree in Cognitive Behavioral Psychology concluded in 2018. He worked in the computer area at IBM do Brasil for 4 years until he moved to Belém-PA and took over the management of Brascomp Compensados do Brasil in 1987, a position he still holds today. These years gave him a good knowledge of the Amazon in general and Pará in particular, where the company had more than 1,000 employees.

Julio Zugman – CEO

Civil Engineer graduated from the Federal University of Paraná, holds a Specialization in Business Administration from the Faculty of Administration and Economics of Faculdade Católica. He has experience in Business Management and is currently a director of two companies of the Zugman Group.

Clemente Soares Harmoy – Administrative Director

An Agronomist Engineer graduated from the Faculty of Agricultural Sciences of Pará (FCAP), he undertook internships in the entomology and olericulture sectors at EMBRAPA's own faculty and in the Soils sector. He worked with the development of systems for forage production in the southern region of the state of Pará until 2006, when by invitation he came to work at Brascomp in the administrative and financial sector.

Salim Dourado - Supply manager

Graduated in Corporate/Private Security Management at Faculdade Ipiranga (FAZ-PA), postgraduate in Production Engineering at UNAMA-PA, graduated as 3rd Sergeant of the Brazilian Army with specialization in forest environment. Currently at Brascomp as Supply Manager, he manages the asset security activities of Brascomp Headquarters and Branches, purchases, management teams (in the pre- and post-exploration processes, execution of the management, measurement, sale, shipment, delivery and after-sales of wood), inspection and surveillance of the company's areas, maintenance of machines, facilities and equipment.

Everton Lima – Forest manager

Everton Lima is a Forest Technician graduated in 2005 from the School of Work and Production of Pará (ETPP, Juscelino Kubistchek School), later trained by the Tropical Forest Institute (IFT) in Reduced Impact Forest Management (MF-EIR). Since then, he has worked in the forestry sector working in the pre-exploratory, exploratory and post-exploratory phases of management, acquiring a lot of experience in operational management and even in the strategic planning of activities related to exploration. He is currently responsible for implementing and supervising technical forest management procedures and exploration teams.

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

The Tueré REDD+ Project has all the necessary partnerships for the construction and implementation of forest asset conservation activities. Currently, the partner institutions, mentioned in Section 2.1.4, are responsible for preparing 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 Tueré REDD+ Project will articulate 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.

Brascomp Compensados do Brasil is part of a timber conglomerate composed of the companies Lavrasul, Lavrama and Agro Pastoril Novo Horizonte, all part of the group founded by the Zugman family in 1948, with Lavrama and Agro Pastoril Novo Horizonte being shareholders of Brascomp. Despite having gradually reduced its industrial activities, today it is focused on the sale of in natura goods arising from the low-impact sustainable forest management processes carried out at the Terra Alta and Santo Antônio farms.

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 Prevention of Corruption and Other Unethical Behavior (G4.3)

Biofílica Ambipar supports annual financial audit processes 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. In addition, Biofílica applies, on a daily and permanent basis, Ambipar Group's Code of Conduct and Compliance, which seeks to achieve the highest standards of integrity, transparency and reliability in its business and relationships, a Code based on strict ethical principles and respect for the laws.

Like Biofílica Ambipar, Brascomp Compensados do Brasil does not condone any practice of bribery or corruption, carefully following the Code of Ethics and Conduct established by Lavrasul, which determines ethical principles, rules of conduct and guidelines to guide the behavior of all managers , employees and service providers and internal and external relations.

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

Some information required by the VCS and/or CCB standards is considered confidential or commercially sensitive and cannot be publicly disclosed by the Project proponents. This information was fully 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 has been made available:

- Land Documents and Legal Status;

- Financial Statements of Brascomp;

- Financial Statements of Biofílica Ambipar;

- Project Financial Performance Spreadsheet (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)

Brascomp Compensados do Brasil S.A., belonging to the Zugman Group, is the legitimate owner of the properties called Santo Antônio and Terra Alta where the Tueré REDD+ Project is located. Brascomp's properties cover the municipality of Portel in the State of Pará and were acquired through auction letters from Banco do Brasil in the 1980s. In addition, Brascomp has all the registrations, which present the registration of ownership, the descriptive memorial of the properties and the domain chain. In addition, the Rural Territorial Property Tax (ITR) and Rural Property Registration Certificate (CCIR) were shared with VVB. 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 Santo Antônio and Terra Alta farms are composed of 19 properties certified and registered in a real estate registry office. In addition, Brascomp has a history of Authorization for Forest Exploration (AUTEF) issued by the Government of the State of Pará – Secretary of State for the Environment and Sustainability – SEMAS to carry out the Sustainable Forest Management Plan in both existing and already exploited production units (UPA), which reinforces ownership and right over the area.

Therefore, the demonstration of the right to use the Project area is respected in accordance with the criteria of the VCS Standard v4.4 (page 25):

1) Right of use resulting from or granted under 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 right over the land, vegetation or conservation process, or management that generates reductions and/or removals of GHG emissions (where this right includes the right of use of such reductions or removals and the project proponent has not been stripped of such right of use).

2.5.2 Recognition of Property Rights (G5.1)

The Tueré 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 as demonstrated in the previous item. The Project recognizes and supports rights to lands, territories and resources, including the statutory and traditional rights of Indigenous peoples, traditional communities and other actors.

The project proponents act as mediators of potential conflicts, in addition to valuing good relationship with neighboring communities. In this way, the following aspects are described in detail:

- Brascomp Compensados do Brasil S.A. 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 existing therein, under the terms of the Federal Constitution of Brazil and the Civil Code, by virtue of being the owner of the properties where the Tueré 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 a dialogue and consent approach 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 without being requested. 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 interested parties.

No action related to the Project will result in the relocation of activities that are important for the culture or livelihoods of Property Rights Holders, nor will it aim at the involuntary relocation or removal of their lands or territories. Any proposed removal or relocation need to be performed only after obtaining the free, prior and informed consent of the appropriate Property Rights Holders.

In addition, the proponents ensure that all actors that could be impacted in any way by the Tueré REDD+ Project have been consulted. Workshops were held during the socio-environmental diagnoses in order to pass on information regarding the Project to the communities surrounding the Project area. There were also consultations and questionnaires regarding the views of local residents regarding the Project and its activities as described in Section 2.3.6. These consultations will continue to be carried out throughout the Project's life cycle. In addition, all information about the Tueré REDD+ Project can be acquired on Biofílica's virtual channels, such as website, newsletter and social media.

2.5.4 Property Rights Protection (G5.3)

The implementation and development of the Tueré REDD+ Project will not lead to the involuntary removal or relocation of any party, and activities important to the livelihood of the communities residing in the Project Zone must be respected and supported by the Project. Thus, the Project proposes social activities that seek the promotion of sustainable practices and the development and strengthening of value chains, strengthening and improving 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 Brascomp and supported by the responsible public institutions. As previously mentioned, possible judicial inconsistencies are resolved following all procedures established by the local jurisdiction.

2.5.5 Identification of Illegal Activities (G5.4)

Deforestation is the main illegal activity that can negatively impact the development of the Tueré REDD+ Project as well as the predatory exploitation of fauna and flora. Family farmers, middlemen (regatão), outsiders and squatters were identified as the main causes of this illegal deforestation. Between 2012 and 2022, approximately 149,816 hectares were deforested in the Reference Region, which corresponds to a reduction of 17.22% of the existing forest in 2012. For the next 10 years, a loss of 137,675 hectares of native forest is expected in a scenario of absence from the project, of which 13,337 hectares could be deforested in the Project Area.

The Project seeks to control and combat illegal activities commonly found in the Project region through mitigating and preventive measures such as strengthening heritage surveillance, in addition to encouraging the involvement of other actors and stakeholders, social inclusion and local socioeconomic development by encouraging alternative economic activities to deforestation and discouraging hunting and overfishing.

With the application of these measures encouraged by the Project's activities, it is expected to improve the well-being of the communities without generating burdens for the native forest and local biodiversity. Asset 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 the prevention of illegal activities are summarized in Table 11.

Table 11- Mechanisms and procedures for the prevention of illegal activities in the Tueré REDD+ Project.

MECHANISMS AND PROCEDURES FOR THE PREVENTION OF ILLEGAL ACTIVITIES	
General conditions	- Carry out regular patrols in order to ensure the protection of Brascomp's land assets; - Avoid deforestation, forest fires or other acts of aggression to the environment; - Prevent illegal timber extraction and trade; - Maintain a good relationship with surrounding communities and other stakeholders; - Perform entry and exit control of Brascomp Farms; - Promote environmental education with local actors who practice predatory hunting and fishing and encourage the practice of alternative and sustainable economic activities; - Request support from police and supervisory authorities, when necessary; - Displacement of a surveillance team to the place of occurrence to investigate the fact and 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 damage to the environment must be registered with the responsible bodies (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.

Forms of registration	- Police report; - Photographic record of occurrences; - Monthly monitoring program; - Report on property security activities.

2.5.6 Ongoing Disputes (G5.5)

In the area destined to the Tueré REDD+ Project there are no conflicts, current or unresolved disputes over the right and use of land or access to natural resources, just as there are no disputes with third parties or squatters revoking Brascomp's property right over land.

2.5.7 National and Local Laws (G5.6)

Compliance with Laws, Statutes and other significant regulatory bodies for the Tueré REDD+ Project is related to low-impact forest management activity. In the State of Pará, the project's activities are licensed by the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA), so federal legislation must apply. Subordinate to federal legislation, legislation at the state level (SEMAS) applies.

Regarding REDD+ activities, a history of initiatives can be noted despite the construction and negotiation of this concept through agreements and meetings at the United Nations Framework Convention on Climate Change (UNFCCC). In December 2015, Brazil's National REDD+ Strategy (ENREDD+) was instituted by MMA Ordinance No. 370, 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 November 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 preparation of requirements for access to payments for results of REDD+ policies and actions in the country. The following year, CONAREDD+ 's bylaws were published, through Ordinance No. 544, of October 26, 2020.

At the same time, of a widely relevant nature, Bill No. 572/2020 is under analysis, which "provides for 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". So far, the text is being processed in the Chamber of Deputies.

As for the carbon market, there is a Bill (Bill No. 528 of 2021) being processed 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 from activities to Reduce Emissions from Deforestation and Forest Degradation, for example. The promotion of this voluntary carbon market is provided for in the Law that established the National Policy on Climate Change (Law No. 12.187 of 12/29/2009).

After years of discussion and stagnation of Bill No. 528/21 in the National Congress, Decree No. 11.075 of May 19, 2022 was recently enacted, 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 to Mitigate Climate Change. In addition to these measures, the document also brings unprecedented concepts regarding methane credit, recording the carbon footprint of processes and activities, carbon from native vegetation, soil carbon and blue carbon.

Below, the main relevant legislation and regulations at federal and state levels are listed and detailed. In addition, a brief analysis of the international climate agreements that has been guiding the creation and development of REDD+ initiatives around the world were carried out.

Federal Legislation

- Law No. 14119, of January 13, 2021: Establishes 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, 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, 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, of 12/29/2009: Institutes the National Policy on Climate Change – PNMC and takes other measures.

- Decree No. 11075, of May 19, 2022: Establishes procedures for the preparation of Sector Plans for Mitigating Climate Change, establishes the National System for Reducing Greenhouse Gas Emissions and amends Decree No. 11003, of March 21, 2022.

- Decree No. 10144, of November 28, 2019: Establishes the National Commission for the Reduction of Greenhouse Gas Emissions from Deforestation and Forest Degradation, Conservation of Forest Carbon Stocks, Sustainable Management of Forests and Increase of Forest Carbon Stocks – REDD+.

- Decree No. 5975, of November 30, 2006: Regulates Art. 12, final part, 15, 16, 19, 20 and 21 of Law No. 4771, of September 15, 1965; Art. 4, section III, of Law No. 6938, of August 31, 1981; Art. 2 of Law No. 10650, of April 16, 2003; amends and adds provisions to Decrees Nos. 6514/08 and 3420/00, and other provisions.

- Decree No. 2661, of July 08, 1998: Regulates the sole paragraph of Art. 27 of Law No. 4771, of September 15, 1965 (Forestry Code), through the establishment of precautionary norms related to the use of fire in agropastoral and forestry practices, and other provisions.

- Decree No. 58054, of March 23, 1966: Promulgates the Convention for protection of flora, fauna and scenic beauty of the countries of America.

- CONAMA Resolution No. 378, 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, of 10/19/2006: Creates and regulates data and information system on forest management within the scope of the National Environmental System - SISNAMA.

- CONAMA Resolution No. 16, of December 7, 1989: Establishes the Legal Amazon Environmental Assessment and Control Integrated Program.

- IBAMA Ordinance No. 438, of August 9, 1989: Changes the wording of Article 4 of Ordinance No. 218, of May 4, 1989.

- IBAMA Ordinance No. 218, of May 4, 1989: Provides for the felling and exploitation of native forests and forest formations native to the Atlantic Forest, and other provisions.

- MMA Ordinance No. 544, of October 26, 2020: Publishes the Internal Regulations of 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+.

- MMA Ordinance No. 370, of December 02, 2015: Establishes the National Strategy for Reducing Greenhouse Gas Emissions from Deforestation and Forest Degradation, Conservation of Forest Carbon Stocks, Sustainable Forest Management and Increase of Forest Carbon Stocks (REDD+) in Brazil-ENREDD+.

- MMA Ordinance No. 253, of August 18, 2006: Establishes, as of September 1, 2006, within the scope of the Brazilian Institute of the Environment and Renewable Natural Resources - IBAMA, the Document of Forest Origin - DOF replacing the Authorization for Transport of Forest Products - ATPF.

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

- SEPRT Ordinance No. 22,677, of October 22, 2020: Approves the new wording of Regulatory Standard No. 31 - Safety and Health at Work in Agriculture, Livestock, Forestry, Forestry and Aquaculture.

- IBAMA Normative Instruction No. 178, of June 23, 2008: Defines the guidelines and procedures, on the part of IBAMA, for consideration and approval regarding 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.

- MMA Normative Instruction No. 06, of December 15, 2006: Provides for forest replenishment and the consumption of forest raw materials, and other measures.

- MMA Normative Instruction No. 02, of May 10, 2001: Provides for the economic exploitation of forests on rural properties located in the Legal Amazon, including Legal Reserve areas, except for permanent preservation areas established in current legislation, which will be carried out through sustainable forest management practices for multiple uses.

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

- MMA Normative Instruction No. 1, of September 5, 1996: Deals with the Mandatory Forest Replenishment and the Integrated Forestry Plan.

State Legislation

- State Law No. 9.781, of December 27, 2022: Amends State Law No. 9.048, of April 29, 2020, which establishes the State Policy on Climate Change of Pará (PEMC/PA).

- State Law No. 7.389, of March 31, 2010: Defines activities with a local environmental impact in the State of Pará and other provisions.

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

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

- State Law No. 6.671, of July 27, 2004: Amends Art. 122 of State Law No. 5887, of May 9, 1995.

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

- State Law No. 6.462, of July 04, 2002: Provides for the State Policy on Forests and other forms of vegetation.

- State Law No. 5.977, of July 10, 1996: Provides for the protection of wild fauna in the State of Pará.

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

- State Decree No. 941, of 08/03/2020: Institutes the *Amazônia Agora* State Plan (PEAA), creates the Plan's Scientific Committee and the Permanent Plan Monitoring Nucleus, and other measures.

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

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

- State Decree No. 216, 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 August 10, 2010: Regulates actions directly or indirectly linked to agrosilvopastoral activities, carried out within areas of alternative land use, considered to have low environmental impact.

- State Decree No. 2.099, of January 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, of 06/05/2009: Establishes the Plan for Prevention, Control and Alternatives to Deforestation in the State of Pará and other measures.

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

- State Decree No. 2.592, of 11/27/2006: Establishes the Registry of Forest Product Explorers and Consumers in the State of Pará – CEPROF-PA and the System for Commercialization and Transport of Forest Products in the state of Pará SISFLORA-PA and its operational documents and other measures.

- State Decree No. 2.141, of June 31, 2006: Regulates provisions of Law No. 6462, of July 4, 2002, which provides for the State Policy on Forests and other forms of vegetation.

- State Decree No. 2.141, of 03/31/2006: Regulates provisions of State Law No. 6462 of July 4, 2002, which provides for the State Policy on Forests and Other Forms of Vegetation and other measures, with the aim of encouraging the recovery of altered and/or degraded areas and the recomposition of legal reserves, for energy, timber, fruit, industrial or other purposes, through forestry and agroforestry repopulation with native and exotic species and other provisions.

- State Decree No. 1.523, of 07/25/1996: Approves the Regulation of the State Fund for the Environment - FEMA, created by Law No. 5887, of May 9, 1995.

- Resolution No. 54, of October 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 in developing countries: approaches to stimulate action. Submission from Parties. (Translation: Reduzindo emissões de desmatamento em países em desenvolvimento: abordagem para estimular ação. Submissão das partes. 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 3 to 15 December 2007. Addendum. Part two: Action taken by the Conference of the Parties at its thirteenth session. (Translation: Relatório da Conferência das Partes sobre sua décima terceira sessão, ocorrida em Bali de 3 a 5 de dezembro de 2007. Addendum. Parte Dois: Ação tomada pela Conferência das Partes em sua décima terceira sessão ou “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 7 to 19 December 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 7 to 19 December 2009. Addendum. Parte Dois: 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 29 November to 10 December 2010. Addendum. Part Two: Action taken by the Conference of the Parties at its sixteenth session. (Translation: Relatório da Conferência das Partes sobre sua décima sexta

sessão, ocorrida em Cancun de 19 de novembro a 10 de dezembro de 2010. Addendum. Parte Dois: Ação tomada pela Conferência das Partes na sua décima sexta sessão ou "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 28 November to 11 December 2011. Addendum. Part Two: Action taken by the Conference of the Parties at its seventeenth session. (Translation: Relatório da Conferência das Partes sobre sua décima sétima sessão, ocorrida em Durban de 28 de novembro a 11 de dezembro de 2011. Addendum. Parte Dois: Ação tomada pela Conferência das Partes em sua décima sétima sessão. 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 26 November to 8 December 2012. Addendum. Part two: Action taken by the Conference of the Parties at its eighteenth session. (Translation: Relatório de Conferência das Partes sobre sua décima oitava sessão, ocorrida em Doha de 26 de novembro a 8 de dezembro. Addendum. Parte Dois: Ação tomada pela Conferência das Partes em sua décima oitava sessão.)

- FCCC/CP/2013/Add.1: Warsaw Framework for REDD-plus, held in Warsaw, Poland, from 11 to 22 November 2013 (Tradução: Pacote de Varsóvia para REDD+, ocorrida em Varsóvia, Polônia, de 11 a 22 de Novembro de 2013), em especial as seguintes decisões:

- Decision9/CP.19: Work programme on results-based finance to progress the full implementation of the activities referred to in decision 1/CP. 16, paragraph 70. (Translation: Programa de trabalho em financiamento baseados em resultados para o progresso da implementação completa das atividades referidas na decisão 1/CP. 16, parágrafo 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: Coordenação do suporte para a implementação de atividades relacionadas a ações de mitigação no setor florestal por países em desenvolvimento, incluindo arranjos institucionais.)

- Decision12/CP.19: The timing and the 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: O tempo e a frequência na qual são apresentadas as informações resumidas de como todos as salvaguardas referidas na dicisão1/CP.16, apêndice I, estão sendo abordadas e respeitadas.)

- 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: Guia e procedimentos para avaliação técnica das submissões das Partes em propostas de níveis de referência em emissões florestais e/ou níveis de referência florestal.)

- Decision14/CP.19: Modalities for measuring, reporting and verifying. (Translation: Modalidades para medir, reportar e verificar.)

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

- FCCC/CP/2015/Add.1: Report of the Conference of the Parties on its twenty-first session, held in Paris from 30 November to 13 December 2015. Addendum. Part two: Action taken by the Conference of the Parties at its twenty-first session. (Translation: Relatório de Conferência das Partes sobre sua vigésima

primeira sessão, ocorrida em Paris de 30 de novembro a 13 de dezembro. Addendum. Parte Dois: Ação tomada pela Conferência das Partes em sua vigésima primeira sessão).

- 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 4 November 2016. (Translation: Paris Agreement: Legally binding global agreement establishing a global framework to prevent dangerous climate change by limiting global warming well below 2°C and pursuing efforts to limit it to 1.5°C. Effective 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). (Translation: Decisions adopted by the Conference of the Parties (COP): Especially decisions 1 (preparation for the entry into force of the Paris Agreement), 3 (Warsaw International Mechanism for Loss and Damage associated with the Impacts of Climate Change), 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 of the implementation of the Paris Agreement. (Translation: Decisions adopted by the COP: Especially decision 1 reporting on the progress of 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, de 03/03/1973: “Convention on International Trade in Endangered Species of Wild Fauna and Flora”, assinada em Washington D.C. em 03 de março de 1973, alterado em Bonn em 22 de junho de 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). (Translation: Article 6 of the Paris Agreement (2021): Decision 1/CP.21 mandated SBSTA to operationalize the provisions of this Article by recommending a set of decisions to the COP that acts as the meeting of the Parties to the Paris Agreement at its first session. At COP26, the Parties to the Paris Agreement at their 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. (Translation: Glasgow Leaders' Statement on Forests and Land Use (2021): Signatories (including Brazil) pledge to reverse and end deforestation by 2030).

- Brazilian Nationally Determined Contribution (NDC): First Brazilian NDC submitted in 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. (Translation: Brazilian Nationally Determined Contribution (NDC):

First Brazilian NDC submitted in September 2015 to the United Nations Framework Convention on Climate Change for mitigation, adaptation and means of implementation, consistent with the purpose of the contributions to achieve the final objective of the Convention, in accordance with Decision 1/CP.20, paragraph 9. The updated Brazilian NDC was presented at COP26 on December 8, 2022).

2.5.8 Approvals (G5.7)

Project proponents gained recognition and approval of the implementation of the Tueré REDD+ Project with stakeholders through virtual meetings, lectures and face-to-face meetings with communities, partners, proponents and authorities mentioned in Section 2.3.

In November 2022, the first project presentation and consultation with the initially selected communities took place, a process that gave rise to the report prepared by STA, which contains the results of the socioeconomic diagnosis (SDR) (Section 2.1.6 for more details).

Subsequently, there was a feedback event, the feedback to the communities, to present the results of the socioeconomic diagnosis and information on the activities, impacts and benefits of the project and communication channels, held between August 5 and 8, 2023. These actions occurred through community involvement, provided by efficient dissemination through direct communication with community leaders. In the feedback event, participants were able to understand, clear up doubts and collaborate with the design and development of the Project as described in Section 2.3.7.

In addition to these stakeholder participation meetings and meetings, the Project will go through the public consultation event on Verra's registration platform for comments, suggestions and clarification of doubts about the Tueré REDD+ Project, scheduled to take place on October 6, 2023 on November 5, 2023. The importance of the actors' engagement and collaboration in this process was reinforced by sending formal invitations to those directly and indirectly involved with the forest conservation sector, community associations, non-governmental organizations (NGOs), educational institutions, government agencies and private companies. This invitation was made by email, with information about the project and an invitation to participate in the public consultation. In addition, letters were sent to relevant local institutions in the state of Pará, such as the State Public Prosecutor's Office and other government and federal agencies, containing information about the public consultation, as well as the context of the project and the communication channels used.

It is worth mentioning that despite the advances of the National REDD+ Strategy in Brazil (ENREDD+), the processing of Bill nº 572/2020 and the resumption of the Pará Forum on Climate Change and Adaptation (FPMAC), demonstrated in Section 2.5.7, there are still no policies REDD+ officials at the national or jurisdictional level. However, the proponents of the Project are always aware of the new information, always present in the discussion forums of the 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)

Brascomp is the legitimate owner of the properties where the Tueré 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 by the Project proponents.

2.5.10 Double Counting Risk Management (G5.9)

The Tueré REDD+ Project generates benefits for climate, communities and biodiversity. However, only net greenhouse gas (GHG) reductions and removals will be traded after being properly registered on a trading platform.

2.5.11 Emissions Trading Program and Other Bound Limits

Not applicable.

2.5.12 Other Forms of Environmental Credit

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

2.5.13 Participation under Other GHG Programs

The Tueré 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 Verified Carbon Standard (VCS) and Climate, Community and Biodiversity Standard (CCBS).

2.5.14 Projects Rejected by Other GHG Programs

The Tueré REDD+ Project has not undergone 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 has brought the issue of REDD+ for debate since the beginning of discussions on the subject in the context of international climate conferences. In 2009, the Paraense Forum for Climate Change and Adaptation (FPMCA) was created, which in 2019 was reactivated through a Decree of Law signed by the governor of the state of Pará[65]. The FPMCA, among its objectives, guides and subsidizes the elaboration and implementation of the State Policy on Climate Change of Pará (PEMC/PA). One year after the reactivation of the FPMCA, a law was published that instituted the PEMC/PA[66], amended in 2022[67], and which provides for the planning and execution of plans, actions and programs related to climate change through policies, research and technical studies focused on services environmental issues and Reducing Emissions from Deforestation and Forest Degradation (REDD+)[68].

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 and forest conservation and management. In this sense, in December 2021, the FPMCA approved the creation of the Technical Chamber of Bioeconomy to compose the State Council on Climate Change which, among several

[65] 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
[66] GOVERNMENT OF THE STATE OF PARÁ. Law No. 9048, of April 29, 2020. Available at: https://www.semas.pa.gov.br/legislacao/files/pdf/4093.pdf
[67] GOVERNMENT OF THE STATE OF PARÁ. Law No. 9.781, of December 27, 2022. Available at: https://www.semas.pa.gov.br/legislacao/files/pdf/212496.pdf
[68] AGENCY PARÁ Paraense Forum on Climate Change and Adaptation debates advances with society. Available at: https://agenciapara.com.br/noticia/24012/.

strategies, includes the regulation of the REDD+ jurisdictional system in Pará, training on REDD+ and the carbon market and actions for eligibility in carbon certification[69].

Given this context, in February 2022 the 1st Seminar on Payments for Environmental Services (PES) 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 REDD+ jurisdictional system in Pará, taking into account the challenges and possible solutions in the areas of REDD+, such as payments for Environmental Services (PSA) and the carbon market in the State of Pará[70]. In April 2023, the third meeting of the working group that is preparing the bases of the jurisdictional REDD+ policy in Pará was held, which involved the involvement of entities representing the peoples and traditional communities of the state[71].

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

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 voluntary or unregulated market operations.

With specific regard to the Tueré REDD+ Project, the proponents of the project (Brascomp and Biofilica Ambipar) will use the Verra registration platform both for registration and for the issuance and commercialization of credits (VCUs). There will be a guarantee, through contracts with the buyers, that any and all credits negotiated will go through the registration and issuance process with immediate accounting and, as soon as the sale is concluded, the credits will be retired or transferred to the buyer's account and consequently will be avoided double counting.

3 CLIMATE

3.1 Methodology Application

3.1.1 Methodology Title and Reference

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

3.1.2 Methodology Applicability

For the Project, the methodology approved by the VCS, code VM0015, was used, which is applicable according to the applicability criteria specified in Table 12 Criteria for applicability of the methodology for the Tueré REDD+ Project.

[69] SEMAS - STATE SECRETARIAT FOR THE ENVIRONMENT AND SUSTAINABILITY 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/.
[70] AGENCY PARÁ Semas and IPAM discuss in a seminar jurisdictional system of REDD+ and carbon market. Available at: https://agenciapara.com.br/noticia/35041/.
[71] SEMAS - STATE SECRETARIAT FOR THE ENVIRONMENT AND SUSTAINABILITY OF PARÁ. SEMAS continues with the elaboration of the Plan for Institutional Strengthening of the Redd+ System of Pará. Available at: https://www.semas.pa.gov.br/2023/04/13/semas-prossegue-com-elaboracao-do-plano-de-fortalecimento-institucional-do-sistema-da-redd-do-para/

Table 12 - Criteria for applicability of the methodology to the Tueré REDD+ Project.

APPLICABILITY CRITERIA	DESCRIPTION OF HOW THE PROJECT MEETS THESE CRITERIA
(a) baseline activities may include planned or unplanned logging, firewood collection, charcoal production, agricultural and grazing activities as long as the category is unplanned deforestation under the latest version of the VCS AFOLU Requeriments.	Project baseline activities include unplanned deforestation as a result of agricultural and livestock activities, as per 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 methodology scope description.	Project activities include forest protection with logging, in accordance with the description of 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 forest, including but not limited to primary forests, degraded forests, secondary forests, planted forests and agroforestry systems, obeying 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 start of the Project, the Project area shall only include areas qualified as "forest" for a minimum of 10 years prior to the Project start date.	The project area only includes 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 on peat. Peat should be defined as organic soils with at least 65% organic matter and minimum thickness of 50 cm. If the Project area includes lowland forests that develop into peat (e.g. peat forests), this methodology is not applicable.	Forest types found in the project area do not include forested wetlands or peatswamp forests.

3.1.3 Project Limits

VM0015 Step 1 - Definition of limits

VM0015 Step 1.1 – Project Spatial Limits

- **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 20 –). The main criteria used to define the spatial limits of the reference region, and thus demonstrate the conditions of compatibility in the probability of future deforestation, were:

a. Probable area of action and influence of the agents and drivers of deforestation;

b. Landscape configurations and ecological conditions;

c. Socio-economic and cultural conditions

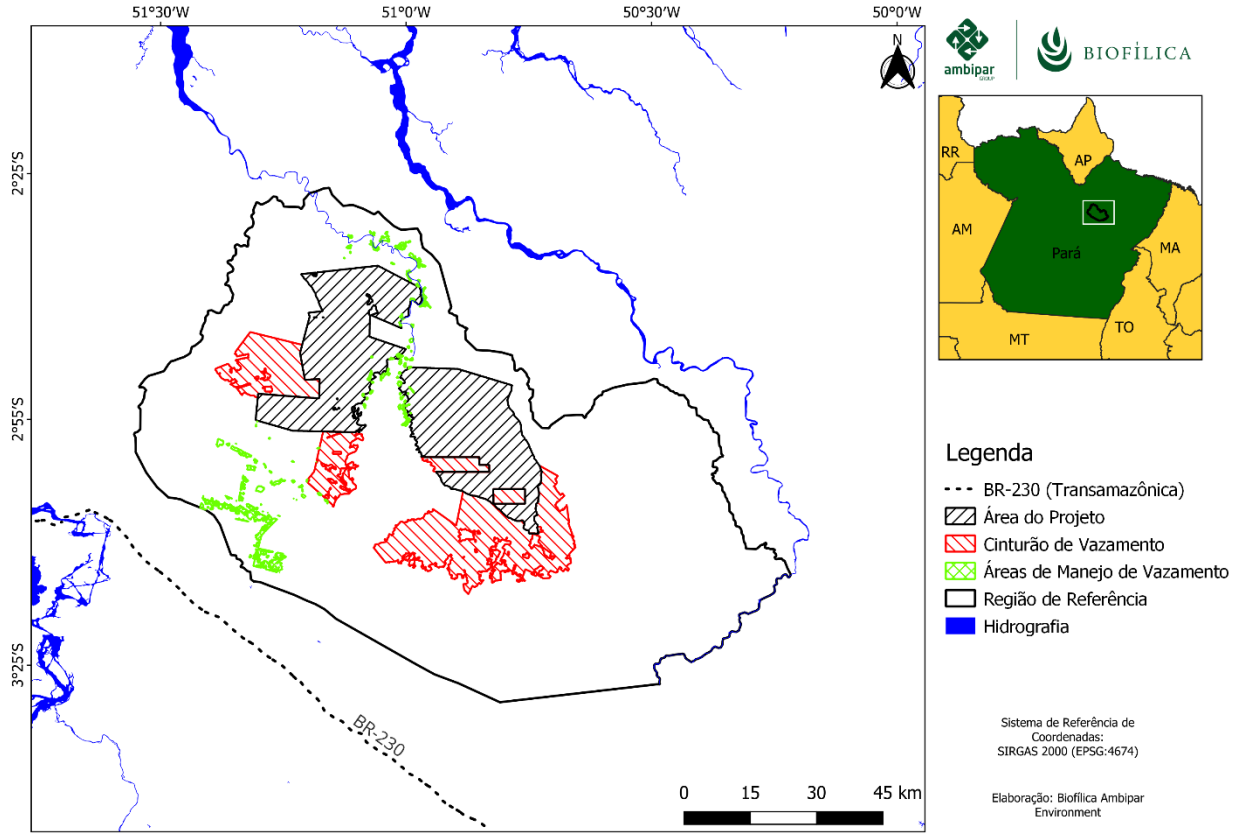


Figure 20 – Boundaries of the Reference Region, Project Area, Leakage Belt and Leakage Management of the Tueré REDD+ Project

Thus, the proposed reference region corresponds to an area of 953,767 hectares, equivalent to 7 times the Project Area (135,342 hectares). To determine the reference region, a set of sub-basins located in the region was considered. Thus, the hydrographic context, proximity to federal highways and unofficial roads (branches), together with the land situation of the areas surrounding the Project Area (private properties) were the main elements used to determine the geographical limit of the Region of Reference. The Reference region has only one stratum to analyze the actions of agents and drivers of deforestation 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 vectors: no infrastructure such as highways and hydroelectric plants is planned to be implemented near the project area.

b. Landscape configuration and ecological conditions:

- 100% of the Project Area has the same vegetation classes present in 100% of the rest of the Reference Region.
- The elevation in 90% of the project area is within the 90% elevation range of the reference region (Table 3)
- The average slope in 95% of the project area is within at least 90% of the average slope of the reference region (Table 3).
- The project area has average annual rainfall within a similar rainfall range (± 2%) of the reference region

The values obtained in the analysis of these criteria are presented in the tables Table 2 and Table 3.

c. Socio-economic and cultural conditions: The legal status of the land in the Project Area in the baseline scenario can be observed at various locations in the reference region. The land situation of the Project area (private property) occurs in 86% of the reference region. The current and projected land use and land cover classes in the Project Area are the same throughout the reference region. They are: a) Forest and b) Anthropized Vegetation. The Project Area is governed by the same laws and regulations applied throughout the Reference Region.

Table 13 - Spatial attributes of landscape configuration and ecological conditions in the Reference Region and Project Area.

Landscape element	Source	Reference Region	Project Area
Dense Ombrophylous Forest	IBGE	100%	100%
Elevation (m)	SRTM	-20- 180	-1- 104
Slope (degrees)	SRTM	0 – 48.11	0 – 33.99
Average annual precipitation (mm)	CHIRPS V.2	2173-3121	2193-3191

Table 14 - Percentiles of topographic variables in the Project Area and Reference Region.

Percentile	Elevation (m)		Slope (degrees)	
	RR	AP	RR	AP
0	-20.00	-1.00	0.00	0.00
5	35.00	43.56	0.93	0.93
10	46.24	55.35	1.86	1.31
15	53.11	60.42	2.07	1.86
20	58.21	64.00	2.07	2.07
25	62.16	67.42	2.88	2.07
30	66.20	68.69	2.88	2.62
35	69.28	70.74	3.34	2.88
40	72.15	72.62	3.86	2.88

Percentile	Elevation (m)		Slope (degrees)	
	RR	AP	RR	AP
45	74.19	73.70	4.14	3.34
50	76.34	75.56	4.67	3.86
55	79.13	76.43	5.24	3.86
60	81.28	77.00	5.89	4.67
65	84.03	78.39	6.62	4.67
70	86.20	80.28	7.12	5.40
75	89.19	81.16	7.89	5.88
80	92.06	83.46	9.15	6.62
85	96.19	84.77	10.37	7.89
90	101.12	86.50	12.11	9.39
95	110.38	89.92	14.62	12.11
100	180.00	104.00	48.11	33.99

- **Project Area**

The Tueré REDD+ Project has an area of 135,342 hectares and its delimitation is presented in the Figure 20 –. The limits of the project area were defined considering the existing forest area inside the properties called Santo Antônio and Terra Alta owned by Brascomp Compensados do Brasil S.A. The description of tenure, property rights and land documents were dealt with in Section 2.5.

The estimate of forest cover for the Santo Antônio and Terra Alta properties, in the year of the beginning of the REDD+ project, was based on PRODES/INPE data. Areas planned for the implementation of the Project's infrastructure must be excluded and estimates presented in the certification process.

- **Leakage Belt**

The Tueré REDD+ Project is not located within a jurisdictional project, so the VM0015 methodology recommends defining an area called the Leakage Belt. The Leakage Belt is the area around or adjacent to the Project Area in which baseline activities may be displaced due to project activities. The total area of the leakage belt corresponds to 92,759 hectares. There is no data or studies available in the reference region that demonstrate that economic advantage is an important driver of deforestation. Thus, the leakage belt was defined using the mobility approach (option II indicated by the approved VCS methodology VM0015 version 1.1, page 24).

To define the spatial limits of the leakage belt, the multi-criteria approach was applied, combining the deforestation risk map for the first 6 years, which identifies areas with conditions for deforestation to occur, with data from the Project Area and maps of private properties located near the project area.

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

a. Deforestation risk map (as a proxy for areas with greater or lesser ease of access and close to other areas already deforested)

b. Limits of georeferenced rural properties from the Rural Environmental Registry (CAR)

c. Rural properties with controlled access (these properties have a certain level of access control to the interior of the forest, therefore greater restriction of the deforestation agent).

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

- Limits of rural properties georeferenced by INCRA (Sigef Brasil)
- Settlement limits by INCRA
- 2022 Tueré REDD+ Project Area
- The deforestation risk map for the first 6 years of the project
- **Leakage Management Area**

The leakage management areas were defined considering the following criteria: areas already deforested within the limits of the PDS Anapu IV and within a 10km radius of the communities where the project intends to develop activities, these communities are Jatobá, Canada, Ipixuna and Bom Futuro. The total area of Leakage Management Areas is 7,696 hectares.

- **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 720,034 hectares in August 2022 (end of the historical reference period). The forest definition adopted by PRODES is in accordance with the forest definition contained in Appendix I of VM0015 v1.1 (page 124). The Figure 21 – shows the areas covered by forests in the Reference Region in August 2022 (Forest Cover Benchmark Map).

Time limits

a. Start and end date of the Historical Reference Period: 08/02/2012 and 08/26/2022. These dates were defined mainly considering the reference period of PRODES data, used to generate the land cover maps and meet the requirements of the methodology VM0015.

b. Start date and end date of the first fixed baseline period: The fixed baseline period is 6 years as updated in VCS Standard version 4.2. In the approved methodology VM0015 version 1.1 the baseline period is still 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 of being at least 1 year.

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

Step 1.3 of VM0015 – Carbon Reservoirs

The carbon reservoirs analyzed in the Tueré REDD+ Project are shown in Table 15. Details of the methodology used to calculate the reservoirs considered were made available to the audit team through the carbon stock report carried out in the Project Area.

Table 15 - Carbon pools considered in the Tueré REDD+ Project (Table 3 of Methodology VM0015, page 26).

Carbon Pool	Included/Excluded	Justification/Explanation
Above the ground	Arboreal: Included	Changes in the carbon stock of this pool are 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 methodology VM0015)
Below ground	Included	Significant reservoir for the forest typology of the Project Area, representing between 15 and 40% of the total carbon stock (>10%)
Dead wood	Included	Significant reservoir for the forest typology of the Project Area, representing 7% of the total carbon stock.
Wood Products	Excluded	Omitted for conservatism, pool present only in scenario with Project
Litter	Excluded	Excluded in accordance with "VCS AFOLU *Requirements*, v4.3"
Soil organic carbon	Excluded	Excluded when land cover is grassland in baseline scenario as per "VCS AFOLU *Requirements*, v4.3"

Table 16 - GHG sources included or excluded within the limits of the Tueré REDD+ project area (Table 4 of methodology VM0015).

Sources		Gas	Included/Excluded	Justification/Explanation
Baseline	Biomass Burning	CO_2	Excluded	Accounted for as changes in carbon stocks
		CH_4	Excluded	Not significant according to "VCS AFOLU requirements, v4.3"
		N_2O	Excluded	Considered insignificant according to "VCS AFOLU Requirements, v4.3"
	Emissions from farmed animals	CO_2	Excluded	Not significant with "VCS AFOLU requirements, v4.3"
		CH_4	Excluded	Not applicable 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

Sources		Gas	Included/Excluded	Justification/Explanation
		N_2O	Excluded	Not applicable 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

3.1.4 Baseline Scenario

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

- **Gathering the appropriate information**

To map the classes of land use and land cover, data from the PRODES program, made available by the National Institute for Space Research (PRODES, 2005), were used. The PRODES program uses images from the Landsat series of satellites and others to map annual clear-cut deforestation and monitor the forest remnant. PRODES data in raster format provided by the Terra Brasilis system were analyzed in the following thematic classes: forest, hydrography and anthropized vegetation (deforestation). The images cover the period from August 2012 to August 2022 and correspond to orbits/points 224-62; 225-62 (Table 17). The maps produced by PRODES have a methodology and estimate of the accuracy of the mapping of classes recognized by the national and international scientific community.

Table 17 - List of satellite images used by the PRODES System to monitor deforestation in the project's Reference Region over the historical period.

Vector (Satellite or airplane)	Sensor	Resolution		Coverage	Acquisition date	Scene ID	
		Spatial (m)	Spectral	(km^2)	(DD/MM/YY)	Path/ Latitude	Row/ Longitude
DMC-UK2/IRS1	SLIM6/LISS-3	32/23.5	0.52 – 9.00 µm	6,400	Thursday, August 02, 2012	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	07/18/2013	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	09/11/2013	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	07/28/2014	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	08/22/2014	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	07/15/2015	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	07/15/2015	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	09/01/2015	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	09/10/2015	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	09/10/2015	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	09/26/2015	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	11/29/2015	224	62

Vector (Satellite or airplane)	Sensor	Resolution		Coverage	Acquisition date	Scene ID	
		Spatial (m)	Spectral	(km^2)	(DD/MM/YY)	Path/ Latitude	Row/ Longitude
Landsat	OLI	30	0.45 – 2.35 µm	34,225	02/24/2016	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	07/17/2016	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	07/26/2016	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	08/27/2016	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	07/20/2017	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	07/29/2017	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	07/16/2018	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	08/24/2018	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	08/11/2019	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	08/20/2019	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	09/06/2019	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	07/28/2020	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	08/06/2020	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	08/06/2020	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	07/24/2021	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	08/06/2021	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	08/06/2021	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	07/24/2022	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	08/26/2022	224	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	08/26/2022	225	62
Landsat	OLI	30	0.45 – 2.35 µm	34,225	08/26/2022	225	62
Planet	Multiespectral	3.7	0.45 - 0.86 µm	Image Mosaic June 2023			

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

The land cover classes present in the reference region on the project start date (PRODES raster data) are: Forest; Hydrography and Equilibrium Anthropized Vegetation (Table 18). The description of each class and code (ND) and its existing area before the start of the project (2022) is presented below:

- Forest (ND = 0 with 720,083 ha): areas of forest remnant belonging to the Dense Ombrophilous Forest phytophysiognomies.

- Anthropized Vegetation in Balance (ND = 1 with 232,046 ha): areas of deforested forests converted to other land uses (mosaic of different types of vegetation that includes pastures, swiddens, plantations and secondary vegetation).

- Hydrography (ND = 3 with 1,647 ha): water bodies (rivers, lakes, streams, among others).

Table 18 - Classes of existing land use and land cover in the Reference Region (table 6 of VM0015).

Class Identification		Carbon Stock Trend	Present in[1]	Baseline Activity[2]			Description
ID_{cl}	Name			LG	FW	CP	
1	Anthropized Vegetation in Balance	Constant	RR, LM.	No	No	No	Forest areas deforested by clearcutting and with a different type of vegetation than the Ombrophilous Forest
2	Forest	Descending	RR, PA, LK.	Yes	Yes	Yes	Remaining forest
3	Hydrography	-	RR	No	No	No	Water bodies

1 - RR: Reference Region: PA: Project Area: LB: Leakage Belt; LM: Leak Management Areas

2 - LG: Logging. FW = Firewood Collection; CP = Coal Production (yes/no).

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

In the spatial modeling of future deforestation, the changes (Table 19) from areas with Forest (Class I1) to areas with Equilibrium Anthropic Vegetation (Class F1) within the Project Area and in the Leakage Belt (Table 18) were considered.

Table 19 - Definition of land use and land cover change categories (Table 7.b of VM0015)

IDcl	Name	Carbon Stock Trend	Present in	Baseline Activity			Name	Carbon Stock Trend	Present in	Baseline Activity		
				LG	FW	CP				LG	FW	CP
I1/F1	Forest	Descending	PA	Yes	Yes	Yes	Anthropized Vegetation in Equilibrium.	Constant	RR. ML	No	No	No
I1/F1	Forest	Descending	LK	Yes	Yes	Yes	Anthropized Vegetation in Balance	Constant	RR. ML	No	No	No

1 - RR: Reference Region: PA: Project Area: LB: Leakage Belt; LM: Leak Management Areas

2 - LG: Logging. FW = Firewood Collection; CP = Coal Production (yes/no).

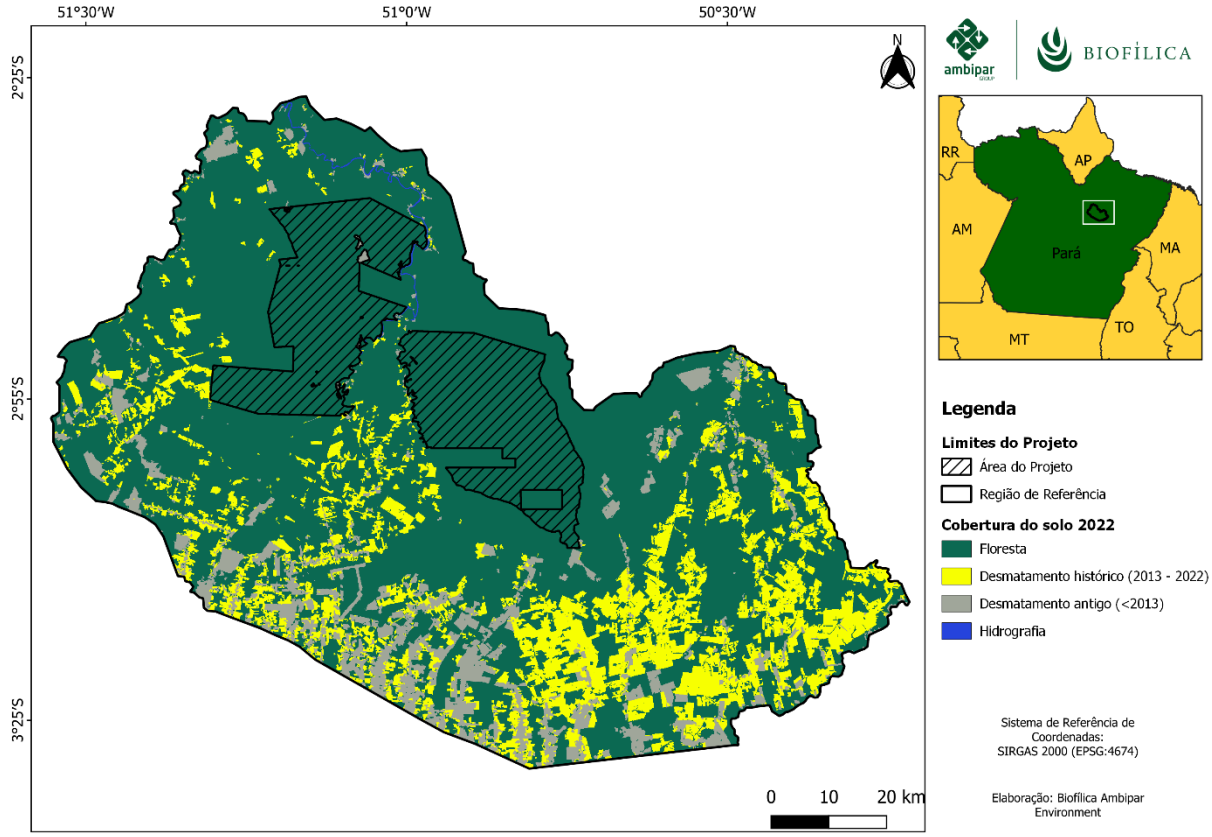


Figure 21 – Map of forest coverage in August 2022.

- **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. Pre-processing: the main image pre-processing procedures performed by PRODES consist of the steps of selecting images with less cloud cover, with acquisition date closest to the dry season in the Amazon and with adequate radiometric quality; georeferencing of images with a spatial resolution of 30 meters with topographic maps on a scale of 1:100,000 and images in NASA's orthorectified MrSID format.

b. Interpretation and Classification: the satellite image classification method used by PRODES follows four steps: i) a spectral mixture model is generated by identifying vegetation, soil and shade 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, non-forest vegetation, hydrography and deforestation (anthropized vegetation) classes; iv) Visual interpretation process directly on the computer screen using the geographic information system.

c. Assessment of Mapping Accuracy: Assessment of Mapping Accuracy: the assessment of the mapping provided by PRODES was carried out by comparing each class of the 2022 map with a set of 396 points randomly distributed in the reference region, 299 points in the Forest class, 96 in the Deforestation class and 1 in Hydrography. The reference data used in this step comes from the visual interpretation of a mosaic of high spatial resolution Planetscope images (June 2023) obtained from the planet plugin via Qgis. Using the random points distributed in the Reference Region and the Planet image, it was possible to evaluate the performance of the Prodes 2022 mapping through the analysis of the error matrix (Table 20). The overall accuracy of PRODES mapping in the Reference Region was 96%, with user and producer accuracy equal to 97% and 98% for forest and 95% and 91% for deforestation, respectively. The results are in line with the published global accuracy of the PRODES maps for the Legal Amazon, of 93%.

Table 20 - PRODES 2022 data evaluation error matrix.

		Prodes Classified x Planet						
		Reference (Planet)			Total	User accuracy	Totaç Class area (ha)	Wi
		Forest	Deforestation	Hydrography				
Classified	Forest	**289**	9	1	299	97%	719536	0.755
	Deforestation	5	**91**	0	96	95%	231888	0.243
	Hydrography	0	0	**1**	1	100%	1659	0.002
Total		294	100	2	**396**		953083	
Producer Accuracy		98%	91%	50%				
Map Accuracy								**96%**

- **Results of analysis of the history of changes in land use and land cover**

From PRODES data, we estimate that the deforestation that occurred between August 2012 and August 2022 (Table 21), in the reference region, was 149,816 hectares, or 17.22% of the forest cover in August 2012.

Table 21 - Matrix of potential changes in land use and land cover (table 7a of VM0015).

ID_{cl}		Name	Initial Class (2013)			Total (ha)
			Forest	Deforestation (Equilibrium Anthropized Vegetation)	Hydrography	
			I1	I2	I4	
Final Class (2022)	F1	Forest	720,034.65	0.00	0.00	720,034.65
	F2	Deforestation (Equilibrium Anthropized Vegetation)	149,816.40	82,254.68	0.00	232,071.08
	F3	Hydrography	0.00	0.00	1,660.86	1,660.86
Total (ha)			869,851.05	82,254.68	1,660.86	953,766.59

During the years 2013 to 2022, an average deforestation rate of 15,092 hectares per year (2.1% per year) was observed. The graph in Figure 22 shows the temporal variation of deforestation on an annual basis for the reference region during the period 2013 – 2022

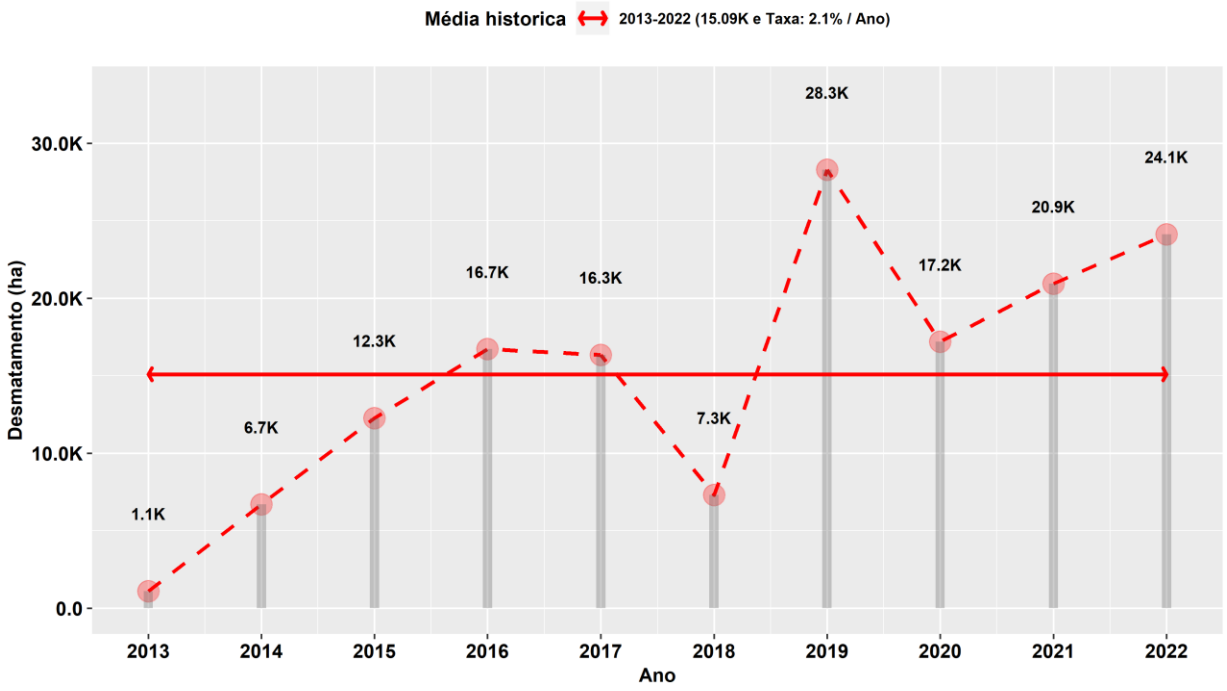


Figure 22 – Evolution of deforestation in the reference region

[Key: Historical Average – 2023 – 2022 (15.09K and 2.1% / Year Tax) – Deforestation(ha) – Year]

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

Under development.

Step 4 of VM0015 – Projection of Future Deforestation

- **Projection of the Amount of Deforestation**

The Reference Region was not stratified, since the characteristics of the agents, drivers and causes of deforestation are the same throughout its extension.

Selection of baseline methodology

The methodology VM0015 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 of the deforestation rate. We opted for the "a" (historical average) approach of sub-step 4.1.1 of the VM0015 methodology to project the baseline of deforestation. In this approach, the baseline deforestation rate is assumed to be a continuation of the average annual rate measured over the historical reference period in the reference region.

Quantitative projection of future deforestation

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

As mentioned, the historical average approach was used to project the annual baseline deforestation areas in the reference region. The annual deforestation area from baseline in year t within the reference region was calculated as indicated in equation 3 of VM0015 version 1.1:

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

Where:

$ABSLRR_{i,t}$	Baseline annual deforestation area in stratum i within the reference region in year *t*; ha yr^{-1}
$ARR_{i,t-1}$	Area with forest cover in stratum i within the reference region in the year *t-1*: ha
$RBSLRR_{i,t}$	Deforestation rate applicable to stratum i in the reference region in year t; %
t	1, 2, 3 … *T*, one year of the proposed project crediting period; dimensionless
i	1, 2, 3 … I_{RR}, a stratum within the reference region; dimensionless

The area with forest cover within the reference region in 2022 (ARR) was 720,034 hectares. The deforestation rate measured between 2013 and 2022 (RBSLRR) was calculated as indicated by Puyravaud (2003), obtaining a value of 2.10%.

Summary of the quantitative projection of future deforestation

Areas of projected annual deforestation were spatially distributed across the entire Reference Region using the procedures described in the next section. Baseline deforestation in the Project Area and Leakage Belt corresponds to baseline deforestation allocated in these regions. The projected deforestation values for the

period 2023 to 2032 in the Reference Region (Table 22), Project Area (Table 23) and Leakage Belt (Table 24) are presented.

Table 22 - Deforestation projected for the Reference Region (Table 9a of methodology VM0015).

Project Year t	Stratum I of the reference region	Total	
	1	Annual	Cumulative
	$ABSLRR_{i,t}$	$ABSLRR_t$	ABSLRR
	ha	ha	ha
2023	15,120	15,120	15,120
2024	14,803	14,803	29,923
2025	14,492	14,492	44,415
2026	14,184	14,184	58,599
2027	13,889	13,889	72,488
2028	13,598	13,598	86,086
2029	13,310	13,310	99,397
2030	13,032	13,032	112,428
2031	12,758	12,758	125,186
2032	12,489	12,489	137,675

Table 23 - Projected deforestation for the Project Area (Table 9b of methodology VM0015).

Project Year t	Stratum I of the reference region in the Project area	Total	
	1	Annual	Cumulative
	$ABSLPA_{i,t}$	$ABSLPA_t$	ABSLPA
	ha	ha	ha
2023	757	757	757
2024	1,109	1,109	1,865
2025	1,375	1,375	3,240
2026	1,335	1,335	4,575
2027	1,368	1,368	5,943
2028	1,400	1,400	7,343
2029	1,252	1,252	8,595

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
2030	1,561	1,561	10,156
2031	1,472	1,472	11,628
2032	1,709	1,709	13,337

Table 24 - Deforestation projected for the Leakage Belt (Table 9c of methodology VM0015)

Project Year t	Stratum I of the reference region in the Leakage Belt 1 $ABSLLK_{i,t}$ ha	Total	
		Annual $ABSLLK_t$ ha	Cumulative ABSLLK ha
2023	1,849	1,849	1,849
2024	2,050	2,050	3,898
2025	1,945	1,945	5,843
2026	1,888	1,888	7,731
2027	2,195	2,195	9,927
2028	1,803	1,803	11,730
2029	1,604	1,604	13,333
2030	1,860	1,860	15,193
2031	1,752	1,752	16,946
2032	1,720	1,720	18,666

Projection of the Location of Future Deforestation

To project the location of future deforestation, Dinamica EGO software was used in its 7.4.0 version, a free platform for environmental modeling and an option for land use and land cover modeling. It involves a stochastic simulation of multiple time steps with dynamic spatial transition probabilities calculated within a spatial neighborhood.

For model parameterization, logistic regression or evidence weights are applied to indicate the most favorable area for each type of transition. Figure 23 shows the flowchart used to spatially model the deforestation of the Tueré REDD+ Project.

Dinamica EGO is indicated by the VM0015 methodology as appropriate for baseline modeling of REDD+ projects to prevent unplanned deforestation (AUD). The use of Dinamica EGO is justified for the following reasons: a) it is a model available in scientific publications (SOARES-FILHO et al., 2001; SOARES-FILHO; COUTINHO CERQUEIRA; LOPES PENNACHIN, 2002); b) it has a transparent process for input and output of data and processed parameters with an easy-to-understand graphical interface; c) incorporates the use of appropriate data to explain the location of deforestation; d) has an appropriate tool for evaluating uncertainties.

The main steps performed in this stage were:

1. Organization of georeferenced maps of land use and land cover, and georeferenced maps with explanatory factors of deforestation;

2. Model calibration by determining the weights of evidence (WoE shown in Figure 23) and analyzing the correlation between variables;

3. Assessment of model accuracy (Figure of Merit - FOM);

4. Development of baseline deforestation scenarios.

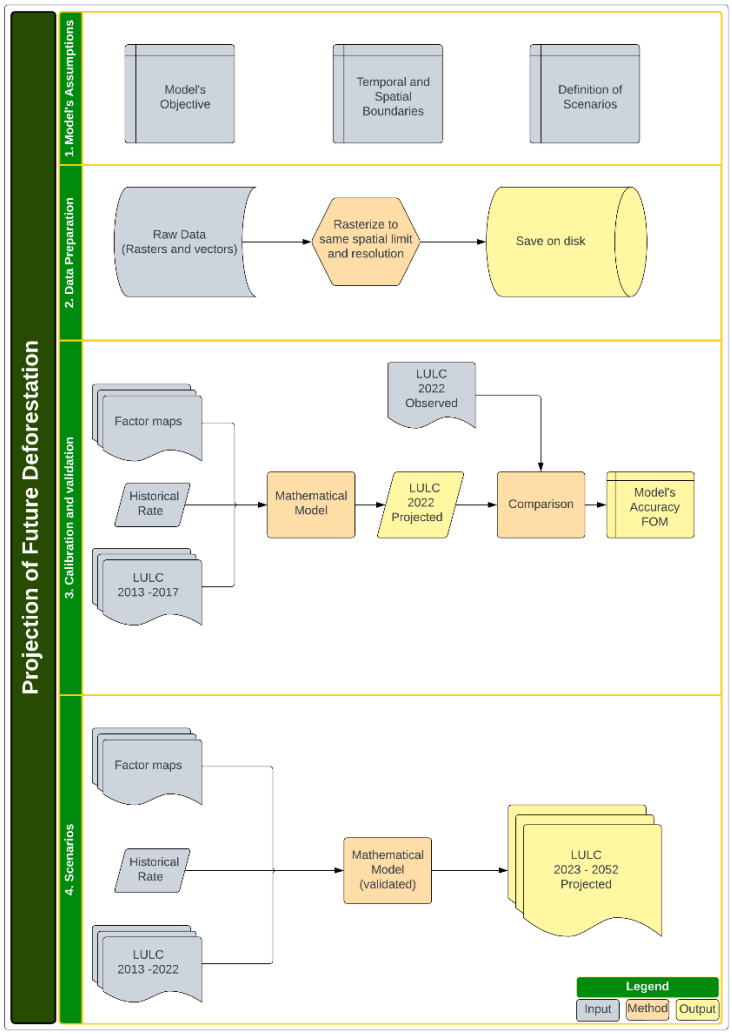


Figure 23 – Modeling steps and spatial projections of deforestation

Preparation of factor maps

To carry out this step, an empirical approach was used to create factor maps (spatial variables that explain the location of deforestation). Studies on deforestation in the Amazon show that distance maps of spatial attributes (roads, locations, etc.) and ecological aspects of the landscape (relief, soils and vegetation, etc.) are highly correlated with the location of new deforestation.

To prepare the risk map and calibrate the model for projecting future deforestation, Dinamica EGO software requires that the input spatial variables are independent before using them. Seven independent spatial variables (six static and one dynamic) were used to produce the deforestation risk map (Figure 24, Table 25). In Dinamica EGO the spatial data were processed with pixel size of ~100 x ~100 meters (01 hectare), GeoTiff format (Coordinate reference system: SIRGAS 2000).

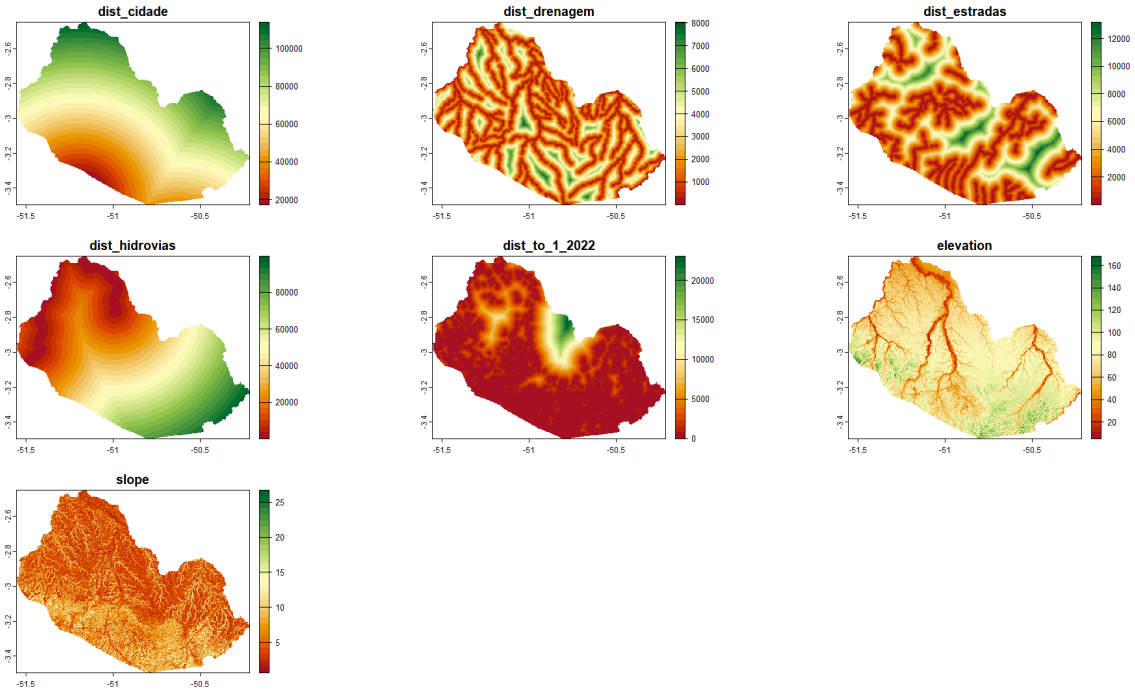


Figure 24 – Spatial variables used

Table - 25 List of maps, variables and factor maps (Table 10 VM0015).

Factor maps		Source	Represented variable		Meaning of categories or pixel values			Maps used to create		Algorithm or equation used	Comments
ID	File name		Unit	Description	Interval		Meaning	ID	File name		
1	dist_cidade.tif	IBGE	Meters	Euclidean distance to nearby municipalities	17308.89	113972.1	Lower values mean closer to municipalities	1	localidades AMZ.shp	Filter where TYPE2 equals “City” + Euclidean distance over a 40 km buffer of the Reference Region	
2	dist_drenagem.tif	ANA	Meters	Euclidean distance to drainage mesh	0.33	8092.81	Values close to zero mean closer to the drainage network	2	vw_drenagem.gpkg	Euclidean distance over a 40 km buffer of the Reference Region	
3	dist_estradas.tif	IBGE	Meters	Euclidean distance to the road network	0.13	13187.11	Values close to zero mean more high accessibility	3	estradas_finais_16032020.shp; Estradas_Federais_SNV_202201B.shp; Rodovias Estaduais_vw_cide_rod_2021.gpkg	Euclidean distance combining road types over a 40 km buffer of the Reference Region	
4	elevation.tif	NASA SRTM Digital Elevation	Meters	Shuttle Radar Topography Mission Elevation Data	-0.64	172.61	Higher values mean higher altitude	4	Elevation.tif	NA	
5	slope.tif	NASA SRTM Digital Elevation	Degrees	Slope	0.13	29.32	High values mean high slope	5	Elevation.tif	Calculation of slope on the elevation data	
6	Dist_hidrovias.tif	DNIT	Meters	Euclidean distance to waterways	2.27	99942.55	Values close to zero mean more high accessibility	6	Hidrovias_PNLT_2018.shp	Euclidean distance over a 40 km buffer of the Reference Region	
7	distance_to_1.tif	INPE and model output	Meters	Euclidean distance for the previous year's deforestation.	0	23.123	Values close to zero mean closer to previous deforestation.	7	distance_to_1.tif	Euclidean distance from previous year's deforestation class	In the first step, the PRODES 2022 data is used and in the next ones, the output of the model from the previous step is used dynamically.

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 (AGTERBERG; BONHAM-CARTER, 1990; BONHAM-CARTER, 2014) available in Dynamics EGO. This method calculates the probability of transition 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 the combinations of all static and dynamic maps.

The result of applying the evidence weights method in Dinamica EGO is a map of deforestation risk that identifies areas with a higher (1.0) and lower (0.0) probability of deforestation occurring (Figure 25). The spatial variables shown in Table 25 and Figure 24, together with the deforestation risk map, are the starting point for producing future deforestation baseline scenarios.

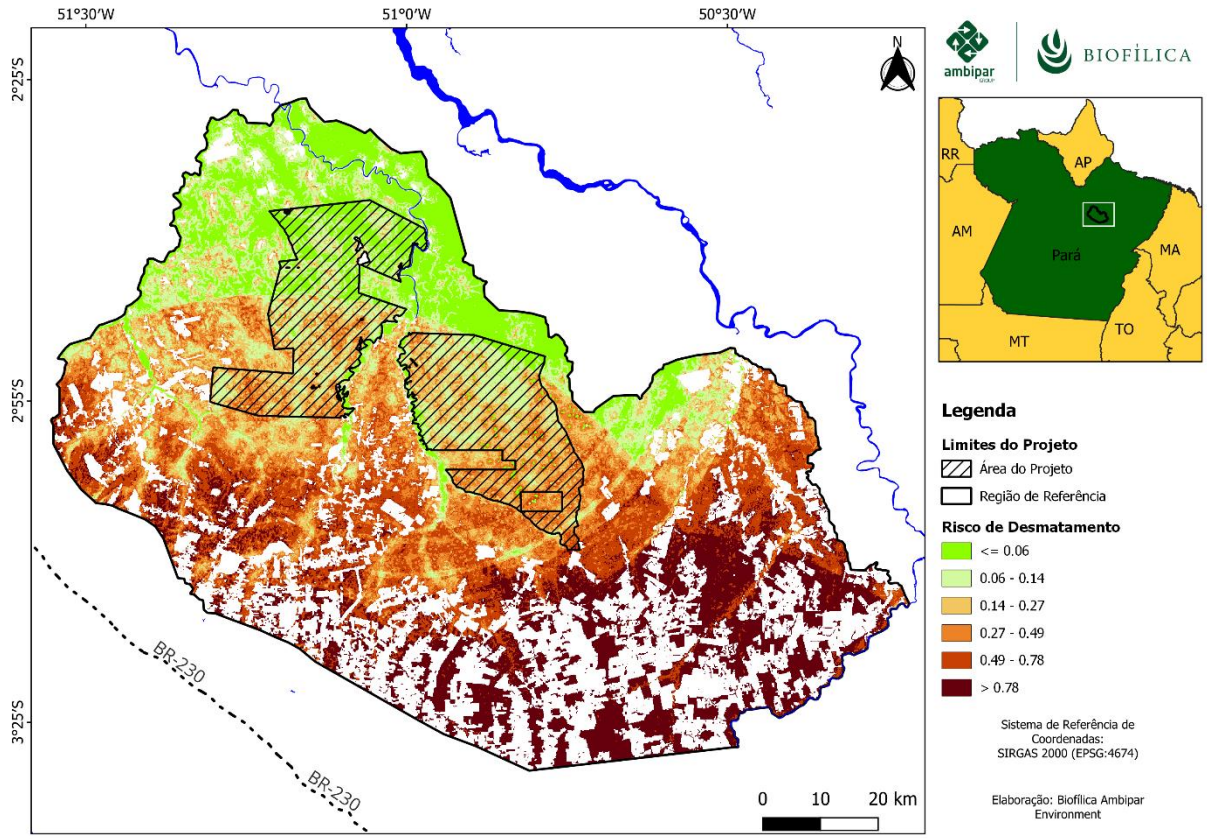


Figure 25 – Deforestation risk map in the Reference Region.

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

To evaluate the quality of the model produced, option "a" available in the VM0015 methodology version 1.1 was used: calibration and confirmation using two historical subperiods. Deforestation data that occurred between the years 2013 and 2017 and the variables listed in Table 25 were used to calibrate the model, while the deforestation map mapped by PRODES in 2022 was used for the confirmation process. In this process, a 2022 deforestation map was simulated from data observed between 2013 and 2017.

FOM (Figure of Merit) technique was used to assess the accuracy of the simulated map in 2022. 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) to the union of the observed change and the predicted variation, as defined in equation 9 of methodology VM0015.

Methodology VM0015 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 observed net change shall be calculated as the total area of modeled change in the reference region during the calibration period (percentage of total area of the reference region), and the FOM value shall 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 should be used.

The net change observed in the Reference Region was 5.46%, and the FOM value obtained by applying equation 9 of VM0015 was 9.65%. In this way, the FOM of the risk map produced is greater than the required threshold (Step 4.2.4 of VM0015). As a result, the deforestation risk map developed in the calibration stage offers good performance to spatially project land use changes until 2052 in the Reference Region of the Tueré REDD+ Project.

Spatial projection of future deforestation

The selection of pixels with the highest risk of deforestation was performed automatically by Dinamica EGO for a period of 10 years, starting in 2023. The results are shown in Figure 26, with deforestation in the Reference Region forecast for the first 10 years of the Project. In the developed baseline scenario, the Project Area would have deforested 13,337 ha over the first 10 years of the Project.

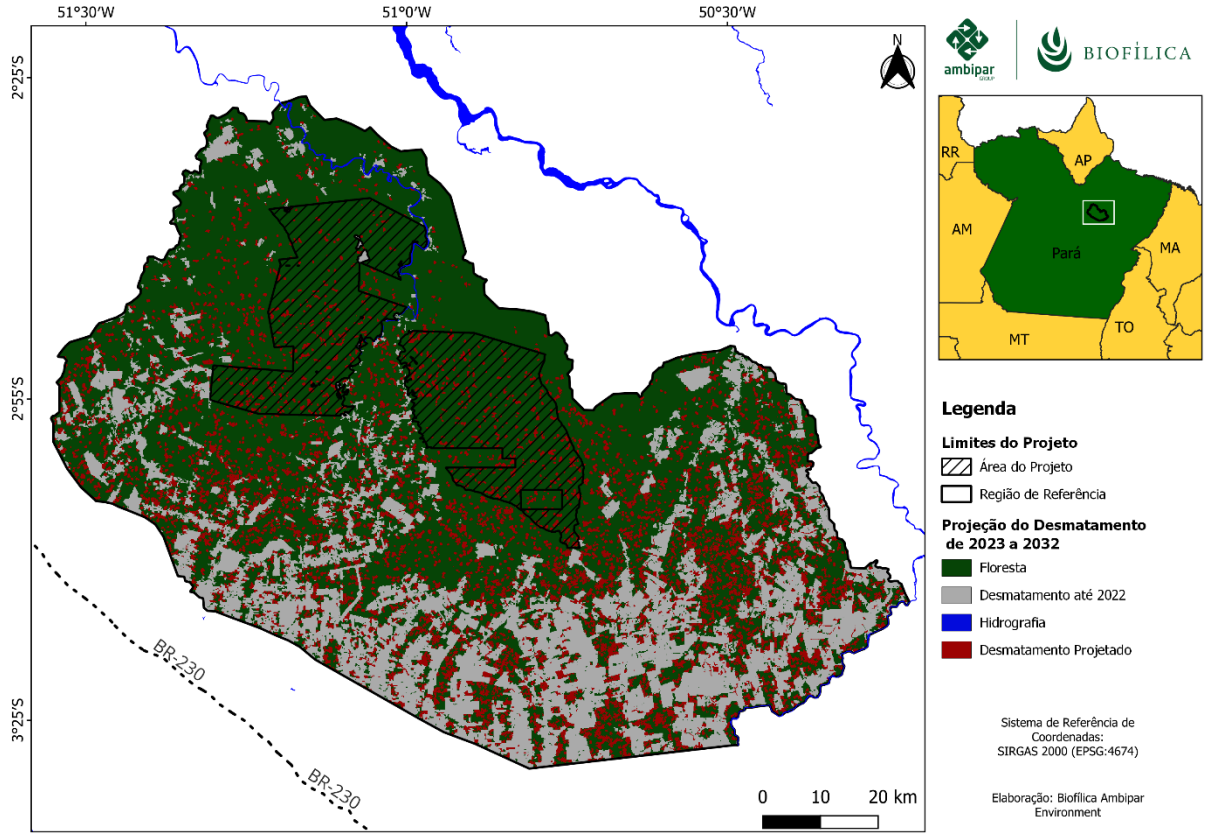


Figure 26 – Deforestation projected in 10 years in the Reference Region.

3.1.5 Additionality

The Tueré REDD+ Project proposes activities that help achieve the additionality provided by the chosen methodology. The additionality was analyzed according to the tool "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 1, 2012.

The conditions of applicability 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 a VCS AFOLU Project, and do not lead to the 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 determining the most plausible baseline scenario (see VM0015's "Part 2 – Methodology Steps for ex-ante estimation of GHG emissions reductions")

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

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

Among the realistic and credible alternative land use scenarios, three distinct scenarios were considered for analysis. Scenario (I) represents the situation where AFOLU Project activities would not take place, and land use would follow currently existing patterns. Scenario (II) considers the existence of forest management, but without the implementation of the specific activities of the REED+ project and without obtaining registration in the VCS. Finally, scenario (III) involves the implementation of the activities of the REED+ project, including forest management, but without obtaining registration with the VCS.

Socioeconomic and environmental diagnostic studies were used to describe the scenarios, which involved field consultation and literature review to support the material.

I) Continuation of land use prior to the Project:

The continuation of land use in the REED+ Tueré Project region encompasses practices harmful to the environment, mainly related to the deforestation activity of mature forests. Throughout the historical process, illegal loggers, squatters and land grabbers have become the main agents of deforestation in the Amazon. Its practices still influence the migration of more agents, attracted by the possibility of buying land, deforestation and agricultural production. These farmers and landowners enhance the degradation process initiated by the initial explorers, resulting in more habitat loss and altering the density and area of distribution of the species. This panorama can be seen by the indicators that show the historical growth of deforestation in the section 3.1.4 Baseline Scenario.

The occupation of the region where the project is located, now known as the municipality of Portel, occurred along the courses of rivers and streams. In general, the surrounding communities are composed of local families of the riverside population, formed between 1955 and 1970, and families of family farmers, some from Tocantins, organized in the PDS Virola Jatobá settlement founded in 2002. There is also the presence of private rural properties, of which 44% are medium to large. The predominant activities in the region are hunting, fishing, cattle breeding, timber extraction, collection of non-timber products and cassava crops,

which can interfere with the conservation of forests and biodiversity if there is no socioeconomic and environmental balance.

The riverside communities have low social organization, making it difficult to protect the limits and their performance on the site. In consultation, they reported that they do not have forest areas or forest management activities registered and that timber extraction is carried out in surrounding areas. In addition, they reported that the practice of farming is itinerant, carried out by cutting, felling and burning the forest, and that there is an intention to increase the fields for both subsistence and trade, mainly because cassava flour is the only product that generates considerable income for families today. Finally, they shared that they develop some sustainability practices to protect the environment in general, but they said that several animals that existed in abundance in the region are no longer seen by them, highlighting the local imbalance and demonstrating the need for more efficient control and conservation actions.

The population of the settlement is more organized, they have the Association of the Sustainable Development Project Virola Jatobá and a plan for the use of the area, approved by the managing body and the population, respecting sustainable guidelines. However, even with the plan, the organization and the land situation resolved, the PDS is the subject of a dispute by loggers and landowners in the region, suffering several invasion attempts. In 2017, the settlement's legal reserve area was in fact invaded, paralyzing management activities and proving the growing socio-environmental risk. Currently, the situation has not yet been resolved, and the invaders continue in the area exploiting wood and the PDS has not been reinstated by the courts.

On the surrounding privately owned rural farms, interviewed in the diagnosis, all showed an intention to increase their production by clearing new areas for cultivation, which generally uses the slash and burn technique mentioned in the previous paragraph. They also reported that they practice logging without identifying the areas where the extractions are carried out, which opens the possibility of extraction in neighboring areas and increases the risk of irregular and illegal deforestation.

Visibly the project region suffers from the continuous pressure of deforestation. Local populations report the frequent presence of "outsiders", that is, people who are not local and who practice activities considered illegal, such as logging, invasions and land grabbing, corroborating the historical process of the presence of deforestation agents in the place. Low governance by the state and federal governments increases the dynamics of the region, resulting in impunity for illegal practices, making clear the fragility of the territory and its vulnerability.

With the absence of the project, deforestation will advance according to the model foreseen and demonstrated in the section 3.1.4, totaling 13,337 hectares of deforestation in the project area by 2032. In this scenario, the action of the main agents of deforestation will not be prevented, there will be no control and inspection of privately owned agricultural production, communities will not have the economic strength to produce sustainably and will not have the leadership force to curb invasions and land grabbing, thus maintaining the growing deforestation on the remaining forests in the area.

II) Timber Forest Management without REDD+ activities and without registration as a VCS AFOLU Project:

The existing Sustainable Forest Management Project (PMFS) on the farms has 42 Annual Production Units (UPAs), with an average area of 2,133.88 ha, and corresponds to about 66% of the area of the Tueré REDD+ Project. This activity helps to guarantee the maintenance of carbon stocks with the application of reduced impact techniques and is considered more effective in the conservation of forest species compared

to alternative agricultural or silvicultural production systems, as mentioned by Gibson et al. (2011)[72], highlighting its relevance for environmental conservation. However, when correlated with the opening of areas for agriculture and illegal extraction, as presented in scenario (I), management does not present economic advantages.

Due to the supply and sale of wood of doubtful and/or illegal origin, from deforestation, the owner faces disadvantages in market competition, which negatively affects prices and profit margin, since its legalized and sustainable production cost is higher. The uncertainty of the market, coupled with the pressure of illegal deforestation, puts the management activity at risk, both due to the danger of invasion of property and the possibility of the entrepreneur not being able to maintain an economic advantage and choosing to sell their land. The combination of these factors creates a challenging scenario for the sustainability and viability of sustainable forest management. An example of this was the paralysis of the forest management operation carried out on the farms in recent years (2021 and 2022), precisely due to a drop in the market, which further weakens the area.

In this context, even with the adoption of guidelines and practices to minimize impacts on the forest, several challenges persist for sustainable forest management on private properties in the Amazon, such as the high cost involved, market volatility and the constant pressure for areas. The PMFS needs additional investments and activities to address this situation and the REED+ project presents solutions that support the practices adopted and complement them, making forest management viable and sustainable.

III) Timber Forest Management with REDD+ activities and without registration as a VCS AFOLU Project:

Although forest management contributes to ensuring the maintenance of carbon stocks, it also faces barriers, as presented in scenario (II). In addition, it does not protect forests from the action of external agents mentioned in scenario (I), especially in unmanaged and less supervised areas. Thus, the activities proposed by the REED+ project serve to ensure the protection of managed areas and add benefits to communities and biodiversity that are not achieved with management alone.

The combination of PMFS activities with those of the REED+ project, without VCS registration, mitigates the deforestation risks of the region, but does not make it economically viable. The economic viability of the management is considerably reduced without the inclusion of additional revenue from the commercialization of credits registered in the VCS, since the market volatility and the high cost associated with the sustainable management model continues to compromise the continuity of existing activities and there is no money to invest in new ones.

For the complementarity of REED+ activities to strengthen governance, improve infrastructure, promote sustainable practices, strengthen value chains, improve surveillance, conserve biodiversity and monitor deforestation, the additional revenue from verified carbon credits is essential. Also ensuring the economic viability of the management and generating more value for the legal and sustainable timber market.

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

Scenarios (II) and (III) are consistent with applicable laws and regulations as they relate to low-impact forest management activity and REED+ activity. The section 2.5.7 – National and Local Laws presents details of

[72] Gibson, L.; Lee, T.M.; Koh, L.P.; Brook, B.W.; Gardner, T.A.; Barlow, J., et al. (2011). Primary forests are irreplaceable for sustaining tropical biodiversity. Nature, 478(7369): 378-381.

the theme. The practices of the activities of scenario (I) are not in accordance with the applicable laws and regulations.

Considering Federal Law 12.651/2012 – Law for the Protection of Native Vegetation, also known as the Forest Code, and Normative Instruction No. 02/2015, on the Authorization for the Suppression of Vegetation – ASV, which discusses the suppression of native vegetation in rural areas or cutting of trees in urban areas, it is understood that any suppression is subject to the issuance of ASV by the governmental agency, whether state or federal.

Analyzing the Annual Report on Deforestation in Brazil carried out by MapBiomas in 2023[73], referring to the year 2022, it is highlighted that only 5% of the areas deforested in the Amazon biome in 2022 had ASV and that this license does not mean that the entire deforested area on the property is within the authorization, which may further reduce the percentage of regularized deforestation. The document, in the chapter on actions on deforestation, states that only 7.6% of deforestation alerts for the state of Pará, in the period from 2019 to 2022, suffered some type of authorization or inspection action from federal and state agencies, evidencing the difficulty of environmental institutions with control and inspection in the face of illegal suppression.

Corroborating the above scenario, the Legal Amazon Deforestation Bulletin through the deforestation alert system, prepared by IMAZON in 2021[74], exposed the increasing suppression of vegetation in the area, detecting an increase of 45% between April 2020 and April 2021, in which 26% were located in the state of Pará. In the State of Pará Forest Management Transparency Bulletin 2011-2012 (Monteiro et al., 2013)[75], the authors show that unauthorized logging, in 2011 and 2012, represented 78% of the total explored and that of these, 17% were found in Marajó (Portel and Bagre).

Portel, the municipality in which the Tueré REDD+ project is located, is the 10th municipality that most deforested between 2019 and 2022 in Brazil (MapBiomas, 2023)[76] and has been, since 2017, on the list of priority municipalities for actions to prevent, monitor and control deforestation in the Amazon, established by Decree No. 6.321/2007[77]. The reality of the region shows that, although there is legislation that prohibits the deforestation of the Amazon forest, its strength and applicability is extremely low, not producing the expected effects. In this perspective, the adoption of new practices is coherent so that illegal deforestation is contained.

Sub-step 1c. Baseline scenario selection

Described in the Section 3 – Application of the Methodology, item 3.1.4 Baseline Scenario.

Step 2. Investment analysis

Under development.

[73] MapBiomas, 2023. 2022 Annual Deforestation Report - São Paulo, Brazil. - 125 pages
[74] IMAZON 2021. Legal Amazon deforestation bulletin (April 2021) sad. Available at: <https://imazon.org.br/publicacoes/boletim-do-desmatamento-da-amazonia-legal-abril-2021-sad/> Accessed at: August 2, 2023.
[75] Monteiro, A., Cardoso, D., Conrado, D., Veríssimo, A., & Souza Jr., C. 2013. Transparency Bulletin Forest Management State of Pará (2011-2012) (p. 14). Belém: Imazon.
[76] MapBiomas, 2023, *op. cit.*
[77] BRASIL, 2007. DECREE No. 6,321, OF DECEMBER 21, 2007. Available at: <https://www.planalto.gov.br/ccivil_03/_ato2007-2010/2007/decreto/d6321.htm> Accessed on: 7/31/2023

Step 3 – Barrier Analysis

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, described in Step 2.

Step 4 – Common practice analysis

Under development.

3.1.6 Methodology Deviations

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 the Land Use and Land Cover Change Component in the Baseline

Calculation of baseline activity data by forestry class (Step 5.1 VM0015)

Result of basic projections of the Project indicates deforestation of 13,337 hectares for the Project Area between 2023 and 2032 and 18,666 hectares for the Leakage Belt.

Table 26 - Annual areas deforested by icl forest class within the Project Area in case of 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
2023	757	757	757
2024	1,109	1,109	1,865
2025	1,375	1,375	3,240
2026	1,335	1,335	4,575
2027	1,368	1,368	5,943
2028	1,400	1,400	7,343
2029	1,252	1,252	8,595
2030	1,561	1,561	10,156
2031	1,472	1,472	11,628
2032	1,709	1,709	13,337

Table 27 - Annual areas deforested by icl forest class within the Leakage Belt area in the baseline case (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
2023	1,849	1,849	1,849
2024	2,050	2,050	3,898
2025	1,945	1,945	5,843
2026	1,888	1,888	7,731
2027	2,195	2,195	9,927
2028	1,803	1,803	11,730
2029	1,604	1,604	13,333
2030	1,860	1,860	15,193
2031	1,752	1,752	16,946
2032	1,720	1,720	18,666

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

Method 1 available in methodology VM0015 was used to define the class that will replace the forest cover in the baseline of the Project (anthropic vegetation in balance). Table 28 shows the area of zone 1, which covers the Project Area, Leakage Belt, and Leakage Management Areas, and the corresponding areas of each post-deforestation land use/land use change class.

Table 28 - Area of the Reference Region that covers potential post-deforestation LU/LC classes (Table 12 of Methodology VM0015).

Zone		Name	Total of all other LU/LC classes present in the zone		Total area of each Zone	
		Zone 1				
		ID_{fcl}	1			
IDz	Name	Area ha	% of Zone %	Area ha	% of Zone %	Area ha	% of Zone %
1	Zone 1	235,797	100	94,037	39.88%	235,797	100
Total area of each class *fcl*		235,797	100	94,037	39.88%	235,797	100

The area projected to be deforested is reported in Table 29 (for Project Area) and Table 30 (for the Leakage Belt).

Table 29 - Annual areas deforested in each zone within the Project Area in the case of baseline (Table 13b of Methodology VM0015).

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
2023	757	757	757
2024	1,109	1,109	1,865
2025	1,375	1,375	3,240
2026	1,335	1,335	4,575
2027	1,368	1,368	5,943
2028	1,400	1,400	7,343
2029	1,252	1,252	8,595
2030	1,561	1,561	10,156
2031	1,472	1,472	11,628
2032	1,709	1,709	13,337

Table 30 - Annual areas deforested in each zone within the Leakage Belt in the case of baseline (Table 13c of Methodology VM0015).

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
2023	1,849	1,849	1,849
2024	2,050	2,050	3,898
2025	1,945	1,945	5,843
2026	1,888	1,888	7,731
2027	2,195	2,195	9,927
2028	1,803	1,803	11,730
2029	1,604	1,604	13,333
2030	1,860	1,860	15,193
2031	1,752	1,752	16,946
2032	1,720	1,720	18,666

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

Not applicable as method 2 was not performed.

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

Estimated changes in baseline carbon stock and non-CO_2 emissions (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 – Soluções Técnicas Ambientais, in 2022, in partnership with Biofílica Ambipar. The main results found in this study will be described below, and more information can be obtained in the Carbon Inventory Report of the company STA.

The following is a summary of the estimates of carbon stocks in the Santo Antônio and Terra Alta Farms area that are part of the Tueré REDD+ Project Area.

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

Methodology: Sample Design and Allocation of Installments

The forest carbon inventory carried out at Terra Alta and Santo Antônio Farms was developed in compliance with all the requirements and recommendations of the VM0015 Methodology version 1.1, developed by the VCS (Verified Carbon Standard).

The sample design considered a single vegetation typology, being the Dense Ombrophilous Forest (FOD), since the two forest types existing in the project area (Alluvial Dense Ombrophilous Forest and Lowland Dense Ombrophilous Forest) are physiognomic subdivisions of the FOD and the diametric distribution of the two types were similar. In addition, other local studies show that FOD subdivisions have very similar biomass results and in the case of the Project area, it is almost mostly represented by the Lowland Forest (99.5% of the area). The forest typologies in the project area are described in more detail in the section 2.1.5.

In addition, the allocation of plots within the areas considered to have the highest and lowest deforestation risk (according to the risk map) was considered, meeting the recommendation of VM0015 (page 132). Thus, the sampling process was randomly stratified, considering a single vegetation type (FOD) and two classes of deforestation risk (high and low).

The number of sample units and their allocation under the stratified random sampling process was calculated following the guidelines of VM0015 (pages 132 to 135). In addition, in order to give greater robustness to the sampling plan and a safety margin, the number of sample units was calculated in order to obtain a sufficient number to reach 7% sampling error (less than that admissible by VM0015 of 10%) and with 95% confidence for the total area of the project and for the risk classes. For this, the 5 steps described below were followed:

1st) Step – define the maximum possible number of sampling units. For this, it is first necessary to define the size of each sample unit. The size was defined as 10,000 m^2, that is, 1 hectare. This size is large enough that it does not influence the results. Thus, the sample unit is similar to a plot (1 hectare) and the maximum possible number of plots is the sample universe itself.

2nd) Step – find the coefficient of variation (CV) of the biomass in the studied region; this coefficient can be found in the literature. In our case, the CV was based on the data presented by STA (2022), for the REDD+ Jutaituba Project, whose area is located near the area of the Tueré REDD+ Project, in the municipality of Portel. In this work, a pre-estimation of biomass was first carried out using data from the forest inventory collected by the company operating in the area (CV= 17.4%); then the biomass estimate was calculated from the inventory data at the Jutaituba farm (CV= 17.71%) for the total area of the project. The CV was

also presented for the high-risk (CV= 17.76%) and low-risk (CV = 13.86%) areas. Based on these data from Fazenda Jutaituba, a CV= 18% was defined to be applied in the present work.

3rd) Step – apply the formula, for infinite populations, to find the number of sample units needed in the project area:

$$n = \frac{t_{st}^2 * (CV\%)^2}{(E\%)^2 + \frac{t_{st}^2 * (CV\%)^2}{N}} = \frac{t_{st}^2 * (CV\%)^2 * N}{N * (E\%)^2 + (t_{st}^2 * (CV\%)^2)}$$

Where:

n = number of sample units required;

t_{st}^2 = t-student value for a 95% confidence level, with n-1 degrees of freedom;

$\mathrm{CV}\%$ = Coefficient of variation, given in percentage (defined as 18%);

$\mathrm{E}\%$ = permissible error, given in percentage (defined as 7%);

N = maximum possible number of sample units (the sample universe itself).

4th) Step – apply the formula to find the number of sample units needed for each deforestation risk class (high risk and low risk). We consider the same cost for all regions of the project, the sampling is distributed proportionally to the area of the classes, so that the number of sample units per class is given by the following equation:

$$n_{cl} = \frac{N_{cl}}{N}$$

Where:

n_{cl} = number of sampling units required for class cl (or stratum);

N_{cl} = maximum number of sample units possible for the class cl, calculated by dividing the area of the class cl by the sample area (the area of the class cl itself, since the size of the sample unit is 1 hectare);

N = maximum possible number of sampling units (the sample universe itself);

After applying the equation independently by class, our results showed the minimum sample units required for the high-risk (8 sample units) and low-risk (19 sample units) areas.

5th) Step – The specific situation of the Tueré REDD+ Project area was considered, which are areas of two farms (continuous blocks of forest areas) geographically separated by a small area. In view of the existence of this situation, VM0015 (page 135) directs that there be a homogeneous distribution by geographic block (in our case, the farms). Two steps are required: 1) divide the total area of the deforestation risk class by the number of sample units of the class, resulting in the average area represented by each sample unit; and 2) divide the area of each farm by the average area obtained in the 1st stage.

Considering VM0015's recommendation to install at least 30 sample units, it was decided to install a number greater than 30, to ensure a good margin of safety. Thus, 36 sample units were allocated in the Project area, 16 plots at Fazenda Santo Antônio (9 plots at low risk and 8 plots at high risk) and 20 at Fazenda Terra Alta (11 plots at low risk and 8 plots at high risk).

Aiming at the feasibility of the inventory in the field, an access region (buffer of up to 5km away from the existing roads of the farm) was created in the Project Area for the allocation of the plots. Two QGIS software tools were used, the "create grid" tool created 100 m x 100 m grids, these were numbered and randomly drawn with the "random points inside the polygons" tool. Figure 27 shows the location of the plots in the Project Area.

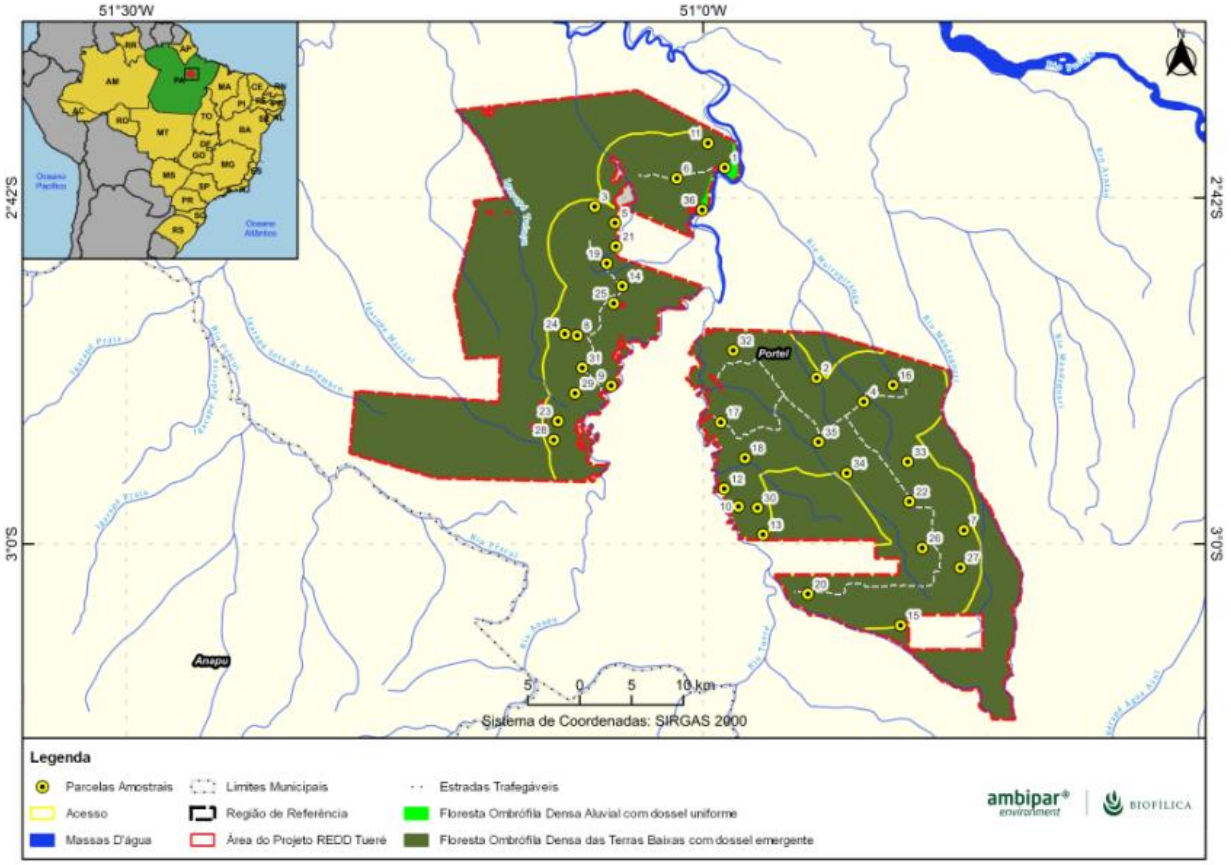


Figure 27 – Location of the carbon stock inventory sample plots.

The installation of the plot in the field began with its location, which was guided by a georeferenced map and predefined geographic coordinates; this location marked the first vertex of the plot, called azimuth 0°; from the first vertex, the bites were opened to delimit the perimeter of the plot, with a length of 100 m wide and 100 m long each. The perimeter of the plots was delimited by the opening of 1 m wide trails where the small vegetation was suppressed with the aid of a machete, facilitating the visualization of the plot limit by the work teams. During the opening of the bites, pickets were placed at the four vertices of the plots indicating the limit of the plot and at the 20 m of the first vertex; at azimuth 0°, 3 pickets were installed, at the other vertices only 1 picket; the pickets are made of weather-resistant wood, and with the upper part carved.

Field Methodology: measurement of living and dead trees

All individuals from trees with DBH ≥ 10 cm were inventoried. It is worth noting that VM0015 does not require botanical identification of individuals; however, an identification based on a popular name was carried out for better control in the field. Each subject had the CAP measured (in cm) with a tape measure. Subsequently, the CAP was transformed into DBH (DBH = CAP/π). To facilitate subsequent location of the trees in the field, all individuals were given an aluminum plate (or labels).

The CAP (or DBH) is normally taken at 1.30 m above the ground (Measurement Point), however this is a reference value, as in some situations taking the CAP at exactly 1.30 m above the ground is prevented due to the existence of several variables that make it difficult, such as: shape of the base of the trunk, deformities at the measurement point, terrain topography, etc. In these situations, it is recommended to establish a new 'Measurement Point' (POM) (Branthomme, 2009; Soares et al., 2011).

Also, the measurement of dead wood on the ground was carried out on top of a line transect (Line intersect), 100 m long; this line was positioned 20 m from the starting point of the plot (**Figure 7**). Along the length of the transect, the diameter (in cm) of each piece of dead wood on the floor that intersected with the line was measured. The diameter measurement occurred with tape measure (similar to that described for the measurement of living trees) in the position orthogonal to the longitudinal axis of the piece of wood and centered around the intersection with the transect.

The pieces of dead wood on the floor that were measured had: (1) DBH > 10 cm; (2) more than 50% of the trunk above ground; and (3) at least 50% of the diameter of the part touching the transect line. If the trunk was hollow, the diameter was measured excluding the hollow.

According to VM0015, each piece of dead wood, at the intersection with the line, was classified according to the degree of decomposition; the degree of decomposition influences the density of the wood, so the degree of decomposition defines the wood density class. The classification was: Class 1: Hard (or healthy); Class 2: Intermediate; Class 3: Rotten.

To determine which density class a piece of deadwood fits into, each piece was struck with a machete (‘machete test’). If the blade did not sink into the part (i.e. bounce), it was rated as hard. If it partially sank into the piece and there was some loss of wood, it was classified as intermediate. If the blade sank into the part or the part was brittle, it was classified as rotten.

Thus, 45 samples of dead wood on the ground were randomly collected in the 36 plots to determine the density (15 samples of each density class). These samples were taken with the aid of a chainsaw; they were identified using a copy pencil on the wooden pieces; later, the samples were taken to the Laboratory of Physical Properties and Drying of Wood, of the Federal Rural University of Amazonia (UFRA), to determine the density of the wood. This density was used in the estimation of biomass of dead wood.

The standing dead wood inventory took place in the same plots as the live tree inventory and all standing dead trees with DBH > 10 cm had their CAP measured and their height estimated; CAP was also later transformed into DBH, as in living trees. If the trunk was hollow, the diameter was estimated excluding the hollow. To estimate the height, the Pythagorean Theorem was considered, and the hypotenuse and the adjacent catheter were measured, and from these data the opposite catheter was estimated, which represents the height of the tree. CAP was measured with a tape measure similar to the tape used in measuring the CAP of living trees and the hypotenuse and adjacent catheter were measured with a laser tape measure (Figure 9b).

The standing deadwood reservoir was classified into 4 classes, according to VM0015:

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: Tree without branches, only with the trunk.

Calculation of biomass and stock estimates

The allometric equation used to estimate the biomass of trees with DBH > 10 cm was chosen from the evaluation of eight equations available in the literature.

For each of the eight equations the biomass of trees with DBH > 10 cm was calculated and a simple linear regression analysis was performed between estimated biomass and diameter, considering each tree as a sample. The results of the eight regressions were analyzed by the following criteria: the largest adjusted R2, best fit of the residuals, and low standard error of the estimate or see (the √ Mean Standard Error) (Kershaw Jr et al. 2017). The best selected equations were evaluated through two analyses: 1) an analysis of variance (ANAVA) to verify if there is a significant difference between the equations; 2) a performance evaluation between the three chosen equations, for which the divergence (%) obtained between the pre-selected equation and the other equations was used (100 minus the percentage value that the biomass of the tree represents in relation to the value of the pre-selected equation). The objective was to choose an equation that fits the data well and that does not underestimate or overestimate the biomass of the area.

The biomass of dead wood on the ground was calculated according to VM0015, in three steps: 1) Calculate the volume of each class of deadwood in the ground; 2) Calculate the biomass of each class, multiplying the volume of the class by the average of the density of the class (at that time the biomass expansion factor (BEF) was not used; 3) Sum the biomass of the three classes to obtain the total biomass of deadwood in the ground. The equations below were used to calculate the total volume and biomass of each class and the total biomass of dead wood in the ground:

$$Volume_{(cl,i)} = \pi^2 * \frac{d_1^2 + d_2^2 + \cdots d_n^2}{8 * L}$$

$$Bldw_{(cl,i)} = \sum_{i=3}^{i} Volume_{(cl,i)} \,.\, d_{(cl,i)}$$

$$Bldw_{total} = \sum_{i=3}^{i} Bldw_{(cl,i)}$$

Where:

$Volume_{(cl,i)}$ = Volume of dead wood on the ground, of density class i (m3 ha-1);

$d_1, d_2, \ldots d_n$ = diameter of the pieces of dead wood on the ground, at the intersection with the line (cm) – if the piece of wood was hollow, the diameter was reduced to exclude the hollow;

L = line length (m) = 100 m.

$Bldw_{(cl,i)}$ = deadwood biomass on the ground of density class i, per hectare (Mg C);

d_{cl} = class density – the following density values were used: Class I (hard) = 0.599 Mg m-3; Class II (intermediate) = 0.448 Mg m-3; Class III (rotten) = 0.302 Mg m-3 (according to Table 1378);

$Bldw_{total}$ = total biomass of dead wood on the ground per hectare (Mg C ha-1).

Regarding the standing dead wood reservoir, the calculations of the biomass estimates considered these 4 classes, according to VM0015. In class 1, the biomass of each standing dead tree was estimated using the same allometric equation that was applied to the living trees; then the leaf biomass (3% of the above-ground living biomass (see VM0015, page 147, item d) was subtracted. The resulting equation was:

$$Bsdw_{(cl=1,\ i)} = \text{Equação a ser escolhida}_i - 3\%$$

Where:

$Bsdw_{(cl=1,\ i)}$= biomass of standing dead tree "i" class 1, per hectare (Mg);

DAP = diameter at breast height (1.30 m).

$\text{Equação a ser escolhida}$ = see text above explaining the process of choosing the equation;

In Classes 2, 3 and 4, the volume equation of the company LN Guerra, a forestry company working in the Portel region, was used, which adjusted a volume equation for the trees in the region. Then the volume was converted to dry biomass using density; at this time biomass expansion factor (BEF) was not used. The volume and biomass equations were:

$$Volume_{(cl=2-4,\ i)} = \left(\frac{\pi}{3}\right) * h_i * DAP_i^2 * 0{,}7$$

$$Bsdw_{(cl=2-4,\ i)} = Volume_{(cl=2-4,\ i)} * d_m$$

Where:

$Volume_{(cl=2-4,\ i)}$ = standing dead tree volume "i" of classes 2, 3 and 4, in m^3;

π = value of pi();

h_i = tree height "i" in meters (measured as the opposite leg);

DAP_i = tree diameter "i" at breast height, in meters;

$Bsdw_{(cl=2-4,\ i)}$ = standing dead tree biomass "i", of classes 2, 3 and 4 (Mg);

d_m = 0.463 = average density of dead wood (see text below).

[78] Density in Table 13 is in g cm-3; however the conversion to Mg m3 is 1:1.

The value used in the density of standing dead trees (d_m = (0.599 + 0.448 + 0.302)/3 = 0.463) was the average value obtained from the three classes of dead wood on the ground. Using the average was a conservative decision, as recommended by VM0015.

Finally, the biomass of all classes was summed to result in the total biomass of standing dead trees per plot:

$$Bsdw_{total} = \sum_{i=4}^{i} Bsdw_{(cl,i=4)}$$

Where:

$Bsdw_{(cl,i=4)}$ = standing dead wood biomass of the 4 density classes (Mg);

$Bsdw_{total}$ = total standing dead wood biomass per hectare (Mg ha-1).

The total deadwood biomass per plot added up the deadwood biomass in the ground and standing deadwood biomass, considering all classes of each of them. The equation used was:

$$Bdw_{total} = Bsdw_{total} + Bldw_{total}$$

Where:

Bdw_{total} = Dead wood biomass per plot (Mg ha-1);

$Bsdw_{total}$ = Standing dead wood biomass per plot (Mg ha-1);

Also, for belowground living biomass (or root biomass), it was considered that for each tree with DBH > 10 cm, inventoried for aboveground biomass, the root biomass would be estimated using the equation by Silva (2007):

$$BGB_i = \frac{1}{1000} * M * 0{,}0469 * DAP_i^{2,4754}$$

$$BGB_{(total)} = \sum_{i=n}^{i} BGB_{(i)}$$

Where:

$BGB_{(total)}$ = total below-ground living biomass or root biomass (Mg. ha^{-1});

$BGB_{(i)}$ = root biomass of tree “i” (Mg) – division by one thousand is to give the value in megagrams;

DAP = diameter at breast height (in cm) of tree “i”;

M = Moisture factor = 0,546.

Thus, the total biomass found in each plot is the result of the sum of the reservoirs analyzed:

$$\text{Total biomass of the parcel} =$$

$$\text{Aboveground Live Biomass (trees with DBH} > 10 \text{ cm)}$$

+ Total biomass of dead wood

+ Total below − ground living biomass (or root biomass).

Results

In the 36 sample plots, 18,260 live trees with DBH > 10 cm were inventoried; 724 standing dead trees with DBH > 10 cm; and 192 pieces of dead wood on the floor with a diameter > 10 cm.

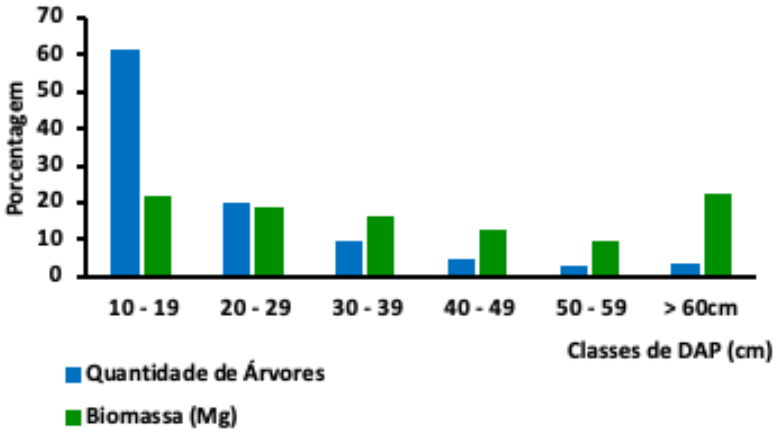
The standing deadwood was mostly from class 4, which is the most degraded class of wood; the opposite was found in the deadwood on the floor, which was mostly from the hard class. The diametric distribution found in living trees follows the negative exponential distribution normally found in natural forests. 507 trees with DBH > 60 cm (14.08 trees per hectare) were inventoried, which corresponds to 2.78% of the trees. Trees larger than 60 cm DBH are considered 'big trees' and their proportion has been considered an important characteristic of mature forests (Lu et al 2003; Caron et al 2021), especially as they contain a large proportion of biomass (Sist et al 2014 ; Fauset et al 2015). As shown by Sist et al (2014) the number of 'big trees' throughout the Amazon is generally between 1 and 10 individuals per hectare. In this sense, the area of the Tueré REDD+ Project presents a number above the Amazonian average, which makes this forest of great importance for the biomass stock.

In conclusion, the regression analyzes carried out to choose among the 8 equations to be used to calculate the biomass in the area of the Tueré REDD+ Project, the Araújo et al. (1999) was chosen to estimate the biomass of living trees with DBH > 10 cm and class I standing dead trees since this was the most adequate and conservative.

Data distribution was different in the reservoirs, with total biomass and root biomass presenting normal data distribution ($p > 0.05$ in all normality tests performed – Tests: Shapiro-Wilk, Anderson-Darling, Lilliefors, Jarque-Bera); while the biomass of living trees and the biomass of dead trees showed non-normal data distribution ($p < 0.05$ in all tests performed, except the biomass of living trees, in these only the Shapiro-Wilk and Jarque-Bera tests detected the non-normality of the data. This difference in data distribution is a result of the variability of each reservoir between the plots. Analyzing the mean and the confidence interval at 95% probability (95% CI), it can be seen that the total biomass is very homogeneous, only a portion presented very high total biomass (portion 36), whose value exceeded the limit of twice the 95% CI, that is, it presented a value very different from the mean.

These results are in accordance with literature reports, which highlight the large spatial variation of biomass (Houghton et al., 2001; Malhi et al., 2006; Fearnside et al., 2009; Costa et al., 2010; Chagas et al., 2012, among others). One of the main reasons for this variation is the variation in the number of individuals and in the size of these individuals.

Figure 28 shows the percentage distribution of both the amount of trees and the biomass; from the diameter class of 30-39 cm the percentage of biomass becomes greater than the percentage of trees. As pointed out in the literature (Sist et al 2014; Fauset et al 2015) the role of large living trees is impressive. The reduced percentage of trees with DBH > 60 cm (only 3.02% of the total number of trees inventoried) accounted for 22.43% of the biomass of living trees.



[Key: Percentage – DAP Classes (cm) – Quantity of Tress – Biomass (Mg)].

Figure 28 – Percentage of quantity (number) and biomass (Mg) living above ground (DBH > 10 cm) by diameter class (DBH in cm) found in the Tueré REDD+ Project area, municipality of Portel, Pará.

Carbon Stock in the Project Area

In total, the average biomass was 448.79 + 70.38 Mg ha-1, with a coefficient of variation of 15.68% and uncertainty of 5.31% (Table 31). The coefficient of variation (CV) and uncertainty were slightly lower, but very close to the predicted values to calculate the number of samples (CV = 18%; Error%=Uncertainty% = 7%). This means that the values used to calculate the number of samples were correct. These results also show that the total biomass in the project area presents relative errors (=uncertainty) within the expected by VM0015 (item f on page 67), that is, less than 10%; therefore, the average value per hectare can be used in the project area.

Table 31 - Biomass, carbon and CO2e from dense Ombrophylous Forests in the Tueré REDD+ Project Area, municipality of Portel, Pará.

Reservoir	Mean + standard deviation (Mg ha^{-1})	CV (%)	Standard error average (Mg ha^{-1})	Sampling error	Uncertainty (%)
Biomass - live above ground	362,65± 60,87	16.78	10.14	20.60	**5.68**
Biomass - dead wood (total)	31.61 ± 25.32	80.08	4.22	8.57	**27.10**
Dead wood standing	6.81 ± 5.20	76.34	0.87	1.76	**25.83**
Dead wood on the floor	24.80 ± 24.53	98.90	4.09	8.30	**33.46**
Below Ground Biomass - Roots	54.52 ± 13.47	24.70	2.24	4.56	**8.36**
Biomass -Total	448.79 ± 70.38	15.68	11.73	23.81	**5.31**
Carbon - live above ground	175.89 ± 29.52	16.78	4.92	9.99	**5.68**
Carbon - dead wood (total)	15.33 ± 12.28	80.08	2.05	4.15	**27.10**
Dead wood standing	3.30 ± 2.52	76.34	0.42	0.85	**25.83**
Dead wood on the floor	12.03 ± 11.90	98.90	1.98	4.03	**33.46**
Below Ground Carbon - roots	26.44 ± 6.53	24.70	1.09	2.21	**8.36**
Carbon - Total	217.66 ± 34.14	15.68	5.69	11.55	**5.31**
CO2e - live above ground	644.91 ± 108.25	16.78	18.04	36.62	**5.68**
CO2e - dead wood (total)	56.22 ± 45.02	80.08	7.50	15.23	**27.10**

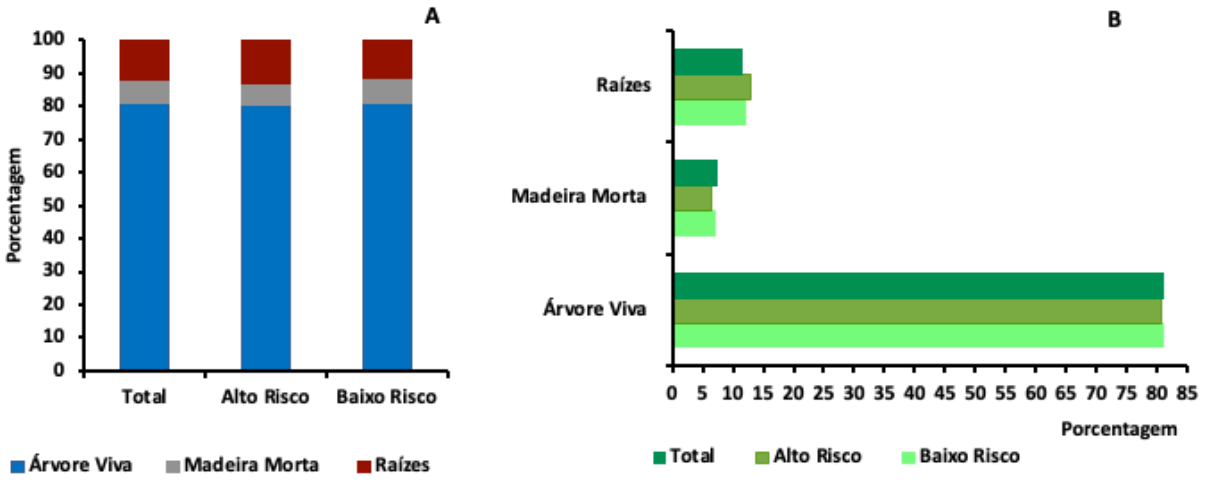
Dead wood standing	12.11 ± 9.25	76.34	1.54	3.13	**25.83**
Dead wood on the floor	44.11 ± 43.62	98.90	7.27	14.76	**33.46**
CO2e Below Ground - roots	96.96 ± 23.95	24.70	3.99	8.10	**8.36**
CO2e - Total	**798.09 ± 125.17**	**15.68**	**20.86**	**42.35**	**5.31**

The values found reveal an area of high biomass, although it is difficult to compare with other studies because the reservoirs considered are not always the same between different authors. Despite this, for comparison purposes, we consider the confidence interval of the biomass found in the Tueré REDD+ project area, it can be considered that the biomass obtained can be considered similar to other areas of the Amazon, as shown by Nascimento and Laurance (2002) to a site near Manaus, in central Amazonia, which was 467.68 Mg ha-1; but the average itself showed different behavior among the reservoirs.

For example, the average for aboveground living biomass (DBH > 10cm) was higher than the highest average found in the literature, which was 405 Mg ha-1 in the south and southeast of Pará, as shown by Costa et al. (2012). The average below-ground biomass is comparable to several other Amazon sites, but well below the average shown by Silva (2007) and Malhi et al. (2009), this is explained by the methodological differences used by these authors, who paid special attention to the roots.

The average biomass of total dead wood was similar to the average found in undisturbed sites, such as in the Caxiuanã FLONA by Malhi et al. (2009) and in Paragominas by Uhl et al. (1988); considering the activities of the MFS, the biomass was well below that found by STA (2022) in the Jutaituba farm and by Gerwing (2002) in Paragominas, these authors found an average of 49.28 and 55 Mg ha-1, respectively, while in the area for the Tueré REDD+ Project the average was 31.61 Mg ha-1. These results indicate that the activities of the MFS applied in the area of the Tueré REDD+ project really have very little impact on the forest.

In addition, most of the biomass comes from living trees above ground (81%), followed by root biomass (12%) and dead wood (7%). These percentages are maintained in the analysis of the total project area and in the areas of high and low deforestation risk. Figure 29 shows the distribution by reservoir in detail; the biomass of living trees was 80.8% in the total project area, and 80.6% and 81.0%, respectively in areas of high and low risk of deforestation; dead wood biomass was 7.0% in the total project area, and 6.5% and 7.4%, respectively in areas of high and low risk of deforestation; root biomass was 12.1% in the total project area, and 12.9% and 11.6%, respectively in areas of high and low risk of deforestation.



[Figure 1 Key: Percentage – Total – High Risk – Low Risk – Living Tree – Dead Wood – Roots].

[Figure 2 Key: Roots – Dead Wood – Living Tree – Percentage – Total – High Risk – Low Risk].

Figure 29 – Percent distribution of biomass per reservoir, in the total Project area and in areas of high and low risk of deforestation. Tueré REDD+ Project, municipality of Portel, PA.

The distribution of biomass among the large reservoirs is in line with the literature, with living trees being the largest reservoir (Houghton et al., 2001; Nascimento and Laurance, 2002; Nogueira et al., 2008; Costa et al. 2012).

For calculations of the values of Carbon equivalent (COe, sometimes also called CO2e) presented in Table 32, the reduced emissions were calculated by multiplying the estimated stock of the inventory by 3.6667, since mass of CO2 = 44 and mass of C = 12; 44/12 = 3.6667. Values were calculated in Carbon equivalent to comply with Table 15 of methodology VM0015.

Table 32 - Carbon stock per hectare for the initial icl class existing in the Project Area and leakage belt (Table 15a of VM0015)

Forest starter 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 $tCO_2e\ ha^{-1}$
644.91	36.62	96.96	8.10	56.22	15.23	798.09	59.95
tC ha-1	CI %	tC ha-1	CI %	tC ha-1	CI %	tC ha-1	CI %
175.88	5%	26.44	5%	15.33	5%	217.66	5%

Where:
Cab_{icl} : Average equivalent carbon stock per hectare for the aboveground biomass pool for the initial forest class;

Cbb_{icl} : Average equivalent carbon stock per hectare for the belowground biomass pool for the initial forest class;

Cdw_{icl} : Average equivalent carbon stock per hectare for the dead biomass pool for the initial forest class;

$Ctot_{icl}$: Average equivalent carbon stock per hectare for total biomass pool for the initial forest class

Post-deforestation classes projected for the Project area and leakage belt in the baseline scenario and non-forest classes existing in the leakage management areas

The VM0015 methodology allows for estimates from local studies and, therefore, the value of 60.9 tCO_{2e} ha^{-1} was taken as a reference for the carbon stock of anthropic vegetation in the equilibrium class, the class that was projected to exist in the Project Area and Leakage Belt in the Project scenario. This estimate of carbon stock was obtained by (WANDERLLI; FEARNSIDE, 2015)[79], through a long-term study of the landscape and average composition of vegetation in deforested areas of the Brazilian Amazon, which consists of a matrix composed of pastures, agriculture of small scale and secondary vegetation, usually found in a post-deforestation scenario in the Amazon.

Wanderlli & Fearnside (2015) is a peer-reviewed scientific literature, and represents one of the most current studies for the Brazilian Amazon on carbon stocks 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. Data were collected from secondary sources, by researchers from INPA (renowned research institute for the subject in Brazil), published by a renowned international scientific journal (Forest Ecology and Management);

3. Data are for a period that accurately reflects current available practice for carbon stock determination;

4. No sampling was applied on these data;

5. Data are publicly available 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 by VCSA and VVB;

7. The data is appropriate for the geographic scope of VM0015,

8. Expert review was not required; and

9. Data are not just held in a central storage repository.

[79] 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.

Calculation of carbon stock change factors (Step 6.1.1 VM0015)

In the baseline scenario, the Project considers the change in the carbon stock of the forest cover and replacement by pasture areas, small-scale agricultural plantations or plantations (temporary or permanent). AFOLU requirements require that decomposition of carbon stock in soil, biomass below ground, deadwood, and harvested timber products, in the case of the baseline, be considered. To calculate such carbon stock reduction, version VM0015 1.1 applies a standard linear function to explain the carbon stock reduction in the initial forest classes (icl) and the carbon stock increase in post-deforestation use classes. Table 33 and Table 34 summarize how the carbon stock change factor was calculated.

Table 33 - Carbon stock change factors for icl initial forest classes (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*	644.9	9.7	5.6	660.2
1	t*+1	0	9.7	5.6	15.3
2	t*+2	0	9.7	5.6	15.3
3	t*+3	0	9.7	5.6	15.3
4	t*+4	0	9.7	5.6	15.3
5	t*+5	0	9.7	5.6	15.3
6	t*+6	0	9.7	5.6	15.3
7	t*+7	0	9.7	5.6	15.3
8	t*+8	0	9.7	5.6	15.3
9	t*+9	0	9.7	5.6	15.3
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 34 - Carbon stock change factors for final icl classes or z zones (Method 1) (Table 20b of Methodology VM0015).

Year after deforestation		$\Delta Ctot_{fcl,t}$
0	t*	0.0
1	t*+1	6.1
2	t*+2	6.1
3	t*+3	6.1

Year after deforestation		$\Delta Ctot_{fcl,t}$
4	t*+4	6.1
5	t*+5	6.1
6	t*+6	6.1
7	t*+7	6.1
8	t*+8	6.1
9	t*+9	6.1
10	t*+10	6.1
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
18	t*+18	0
19	t*+19	0
20-T	t*+20...	

Calculation of changes in baseline carbon stock and non-CO_2 emissions (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 35) and in the Leakage Belt (Table 36) in the year following equation 10 on page 72 of VM0015 version 1.1, as presented:

$$\Delta CBSLPA_t = \sum_{p=1}^{P}\left(\sum_{icl=1}^{Icl} ABSLPA_{icl,t} * \Delta Cp_{icl,t=t*} - \sum_{z=1}^{Z} ABSLPA_{z,t} * \Delta Cp_{z,t=t*}\right.$$
$$+ \sum_{icl=1}^{Icl} ABSLPA_{icl,t-1} * \Delta Cp_{icl,t=t*+1} - \sum_{z=1}^{Z} ABSLPA_{z,t-1} * \Delta Cp_{z,t=t*+1}$$
$$+ \sum_{icl=1}^{Icl} ABSLPA_{icl,t-2} * \Delta Cp_{icl,t=t*+2} - \sum_{z=1}^{Z} ABSLPA_{z,t-2} * \Delta Cp_{z,t=t*+2} + \cdots$$
$$\left. + \sum_{icl=1}^{Icl} ABSLPA_{icl,t-19} * \Delta Cp_{icl,t=t*+19} - \sum_{z=1}^{Z} ABSLPA_{z,t-19} * \Delta Cp_{z,t=t*+19}\right)$$

Where:

ΔCBSLPAt: Total change in baseline carbon stock in the Project Area in year t ($tCO_{2\text{-}e}$);

ABSLPAicl, t: Area of initial class of icl forest deforested at time t within the Project Area in case of baseline (ha);;

ABSLPAicl, t-1: Area of initial icl forest class deforested at time t-19 within the Project Area in case of baseline (ha);

ABSLPAicl, t = t-19: Initial class area of icl forest cleared at time t-19 within the Project Area in case of baseline (ha);

ΔCpicl, t = t *: The average change factor of the carbon stock to the carbon pool fixes the initial icl forest class applicable at time t (according to Table 20.a) (tCO2-e.ha-1);

ΔCpicl, t = t * + 19: The average change factor of the carbon stock to the carbon pool fixes the initial icl forest class applicable at the time t = t * + 19 (20th year after deforestation, (according to Table 20.a VM0015) (tCO2-e. ha-1);

ABSLPAz, t: Area of zone z "deforested" at time t within the Project Area in the baseline case (ha);

ABSLPAz, t-1: Area of zone z "deforested" at time t- 1 in the Project Area in the baseline case (ha);

ABSLPAz, t-19: Area of z-zone "deforested" at time t-19 in the Project Area in the baseline case (ha);

ΔCpz, t = t * : Average change factor in the 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 carbon stock change factor for the applicable carbon pool at time t = t * + 1 ((= second year after deforestation, as per Table 20.b VM0015) (tCO2-e.ha-1);

ΔCpz, t = t * + 19: Average carbon stock change factor for the applicable carbon pool at time t = t * + 19 ((= 20year after deforestation, as per Table 20.b VM0015) (tCO2-e.ha -1).

Table 35 - Baseline carbon stock change in the Project Area (Table 21b of Methodology VM0015).

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	$\Delta CBSLPA_{icl,t}$	$\Delta CBSLPA_{icl}$	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
2023	499,529	499,529	499,529	2023	0	0	0	499,529	499,529
2024	743,521	743,521	1,243,050	2024	4,608	4,608	4,608	738,913	1,238,442
2025	936,332	936,332	2,179,382	2025	11,360	11,360	15,968	924,972	2,163,414
2026	930,960	930,960	3,110,342	2026	19,733	19,733	35,701	911,227	3,074,641
2027	973,227	973,227	4,083,568	2027	27,863	27,863	63,564	945,364	4,020,004
2028	1,015,281	1,015,281	5,098,850	2028	36,194	36,194	99,758	979,087	4,999,092

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	$\Delta CBSLPA_{icl,t}$	$\Delta CBSLPA_{icl}$	ID_{iz}>	1	$\Delta CBSLPA_{z,t}$	$\Delta CBSLPA_{z}$	$\Delta CBSLPA_{t}$	$\Delta CBSLPA$
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
2029	939,126	939,126	6,037,976	2029	44,720	44,720	144,478	894,406	5,893,497
2030	1,162,527	1,162,527	7,200,502	2030	52,345	52,345	196,823	1,110,181	7,003,679
2031	1,127,430	1,127,430	8,327,932	2031	61,855	61,855	258,678	1,065,576	8,069,254
2032	1,306,165	1,306,165	9,634,097	2032	70,820	70,820	329,498	1,235,345	9,304,600

Table 36 - Baseline carbon stock change in the Leakage Belt area (Table 21c of Methodology VM0015).

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
2023	1,220,547	1,220,547	1,220,547	2023	0	0	0	1,220,547	1,220,547
2024	1,381,532	1,381,532	2,602,079	2024	11,259	11,259	11,259	1,370,273	2,590,820
2025	1,343,684	1,343,684	3,945,763	2025	23,742	23,742	35,001	1,319,942	3,910,762
2026	1,336,158	1,336,158	5,281,921	2026	35,586	35,586	70,586	1,300,572	5,211,335
2027	1,567,810	1,567,810	6,849,731	2027	47,085	47,085	117,672	1,520,724	6,732,059
2028	1,342,434	1,342,434	8,192,165	2028	60,455	60,455	178,127	1,281,979	8,014,038
2029	1,238,529	1,238,529	9,430,694	2029	71,436	71,436	249,563	1,167,093	9,181,131
2030	1,432,166	1,432,166	10,862,860	2030	81,203	81,203	330,767	1,350,963	10,532,093
2031	1,389,731	1,389,731	12,252,591	2031	92,530	92,530	423,297	1,297,201	11,829,294
2032	1,395,208	1,395,208	13,647,800	2032	103,203	103,203	526,500	1,292,005	13,121,299

Non-CO2 emission from the forest fires baseline (Step 6.2 VM0015)

Non-CO2 emissions were not considered and accounted for the Tueré REDD+ Project, due to the low risk in the Project Area.

3.2.2 Project Emissions

Step 7 of VM0015 – Ex-ante estimate of actual changes in carbon stocks and non-CO2 emissions in the Project area

Non-CO2 emissions were not considered and accounted for the Tueré REDD+ Project.

Ex-ante estimate of actual changes in carbon stock (Step 7.1 VM0015)

Ex-ante estimate of actual changes in carbon stock due to planned activities (Step 7.1.1 VM0015)

The Tueré REDD+ Project Area has a forest management plan within its limits, which follows all current regulations, norms, standards and legislation, aiming at the production of wood in a sustainable way, through Reduced Impact Exploration (EIR) techniques that mitigate damage to the remaining forest, regulating production, ensuring a cutting cycle of 35 years, 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 the planned deforestation, estimating the reduction of carbon stocks caused by the implementation of permanent infrastructures, such as opening roads and forest yards, necessary to carry out 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 impacted areas for such infrastructures. The calculation of these areas was based on the annual operational plans and the UPAs. The estimates of the Ex-ante scenario were reviewed with those responsible for forest management on the Santo Antônio and Terra Alta farms based on the average area of the UPAs and the average of open areas for infrastructure, considering primary, secondary roads and courtyards.

Table 37 presents 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 the infrastructures opened annually by the average variation of the carbon stock.

Table 37 - Ex-ante estimate of stock reduction due to planned deforestation in the Project area (Table 25a of Methodology VM0015).

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	cumulative
	$APDPA_{icl,t}$	$Ctot_{icl,t}$	$\Delta CPDdPA_t$	$\Delta CPDdPA$
	ha	$tCO_2e\ ha^{-1}$	tCO_2e	tCO_2e
2023	36.8	798	29,396	29,396
2024	36.8	798	29,396	58,792
2025	36.8	798	29,396	88,189
2026	36.8	798	29,396	117,585

2027	36.8	798	29,396	146,981
2028	36.8	798	29,396	176,377
2029	36.8	798	29,396	205,773
2030	36.8	798	29,396	235,170
2031	36.8	798	29,396	264,566
2032	36.8	798	29,396	293,962

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 maximum annual exploited volume allowed by law is 30 m³ ha for PMFS by (MMA, 2006), however in the area of the Tueré REDD+ project the company has exploited on average 28.44 m³ha of wood.

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. Monitoring will be based on relevant documents, ideally post-exploratory reports, and other relevant information provided by those responsible for forest management on Santo Antônia and Terra Alta farms. 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.

We emphasize that the forest management project was not executed in 2021 and 2022 due to a large drop in the timber market.

Charcoal production and firewood collection

Charcoal production or firewood collection is not expected for the Project. 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. Table 38 shows the Ex-ante estimate of the reduction of carbon stock due to activities planned by the Project.

Table 38 - Ex-ante estimation of stock reduction due to planned activities in the Project area (Table 25d of Methodology VM0015).

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
2023	29,396.2	29,396.2	0.0	0.0	0.0	0.0	29,396.2	29,396.2
2024	29,396.2	58,792.4	0.0	0.0	0.0	0.0	29,396.2	58,792.4

2025	29,396.2	88,188.6	0.0	0.0	0.0	0.0	29,396.2	88,188.6
2026	29,396.2	117,584.8	0.0	0.0	0.0	0.0	29,396.2	117,584.8
2027	29,396.2	146,981.0	0.0	0.0	0.0	0.0	29,396.2	146,981.0
2028	29,396.2	176,377.3	0.0	0.0	0.0	0.0	29,396.2	176,377.3
2029	29,396.2	205,773.5	0.0	0.0	0.0	0.0	29,396.2	205,773.5
2030	29,396.2	235,169.7	0.0	0.0	0.0	0.0	29,396.2	235,169.7
2031	29,396.2	264,565.9	0.0	0.0	0.0	0.0	29,396.2	264,565.9
2032	29,396.2	293,962.1	0.0	0.0	0.0	0.0	29,396.2	293,962.1

Optional accounting of increase in carbon stocks

The ex-ante estimate of the carbon stock increase by regeneration after management activities was not considered as conservative measure.

Ex-ante estimation of carbon stock changes due to unavoidable unplanned deforestation in the Project Area (Step 7.1.2 VM0015)

No unavoidable and significant unplanned deforestation is expected in the Project scenario, due to the implementation of effective forest cover monitoring and surveillance improvements, the strengthening of governance in the area due to the management activity and the activities foreseen by the Project, and the greater alignment with communities. As a result, the project is expected to achieve high levels of effectiveness during its 30-year 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 Effectiveness Index (EI). The estimated value of EI is used to multiply the baseline projections by the factor (1 - EI) and the result was considered to be the Ex-ante estimated emissions from unplanned deforestation in the case of the Project. To calculate the actual Ex-ante change in carbon stock due to unavoidable unplanned deforestation, equation 16 of methodology VM0015 version 1.1, presented below, was used.

$$\Delta CUDdPAt = \Delta CBSLt * (1 - EI)$$

Where:

ΔCUDdPAt: Total ex-ante change in actual carbon stock due to unplanned and unavoidable deforestation in year t in the Project Area (tCO2-e);

ΔCBSLt: Total variation in the baseline carbon stock in the year, in the Project Area (tCO2- e);

EI: Ex-ante Index of Estimated Effectiveness;

t: 1, 2, 3 ... T, year of the period proposed for crediting the project (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 their efficiency over the years.

Estimated ex-ante net changes of the actual carbon stock in the project area (Step 7.1.3 VM0015)

Changes in carbon stock related to planned activities and Project effectiveness are presented in Table 39.

Table 39 - Ex-ante estimates of net carbon reduction in the Project Area under 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
2023	29,396.2	29,396.2	0.0	0.0	49,952.9	49,952.9	79,349.1	79,349.1
2024	29,396.2	58,792.4	0.0	0.0	73,891.3	123,844.2	103,287.5	182,636.6
2025	29,396.2	88,188.6	0.0	0.0	92,497.2	216,341.4	121,893.4	304,530.0
2026	29,396.2	117,584.8	0.0	0.0	91,122.7	307,464.1	120,518.9	425,048.9
2027	29,396.2	146,981.0	0.0	0.0	94,536.4	402,000.4	123,932.6	548,981.5
2028	29,396.2	176,377.3	0.0	0.0	78,327.0	480,327.4	107,723.2	656,704.7
2029	29,396.2	205,773.5	0.0	0.0	71,552.5	551,879.9	100,948.7	757,653.3
2030	29,396.2	235,169.7	0.0	0.0	77,712.7	629,592.6	107,108.9	864,762.2
2031	29,396.2	264,565.9	0.0	0.0	74,590.3	704,182.9	103,986.5	968,748.7
2032	29,396.2	293,962.1	0.0	0.0	74,120.7	778,303.6	103,516.9	1,072,265.7

Ex-ante estimation of non-CO2 emissions due to forest fires (Step 7.2 VM0015)

Non-CO2 emissions from fire were not accounted for in the baseline scenario.

Total ex-ante emissions for the project area (Step 7.3 VM0015)

Table 40 presents the expected net changes and non-CO2 emissions in the Project Area. If these emissions occur during the development of Project activities, they will be monitored and reported to verify if there will be an increase in projected emissions in the Project scenario.

Table 40 - 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
2023	29,396.2	29,396.2	0.0	0.0	49,952.9	49,952.9	79,349.1	79,349.1	0.0	0.0
2024	29,396.2	58,792.4	0.0	0.0	73,891.3	123,844.2	103,287.5	182,636.6	0.0	0.0
2025	29,396.2	88,188.6	0.0	0.0	92,497.2	216,341.4	121,893.4	304,530.0	0.0	0.0
2026	29,396.2	117,584.8	0.0	0.0	91,122.7	307,464.1	120,518.9	425,048.9	0.0	0.0
2027	29,396.2	146,981.0	0.0	0.0	94,536.4	402,000.4	123,932.6	548,981.5	0.0	0.0
2028	29,396.2	176,377.3	0.0	0.0	78,327.0	480,327.4	107,723.2	656,704.7	0.0	0.0
2029	29,396.2	205,773.5	0.0	0.0	71,552.5	551,879.9	100,948.7	757,653.3	0.0	0.0
2030	29,396.2	235,169.7	0.0	0.0	77,712.7	629,592.6	107,108.9	864,762.2	0.0	0.0
2031	29,396.2	264,565.9	0.0	0.0	74,590.3	704,182.9	103,986.5	968,748.7	0.0	0.0
2032	29,396.2	293,962.1	0.0	0.0	74,120.7	778,303.6	103,516.9	1,072,265.7	0.0	0.0

3.2.3 Leakage

Step 8 of VM0015 – Ex-ante estimate of leakage

Ex-ante estimate of carbon stock reduction and increase in GHG emissions due to leakage prevention measures (Step 8.1 VM0015)

Leak prevention measures will take place within the boundaries of the leakage management areas. As described in section 2.1.11, three activities proposed by the Project will contribute to leakage management measures: "Promotion of sustainable practices", "Development and strengthening of value chains" and "Improvement of infrastructure". Thus, no activities are foreseen to improve agricultural or pasture management, or forage production or any other activities that reduce carbon stocks and increase GHG emissions compared to the baseline scenario.

The follow-up of activities developed that act as leakage management will be monitored and reported in all Project verification events.

Changes in the carbon stock 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. If significant changes occur in the carbon stock, these activities will be monitored, accounted for and reported.

Ex-ante estimate of methane (CH4) and nitrous oxide (N20) emissions from livestock intensification (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 estimate of carbon stock changes and increase 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 estimate of reduction in carbon stocks and increase in GHG emissions due to leakage due to activity displacement (Step 8.2 VM0015)

Activities that will cause deforestation within the Project Area in the baseline case may be shifted outside the project boundaries due to the implementation of the AUD project activity. Decrease in carbon stocks within the leakage band during the project scenario greater than those predicted Ex-ante would indicate displacement of deforestation activities due to the project.

Ex-ante activity displacement leakage 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 “Improving infrastructure”, “Fostering sustainable practices” and “Developing and strengthening value chains”.

The “Infrastructure Improvement” activity aims to promote and articulate investments in community infrastructure, considering environmental and social aspects, as well as public participation, to ensure that actions are sustainable and meet the real needs of the population. Throughout the development of this activity, it is expected to achieve a solid infrastructure that improves people's quality of life, providing better access to basic services, contributing to the health and well-being of the population, as well as reducing the rural exodus of traditional families. The activity "Fostering sustainable practices" will assist in addressing environmental challenges and will seek to ensure the preservation of natural resources in community areas by promoting sustainable practices with the establishment of strategic partnerships for the execution of on-site actions; technical assistance and rural extension networks; promotion of diversified, sustainable and adaptive agricultural production systems and models; and the implementation of alternatives to the burning of solid waste. In addition, the activity of "Development and strengthening of value chains" will act mainly in the formation and/or strengthening of associations and cooperative dynamics as a means of facilitating access to resources, whether financial or physical, which make it possible to increase small rural enterprises and enable access to different marketing channels.

Although the Project aims to reach 100% of agents at baseline, it was conservatively considered a “Leak Displacement Factor”. To calculate the ex-ante change in the actual carbon stock due to unavoidable unplanned deforestation, an equation similar to equation 16 of the methodology VM0015 version 1.1, presented in Step 7.1.2, was used; however, with an adjustment, multiplying the estimated baseline carbon stock changes 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 a rate of 10% and decreasing over the lifetime of the project. The equation is shown 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 baseline carbon stock in the Project Area in year t (tCO_2);

DLF: Displacement Leakage 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 estimate of leakage due to activity shift for the first fixed baseline period is found in Table 41 and the total Ex-ante leakage is shown in Table 42.

Table 41 - Estimated Ex-ante leakage due to activity displacement (Table 34 of Methodology VM0015 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
2023	49,952.9	49,952.9	0.0	0.0

2024	73,891.3	123,844.2	0.0	0.0
2025	92,497.2	216,341.4	0.0	0.0
2026	91,122.7	307,464.1	0.0	0.0
2027	94,536.4	402,000.4	0.0	0.0
2028	78,327.0	480,327.4	0.0	0.0
2029	71,552.5	551,879.9	0.0	0.0
2030	77,712.7	629,592.6	0.0	0.0
2031	74,590.3	704,182.9	0.0	0.0
2032	74,120.7	778,303.6	0.0	0.0

Ex-ante estimate of total leakage (Step 8.3 VM0015)

Table 42 - Ex-ante total Leakage Estimate (Table 35 of Methodology VM0015 version 1.1)

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 $\Delta CADLK$ tCO_2e	annual $\Delta CLPMLK_t$ tCO_2e	cumulative $\Delta CLPMLK$ tCO_2e	annual ΔCLK_t tCO_2e	cumulative ΔCLK tCO_2e	annual ELK_t tCO_2e	cumulative ELK tCO_2e
2023	0.0	0.0	0.0	0.0	49,952.9	49,952.9	0.0	0.0	49,952.9	49,952.9	0.0	0.0
2024	0.0	0.0	0.0	0.0	73,891.3	123,844.2	0.0	0.0	73,891.3	123,844.2	0.0	0.0
2025	0.0	0.0	0.0	0.0	92,497.2	216,341.4	0.0	0.0	92,497.2	216,341.4	0.0	0.0
2026	0.0	0.0	0.0	0.0	91,122.7	307,464.1	0.0	0.0	91,122.7	307,464.1	0.0	0.0
2027	0.0	0.0	0.0	0.0	94,536.4	402,000.4	0.0	0.0	94,536.4	402,000.4	0.0	0.0
2028	0.0	0.0	0.0	0.0	78,327.0	480,327.4	0.0	0.0	78,327.0	480,327.4	0.0	0.0
2029	0.0	0.0	0.0	0.0	71,552.5	551,879.9	0.0	0.0	71,552.5	551,879.9	0.0	0.0
2030	0.0	0.0	0.0	0.0	77,712.7	629,592.6	0.0	0.0	77,712.7	629,592.6	0.0	0.0
2031	0.0	0.0	0.0	0.0	74,590.3	704,182.9	0.0	0.0	74,590.3	704,182.9	0.0	0.0
2032	0.0	0.0	0.0	0.0	74,120.7	778,303.6	0.0	0.0	74,120.7	778,303.6	0.0	0.0

3.2.4 Net GHG Emission Reductions and Removals

Step 9 of VM0015 - Total ex-ante reduction of net anthropogenic GHG emissions

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 aboveground biomass will contribute to 81% of the expected emissions in the baseline scenario, at belowground biomass with 12% and dead wood with 7%. Therefore, they all represent significant sources of emissions (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 methodology VM0015 version 1.1 to estimate Ex-ante net decrease in Project emissions. The result is shown in Table 43 (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 AUD activity of the project in year t (tCO2e);

∆CBSLPAt: Sum of changes in baseline carbon stock in the Project Area in year t (tCO2e);

EBBBSLPAt: Sum of changes in baseline caused by the burning of biomass in the Project Area in year t (tCO2e);

∆CPSPAt: Sum of ex post changes in carbon stock in the Project Area in year t (tCO2e);

EBBPSPAt: Sum of ex post emissions caused by the burning of biomass 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 due to leakage in year t (tCO2e);

t: 1, 2, 3 ... T, one year of proposed credit period (without dimension).

Ex-ante calculation of Verified Carbon Units (VCU's) (Step 9.3 VM0015)

Equation 20 of Methodology VM0015 was used to estimate the number of VCU's. Risk Factor The parameter was estimated using the VCS AFOLU Non-Permanence Risk Tool, resulting in 10%. The result is presented in Table 43 (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 traded in year t (tCO2e);

ΔREDDt: Reduction of ex post anthropogenic GHG emissions attributed to the AUD activity of the project in year t (tCO2e);

VBCt: Buffer credit number deposited in buffer VCS in year t (t CO2-e);

ΔCBSLPAt: Sum of changes in baseline carbon stock in the Project Area in year t (tCO2e);

ΔCPSPAt: Sum of expost changes in carbon stock in the Project Area in year t (tCO2e);

RFt: Risk factor used to calculate credit buffer VCS (%);

t: 1, 2, 3 ... T, one year of proposed credit period (without dimension)

Table 43 - Ex-ante estimation of net anthropogenic GHG 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
2023	499,529	499,529	0	0	79,349	79,349	0	0	49,953	49,953	0	0	370,227	370,227	328,209	328,209	42,018	42,018
2024	738,913	1,238,442	0	0	103,288	182,637	0	0	73,891	123,844	0	0	561,734	931,961	498,172	826,381	63,563	105,581
2025	924,972	2,163,414	0	0	121,893	304,530	0	0	92,497	216,341	0	0	710,582	1,642,543	630,274	1,456,654	80,308	185,888
2026	911,227	3,074,641	0	0	120,519	425,049	0	0	91,123	307,464	0	0	699,585	2,342,128	620,514	2,077,169	79,071	264,959
2027	945,364	4,020,004	0	0	123,933	548,981	0	0	94,536	402,000	0	0	726,895	3,069,022	644,752	2,721,920	82,143	347,102
2028	979,087	4,999,092	0	0	107,723	656,705	0	0	78,327	480,327	0	0	793,037	3,862,060	705,901	3,427,821	87,136	434,239
2029	894,406	5,893,497	0	0	100,949	757,653	0	0	71,552	551,880	0	0	721,905	4,583,964	642,559	4,070,380	79,346	513,584
2030	1,110,181	7,003,679	0	0	107,109	864,762	0	0	77,713	629,593	0	0	925,360	5,509,324	825,052	4,895,432	100,307	613,892
2031	1,065,576	8,069,254	0	0	103,987	968,749	0	0	74,590	704,183	0	0	886,999	6,396,323	790,840	5,686,272	96,159	710,051
2032	1,235,345	9,304,600	0	0	103,517	1,072,266	0	0	74,121	778,304	0	0	1,057,707	7,454,030	944,525	6,630,797	113,183	823,233

3.3 Monitoring

3.3.1 Data and Parameters Available at Validation

Data / Parameter	Cab_{cl}
Data unit	t CO_2e ha^{-1}
Description	Average stock per hectare of CO_2 and biomass in aboveground reservoir of class *cl* LU/LC
Source of data	Calculated by allometric equations, conversion factors from the literature and data measured in the field
Value applied	644.9
Justification of choice of data or description of measurement methods and procedures applied	Aboveground carbon stock estimates were obtained using forest inventory data and allometric equations developed in areas similar to the Project Area and adopting standard values from the literature or recommended by VCS VM0015
Purpose of data	• Determination of the baseline scenario • Baseline emissions calculation • Project emission calculation • Leakage calculation
Comments	See document: Carbon Final Report - STA V2

Data / Parameter	Cbb_{cl}
Data unit	t CO_2e ha^{-1}
Description	Average stock per hectare of CO_2 and biomass in the below-ground reservoir of class *cl* LU/LC
Source of data	Calculated by allometric equations, conversion factors from the literature and data measured in the field
Value applied	96.96
Justification of choice of data or description of measurement methods and procedures applied	Estimates of below-ground carbon stock were obtained using forest inventory data and allometric equations developed in areas similar to the Project Area and adopting standard values from the literature or recommended by VCS VM0015
Purpose of data	• Determination of the baseline scenario • Baseline emissions calculation

	• Project emission calculation • Leakage calculation
Comments	See document: Carbon Final Report - STA V2

Data / Parameter	Cdw_{cl}
Data unit	t CO_2e ha^{-1}
Description	Average stock per hectare of CO_2 and biomass in dead wood (standing and on the ground) of class *cl* LU/LC
Source of data	Calculated by allometric equations, density and volume equations, literature conversion factors and forest inventory data.
Value applied	56.22
Justification of choice of data or description of measurement methods and procedures applied	Carbon stock estimates in standing and ground deadwood were obtained using forest inventory data, allometric equations, and density and volume equations recommended by VCS VM0015
Purpose of data	• Determination of the baseline scenario • Baseline emissions calculation • Project emission calculation • Leakage calculation
Comments	See document: Carbon Final Report - STA V2

Data / Parameter	CF_j
Data unit	t C
Description	Carbon fraction in biomass
Source of data	Literature: IPCC, 2006[80]
Value applied	0.47

[80] IPCC. (2006). Agriculture, Forestry and Other Land Use. In: Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Vol. 4. IGES, Japan.

Justification of choice of data or description of measurement methods and procedures applied	IPCC default value
Purpose of data	• Calculation of baseline emissions • Project emission calculation • Leakage calculation
Comments	-

Data / Parameter	$Ctot_{cl}$
Data unit	t CO_2e ha^{-1}
Description	Average stock of CO_2e per hectare in all carbon pools accounted for in the *cl* LU/LC class
Source of data	Calculated by allometric equations, conversion factors from the literature and data measured in the field
Value applied	798.09
Justification of choice of data or description of measurement methods and procedures applied	Estimates of aboveground, belowground and dead wood carbon stock were obtained using forest inventory data and allometric equations[81] developed in areas similar to the Project Area and adopting standard values from the literature or recommended by VCS VM0015
Purpose of data	• Determination of the baseline scenario • Baseline emissions calculation • Project emission calculation • Leakage calculation
Comments	See document: Carbon Final Report - STA V2

Data / Parameter	DBH
Data unit	cm
Description	Diameter at breast height (130 cm) for each tree
Source of data	Measured in the field by STA – Environmental Technical Solutions

[81] Nogueira, E.M.; Fearnside, P.M.; Nelson, B.W. Barbosa, R.I.; Keizer, E.W.H. Estimates of forest biomass in the Brazilian Amazon: New allometric equations and adjustments to biomass from wood-volume inventories. Forest Ecology and Management, v. 256, n. 11, p. 1853-1867, 2008.

Value applied	See worksheet with field data
Justification of choice of data or description of measurement methods and procedures applied	Requirement demanded by VCS methodology VM0015. Forest inventory data in 36 plots of 1 hectare, located in wide spatial distribution
Purpose of data	• Determination of the baseline scenario • Baseline emissions calculation • Project emission calculation • Leakage calculation
Comments	Main variable to estimate the carbon stock aboveground, belowground and standing dead wood of the Tueré REDD+ Project. See document: Carbon Final Report - STA V2

Data / Parameter	H
Data unit	meters
Description	Tree height
Source of data	Measured in the field by STA – Environmental Technical Solutions
Value applied	See worksheet with field data
Justification of choice of data or description of measurement methods and procedures applied	Requirement demanded by VCS methodology VM0015. Forest inventory data in 36 plots of 1 hectare, located in wide spatial distribution
Purpose of data	• Determination of the baseline scenario • Baseline emissions calculation • Project emission calculation • Leakage calculation
Comments	See document: Carbon Final Report - STA V2

Data / Parameter	D_{dc}
Data unit	$t\ m^{-3}$
Description	Density of dead wood on the ground

Source of data	Measured by UFRA Laboratory and validated by STA – Environmental Technical Solutions
Value applied	See worksheet with field data
Justification of choice of data or description of measurement methods and procedures applied	Requirement demanded by VCS methodology VM0015. Calculation of the amount of dead wood biomass on the ground in rotten, intermediate and hard samples with a diameter greater than 10 cm.
Purpose of data	• Determination of the baseline scenario • Baseline emissions calculation • Project emission calculation
Comments	See document: Carbon Final Report - STA V2

Data / Parameter	D_j
Data unit	t m^{-3}
Description	Average wood density of species
Source of data	Measured by UFRA Laboratory and validated by STA – Environmental Technical Solutions
Value applied	0.463
Justification of choice of data or description of measurement methods and procedures applied	Variable used for volume conversion to standing deadwood biomass. The value used in the density of standing dead trees (d_m= (0.599 + 0.448 + 0.302)/3 = 0.463) was the mean value obtained from the three classes of dead wood on the ground.
Purpose of data	• Calculation of baseline emissions • Project emission calculation
Comments	See document: Carbon Final Report - STA V2

Data / Parameter	R_j
Data unit	Dimensionless
Description	Root-to-air ratio appropriate for species, species group or forest type

Source of data	Literature: GOFC-GOLD, 2008[82] and VCS VM0015, 2012
Value applied	0.24
Justification of choice of data or description of measurement methods and procedures applied	Suggested default value for tropical rainforest regions with aboveground biomass greater than 125 t ha-1 (GOFC-GOLD, 2008; VCS Methodology VM0015, p. 140, Table -2)
Purpose of data	• Calculation of baseline emissions • Project emission calculation • Leakage calculation
Comments	-

Data / Parameter	$Volume_{dc}$
Data unit	m^3
Description	Dead wood volume in density class *dc*
Source of data	Measured by UFRA Laboratory and validated by STA – Environmental Technical Solutions
Value applied	See worksheet with field data
Justification of choice of data or description of measurement methods and procedures applied	Requirement demanded by VCS methodology VM0015. Calculation of the amount of dead wood biomass on the ground in rotten, intermediate and hard samples with a diameter greater than 10 cm.
Purpose of data	• Calculation of baseline emissions • Project emission calculation
Comments	See document: Carbon Final Report - STA V2

3.3.2 Data and Parameters Monitored

Parameters for monitoring deforestation, emissions and credit generation

Data / Parameter	$ABSLPA_t$
Data unit	Hectare (ha)

[82] http://www.gofcgold.wur.nl/redd/sourcebook/GOFC-GOLD_Sourcebook.pdf

Description	Baseline annual deforestation area in the Project Area in the year *t*
Source of data	Calculated using remote sensing and data available from reliable sources
Description of measurement methods and procedures to be applied	Monitoring of the forest component through remote sensing using satellite imagery and data from reliable sources
Frequency of monitoring/recording	Annual
Value applied	Table 23 (Table 9b of methodology VM0015)
Monitoring equipment	Geotechnologies: remote sensing and geographic information systems
QA/QC procedures to be applied	In mapping changes in forest cover and defining land use classes, data obtained at medium spatial resolution (between 10m and 100m) will be used. Subsequently, for validation and refinement of the described mapping, data obtained by high resolution sensors (up to 5m pixels) will be used. The minimum accuracy of the land use and land cover classification map is 80%
Purpose of data	• Calculation of project emissions
Calculation method	-
Comments	-

Data / Parameter	$\Delta CUDdPA_t$
Data unit	tCO_2-e
Description	Total change in actual carbon stock due to unplanned and unavoided deforestation in year *t* in the Project Area
Source of data	Calculated from the detected areas of forest loss due to unplanned deforestation in the Project Area and the estimated average carbon stock for the initial forest class

Description of measurement methods and procedures to be applied	Monitoring the $ABSLPA_t$ indicator for later calculation of the change in carbon stock from unplanned and unavoided deforestation
Frequency of monitoring/recording	Annual
Value applied	To be accounted for after the start of the Project
Monitoring equipment	Emissions spreadsheet
QA/QC procedures to be applied	Good practices applied to the calculation of $ABSLPA_t$
Purpose of data	• Calculation of project emissions
Calculation method	The parameter is estimated from the multiplication of unplanned deforestation areas by the estimated average carbon stock value for the initial forest class. The sum of carbon stock residual emissions under the soil and in dead timber is also considered, as such pools have 1/10 annual decay, causing emissions along the years. Finally, the estimated carbon stock value for the Reference Region in a post-deforestation scenario is subtracted from this result, obtaining the net value of carbon stock that was reduced by unplanned and unavoidable deforestation
Comments	-

Data / Parameter	$AUFPA_{icl,t}$
Data unit	Hectare (ha)
Description	Areas affected by forest fires in the *icl* class where carbon stock recovery occurs in the year *t*
Source of data	Calculated using remote sensing and data available from reliable sources
Description of measurement methods and procedures to be applied	Identification of affected areas from reliable sources with data from hot spots and fire scars. Photointerpretation technique with high resolution images for validating the data obtained, identifying and quantifying the affected areas.

Frequency of monitoring/recording	Whenever the occurrence of forest fires is identified
Value applied	To be accounted for after the start of the Project
Monitoring equipment	Geotechnologies: remote sensing and geographic information systems
QA/QC procedures to be applied	In validating and refining the mapping of areas affected by fires, data or images obtained from high-resolution sensors (up to 5m pixels) will be used. Minimum mapping accuracy is 80%
Purpose of data	• Calculation of project emissions
Calculation method	-
Comments	-

Data / Parameter	$\Delta CUFdPA_t$
Data unit	tCO_2-e
Description	Total decrease in carbon stock due to unplanned (and planned - when applicable) forest fires in year *t* in the Project Area
Source of data	Calculated through the areas affected by forest fires in the Project Area and the estimated average carbon stock for the initial forest class
Description of measurement methods and procedures to be applied	Parameter monitoring $AUFPA_{icl,t}$ for later calculation of the change in carbon stock from areas affected by forest fires.
Frequency of monitoring/recording	Every occurrence of forest fires
Value applied	To be accounted for after the start of the Project
Monitoring equipment	Emissions spreadsheet
QA/QC procedures to be applied	Good practices applied to the calculation of $AUFPA_{icl,t}$

Purpose of data	• Calculation of project emissions
Calculation method	The carbon stock variation is estimated by multiplying the area affected by catastrophic events and the estimated average carbon stock for the initial forest class
Comments	-

Data / Parameter	ACPAicl,
Data unit	Hectare (ha)
Description	Area affected by catastrophic events in class *icl* in year *t* within the Project Area
Source of data	High-resolution satellite imagery
Description of measurement methods and procedures to be applied	Identification of affected areas from reliable data sources. Photointerpretation technique with high resolution images for validating the data obtained, identifying and quantifying the affected areas.
Frequency of monitoring/recording	Every occurrence of a catastrophic event
Value applied	To be accounted for after the start of the Project
Monitoring equipment	Geotechnologies: remote sensing and geographic information systems
QA/QC procedures to be applied	In validating and refining the mapping of areas affected by catastrophic events, data or images obtained from high-resolution sensors (up to 5m pixels) will be used. Minimum mapping accuracy is 80%
Purpose of data	• Calculation of project emissions
Calculation method	-
Comments	-

Data / Parameter	$\Delta CUCdPA_t$
Data unit	tCO_2-e
Description	Total carbon stock decrease due to catastrophic events in year *t* in the Project Area
Source of data	Calculated through the areas affected by forest fires in the Project Area and the estimated average carbon stock for the initial forest class
Description of measurement methods and procedures to be applied	Parameter monitoring $ACPA_{icl,t}$ for later calculation of the change in carbon stock from areas affected by catastrophic events
Frequency of monitoring/recording	Every occurrence of a catastrophic event
Value applied	To be accounted for after the start of the Project
Monitoring equipment	Emissions spreadsheet
QA/QC procedures to be applied	Good practices applied to the calculation of $ACPAi_{cl,t}$
Purpose of data	• Calculation of project emissions
Calculation method	The carbon stock variation is estimated by multiplying the area affected by catastrophic events and the estimated average carbon stock for the initial forest class
Comments	-

Data / Parameter	$ABSLLK_t$
Data unit	Hectare (ha)
Description	Baseline annual deforestation area in the Leakage Belt in the year *t*
Source of data	Calculated using remote sensing and data available from reliable sources

Description of measurement methods and procedures to be applied	Monitoring of the forest component through remote sensing using satellite imagery and data from reliable sources
Frequency of monitoring/recording	Annual
Value applied	Table 24 (Table 9c of VM0015 methodology)
Monitoring equipment	Geotechnologies: remote sensing and geographic information systems
QA/QC procedures to be applied	In mapping changes in forest cover and defining land use classes, data obtained at medium spatial resolution (between 10m and 100m) will be used. Subsequently, for validation and refinement of the described mapping, data obtained by high resolution sensors (up to 5m pixels) will be used. The minimum accuracy of the land use and land cover classification map is 80%
Purpose of data	• Leak Calculation
Calculation method	-
Comments	-

Data / Parameter	$\Delta CADLK_t$
Data unit	tCO_2-e
Description	Total decrease in carbon stocks due to year-displaced deforestation *t*
Source of data	Calculated from the detected areas of forest loss in the Leakage Belt, the average carbon stock and the estimated loss in carbon stock projected by the baseline
Description of measurement methods and procedures to be applied	Indicator follow-up $\Delta BSLLK_{icl,t}$ for later calculation of the change in carbon stock from deforestation shifted to the Leakage Belt
Frequency of monitoring/recording	Annual

Value applied	To be accounted for after the start of the Project
Monitoring equipment	Emissions spreadsheet
QA/QC procedures to be applied	Good practices applied to the calculation of $\Delta BSLLK_{icl,t}$
Purpose of data	• Leak Calculation
Calculation method	The parameter is estimated from the multiplication of areas of forest loss by the average carbon stock value estimated for the initial forest class. The sum of carbon stock residual emissions under the soil and in dead timber is also considered, as such pools have 1/10 annual decay, causing emissions along the years. Then, the value of the estimated carbon stock for the Reference Region in a post-deforestation scenario is subtracted from this result, obtaining the net value of the carbon stock that was reduced by displaced deforestation. Finally, the estimated loss of carbon stock in the Leakage Belt projected by the baseline is subtracted from this value.
Comments	-

Data / Parameter	$EgLK_t$
Data unit	tCO_2-e
Description	Emissions from animals on pastures in the leakage management areas in year *t*
Source of data	Existing records on the practice of grazing
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	Only when applicable
Value applied	To be accounted for after the start of the Project

Monitoring equipment	Emissions spreadsheet
QA/QC procedures to be applied	To be defined when the parameter is applicable
Purpose of data	• Leak Calculation
Calculation method	Emissions will be calculated using the guidelines in section 8.1.2 of methodology VM0015 v1.1
Comments	-

Data / Parameter	$EADLK_t$
Data unit	tCO_2-e
Description	Ex-ante total increase in GHG emissions due to forest fires displaced in the year *t*
Source of data	Calculated using the areas affected by forest fires in the Leakage Belt and estimated average carbon stock for the initial land use class
Description of measurement methods and procedures to be applied	Identification of affected areas from reliable sources with data from hot spots and fire scars. Photointerpretation technique with high resolution images for validating the data obtained, identifying and quantifying the affected areas.
Frequency of monitoring/recording	Whenever the occurrence of forest fires is identified
Value applied	To be accounted for after the start of the Project
Monitoring equipment	Geotechnologies: remote sensing and geographic information systems
QA/QC procedures to be applied	In validating and refining the mapping of areas affected by fires, data or images obtained from high-resolution sensors (up to 5m pixels) will be used. Minimum mapping accuracy is 80%

Purpose of data	• Leak Calculation
Calculation method	The carbon stock variation is estimated by multiplying the area affected by the forest fire and the estimated average carbon stock for the initial land use class
Comments	-

Data / Parameter	$\Delta REDD_t$
Data unit	tCO_2-e
Description	Net reduction in anthropogenic greenhouse gas emissions attributable to the AUD Project activity in the year *t*
Source of data	Parameter is calculated by subtracting baseline carbon stock rates from changes in carbon stock over the Project
Description of measurement methods and procedures to be applied	The calculation of net reductions in anthropogenic GHG emissions attributable to Project activities will be calculated using Equation 19 and Table 36 of Methodology VM0015 v1.1
Frequency of monitoring/recording	Annual
Value applied	To be accounted for after the start of the Project
Monitoring equipment	Emissions spreadsheet
QA/QC procedures to be applied	Good practices applied to the calculation of the base parameters for calculating the emissions of the Project that were previously described
Purpose of data	• Calculation of baseline emissions • Calculation of project emissions • Leakage calculation
Calculation method	Emissions will be calculated using the guidelines in section 9.2 of methodology VM0015 v1.1
Comments	-

Data / Parameter	VCU_t
Data unit	tCO_2-e
Description	Number of Verified Carbon Units (VCU) to be made available for sale in the year *t*
Source of data	Value resulting from subtracting/discounting the risk factor (buffer) of net reductions in anthropogenic GHG emissions ($\Delta REDD_t$)
Description of measurement methods and procedures to be applied	The calculation of the VCUs will be performed using Equation 20, 21 and 22 and Table 36 of Methodology VM0015 v1.1
Frequency of monitoring/recording	Annual
Value applied	To be accounted for after the start of the Project
Monitoring equipment	Emissions spreadsheet
QA/QC procedures to be applied	Good practices applied to the calculation of the base parameters for calculating the emissions of the Project that were previously described
Purpose of data	• Calculation of baseline emissions • Calculation of project emissions • Leak calculation
Calculation method	Emissions will be calculated using the guidelines in section 9.3 of methodology VM0015 v1.1
Comments	-

Monitoring parameters of Climate Scope activities

Data / Parameter	Number of procedures and protocols performed
Data unit	Number
Description	Accounting for the amount of all material produced, in the form of procedures and protocols, which will be established and executed

	continuously to develop deforestation monitoring and improve Farm surveillance
Source of data	Calculated through the number of documents, in the form of procedures and protocols, developed and executed continuously over time in the Climate Scope activity (Improvement of Farm Surveillance)
Description of measurement methods and procedures to be applied	All documents that can be understood as procedures and protocols produced and executed by the Project will be stored in digital files throughout the crediting period of the Project. In this way, the reports from the “Improvement of Farm Surveillance” activity will be monitored and accounted for
Frequency of monitoring/recording	At each verification period
Value applied	To be accounted for after the start of the Project
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Information systematized in the procedures and protocols will be validated among the proponents, allowing for greater reliability and quality of data. In addition, the Project will undergo continuous evaluation of the information generated, through the identification of improvements in the collection and registration processes and, when relevant, the appropriate adjustments will be made
Purpose of data	• Calculation of project emissions
Calculation method	Not applicable
Comments	-

Data / Parameter	Number of occurrences
Data unit	Number
Description	Measurement of the number of occurrences of illicit activities within the Project Area, such as deforestation, wood theft, fires and hunting

Source of data	Calculated through the number of incident records, in the form of bulletins, photographs, among other documents
Description of measurement methods and procedures to be applied	Every document produced by the Project will be stored in digital files along Project crediting period. In this way, the records of occurrences carried out in the activity of "Improvement of Farm Surveillance" will be monitored and accounted for
Frequency of monitoring/recording	At each verification period
Value applied	To be accounted for after the start of the Project
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Information systematized in documents that evidence unlawful activity occurrence registrations will be validated between proponents, enabling greater data reliability and quality. In addition, the Project will undergo continuous evaluation of the information generated, through the identification of improvements in the collection and registration processes and, when relevant, the appropriate adjustments will be made
Purpose of data	• Calculation of project emissions
Calculation method	Not applicable
Comments	-

Data / Parameter	Number of bulletins
Data unit	Number
Description	Measurement of the number of deforestation and forest fire bulletins carried out for the Project Area and Leakage Belt
Source of data	Calculated through the number of bulletins generated, compilation of deforestation and forest fire information, among other documents

Description of measurement methods and procedures to be applied	Every document produced by the Project will be stored in digital files along Project crediting period. In this way, the number of bulletins carried out in the activity of "Monitoring deforestation via satellite images" will be monitored and counted
Frequency of monitoring/recording	At each verification period
Value applied	To be accounted for after the start of the Project
Monitoring equipment	Not applicable
QA/QC procedures to be applied	The systematized information in the documents proving the deforestation and forest fire bulletins 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, through the identification of improvements in the collection and registration processes and, when relevant, the appropriate adjustments will be made
Purpose of data	• Calculation of project emissions • Leakage Calculation
Calculation method	Not applicable
Comments	-

Data / Parameter	Improvements made to infrastructures
Data unit	Number
Description	Accounting for the amount of improvements made to the Farms and promoted in the communities
Source of data	Invoices for materials/equipment and hiring of personnel/specialized company, photographic records, reports of activities carried out, among others
Description of measurement methods and procedures to be applied	Every document produced by the Project will be stored in digital files along Project crediting period. In this way, the number of improvements made to the infrastructure will be monitored and accounted for

Frequency of monitoring/recording	At each verification period
Value applied	To be accounted for after the start of the Project
Monitoring equipment	Not applicable
QA/QC procedures to be applied	The systematized information in the documents proving improvements made in the infrastructures will be validated among the bidders, allowing greater reliability and quality of the data. In addition, the Project will undergo continuous evaluation of the information generated, through the identification of improvements in the collection and registration processes and, when relevant, the appropriate adjustments will be made
Purpose of data	• Calculation of project emissions
Calculation method	Not applicable
Comments	-

3.3.3 Monitoring Plan

The Climate Impacts Monitoring Plan will encompass key issues for demonstrating the reduction of emissions from deforestation and degradation due to avoided unplanned deforestation, in accordance with the applied methodology VM0015. Thus, the main objective is to monitor changes in the carbon stock throughout the Project's life cycle, 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 VERIFICATIONS

1.1 Monitoring actual changes in carbon stock and GHG emissions within the Project Area

Monitoring actual changes in carbon stock and GHG emissions within the Project Area involves four main scopes, which are:

i) project implementation;

ii) land use and land cover change;

iii) carbon stocks and non-CO_2 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, therefore, within the scope, non-CO_2 emissions (iii) were not considered, as emissions were not considered in the baseline derived from biomass burning.

Details on the monitoring of the four scopes are presented below.

a) Technical description of monitoring tasks

Changes in carbon stock due to conversion of forest areas to non-forest areas by unplanned deforestation will be monitored. Similarly, changes in carbon stock due to uncontrolled forest fires and other catastrophic events will be monitored and considered over the Project scenario in cases where they are significant.

As explained in Section 2.1.11, the proponents will develop the activity “Improvement of the surveillance of the Farms” which consists of the remote and continuous monitoring of the Project Area in order to allow agility in the identification and verification of deforestation events, in addition to improvements in the communication procedures, approach of violators and verification of occurrences.

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	Frequency
ABSLPAicl,t	Forest cover areas of initial *icl* forest class converted to non-forest cover areas within the Project Area in year t	ha (hectare)	Calculated using remote sensing and data available from reliable sources	Annual

Data/Parameter	Description	Unit	Source	Frequency
ΔCUDdPAt	Total change in actual carbon stock due to unavoidable unplanned deforestation in year *t* in the Project Area	tCO_2-e	Calculated from the detected areas of forest loss due to unplanned deforestation and estimated average carbon stock for the initial forest class	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 the initial icl forest class in which carbon stock recovery occurs in year *t*	ha (hectare)	Calculated using remote sensing and data available from reliable sources	Annual
ΔCUFdPAt	Total reduction in carbon stock due to unplanned (and planned - when applicable) forest fires in year *t* in the Project Area	tCO_2-e	Calculated from the areas affected by forest fires and the estimated average carbon stock for the initial forest class	Annual

Data/Parameter	Description	Unit	Source	Frequency
ACPAicl,t	Area affected by catastrophic events in the *icl* class in year *t* in Project Area	ha (hectare)	Calculated using remote sensing and data available from reliable sources	Annual
ΔCUCdPAt	Total reduction in carbon stock due to catastrophic events in year *t* in the Project Area	tCO_2-e	Calculated through the areas affected by forest fires in the Project Area and the estimated average carbon stock for the initial forest class	Annual

c) Brief description of data collection procedures

Project activity implementation monitoring

Monitoring the implementation of REDD+ activities will be carried out through schedules, activity performance reports, registration of indicators, financial reports, attendance lists, minutes of meetings, plans, established procedures and protocols, updated forest cover maps, among other relevant documents. Efficient management of the Project will be promoted over the years, ensuring effectiveness in the execution of activities so that positive impacts are achieved.

Monitoring of land use change and land cover within the Project Area

This monitoring will be carried out by mapping the forest cover of the Project Area, using qualified and scientifically recognized data sources, such as PRODES and DETER, databases developed through the National Institute for Space Research, data made available by MapBiomas (collaborative network formed by NGO's, universities and technology startups), among other qualified and recognized sources that can be used in the future. The choice of methodology for identifying and quantifying changes in land use must meet the requirements of quality of data and minimum accuracy, according to the indications of Methodology VM0015.

Also, especially for the monitoring of planned deforestation, open areas will be considered for the implementation of infrastructures, such as the construction of roads, branches 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.

In addition, different classification and visual interpretation techniques can be used during the course of the Project, both to identify deforestation and forest degradation and to validate and refine secondary data, such as photointerpretation using high-resolution satellite images, alternative sensors and data collected in the field.

After collecting 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

It is expected that the ex-ante estimate of the carbon stock for the forest class does not change during the baseline period. However, the VM0015 Methodology requests the monitoring of the carbon stock in the Project Area subject to the relevant decrease in the Project scenario in accordance with the ex-ante assessment due to the deforestation of areas subject to the unplanned and significant decrease in carbon stock in the Project scenario. Thus, the monitoring of changes (reduction) in the carbon stock of these areas will be carried out as follows:

1) Planned deforested areas

- The planned deforestation areas are multiplied by the average carbon stock value in the initial forest class (Ctot) established as an indicator in the Project validation. Thus, the net value of carbon stock reduced by planned deforestation is obtained.

2) Unplanned deforested areas

- The areas of unplanned deforestation are multiplied by the average carbon stock value in the initial forest class (Ctot) established as an indicator in the Project validation. The sum of carbon stock residual emissions under the soil and in dead timber is also considered, as such pools have 1/10 annual decay, causing emissions along the years. Finally, the value of the carbon stock estimated for the Reference Region in a post-deforestation scenario is subtracted from this result, obtaining the net value of the carbon stock that was reduced by unplanned and unavoidable deforestation. If there is a significant reduction in the carbon stock due to deforestation in the Project Area, this reduction will be presented in the verification processes using Table 29 of Approved Methodology VM0015 version 1.1.

Non-CO_2 emission monitoring

Monitoring of non-CO2 emissions will be based on sources of secondary data from reliable bases, such as hot spots or fire scars. Complementarily, the technique of photointerpretation of high resolution images will be used for validation of secondary data, classification and quantification of affected areas. In order to verify the damage and recovery of vegetation over time, NDVI analyses will be carried out, and, when necessary, field checks of points of interest to assess vegetation in situ. If forest areas are affected, the possible reduction in 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 change is significant, it will be reported in the verification processes using Tables 25e, 25f and 25g of methodology VM0015 version 1.1.

Monitoring of natural disturbances and other catastrophic events

Carbon stock reduction and increase in GHG emissions, as well as significant carbon stock reduction caused by natural disturbances or catastrophic events will be tracked, monitored and reported similar to non-CO_2 emissions in the Project Area. Therefore, if there is a significant decrease in the 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

To monitor the activities of the Tueré REDD+ Project, continuous evaluation processes will be carried out, allowing the incorporation of learnings and improvements and, consequently, quality assurance to the Project.

As described in the previous items, changes in carbon stock due to the conversion of forest areas 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 are significant. The control and quality assurance of the monitoring of these parameters will be carried out through the accuracy process indicated by the VM0015 version 1.1 methodology, which will be the same regardless of the type of data used in the monitoring.

An analysis of general accuracy and the kappa index obtained from a confusion matrix such as Congalton's (1999) will be performed[83]. Through a geographic information system, at least 100 points will be generated and randomly distributed in the area of interest. Validation will be performed using high spatial resolution satellite images and/or data collected in field. The minimum mapping accuracy, according to VM0015, for each class or category in the land use and land cover map, must be 80%.

In addition to the accuracy process carried out, when necessary, field verifications will also be carried out in areas where unplanned deforestation events, uncontrolled forest fires and catastrophic events are identified.

e) Data archiving

The Biofílica Ambipar Environment will store all data and reports of the Tueré REDD+ Project in digital files throughout the duration of the Project. All documents relating to Project monitoring will be made available to auditors at each verification event.

f) Organization and responsibilities of the parties involved in all of the above points

The procedures described will be responsibility of the Project proponents: Biofílica Ambipar Environment and Brascomp Compensados do Brasil S.A.

1.2 Leak monitoring

Leakage monitoring by the Project involves two main scopes, which are:

i) Changes in carbon stocks and GHG emissions associated with leak prevention activities; and,

ii) Changes in carbon stocks and GHG emissions associated with the leakage due to the 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.

Next, two scope monitoring details are presented.

[83] CONGALTON, R. G.; KASS GREEN. Assessing The Accuracy Of Remotely Sensed Data: Principles And Practices. New York – CRC Press, 1999.

a) Monitoring task technical description

It is not expected that there will be changes in the carbon stock and GHG emissions associated with spill prevention activities, since no activity is planned, such as intensive agriculture, pasture area management or forage production, capable of changing the carbon stock and increasing GHG emissions when compared to the baseline scenario.

However, although no stock reduction in leakage prevention activities is foreseen, should they prove necessary during Project implementation, the ex-ante changes in carbon stock and GHG emissions associated with these activities will be estimated according to step 8 of Methodology VM0015. If results are significant, they will be monitored and data will be made available to verifiers at each verification event using Tables 30b, 30c, 31, 32 and 33 of Methodology VM0015 version 1.1.

The changes in carbon stock and GHG emissions associated with the leakage due to the displacement of activities will be monitored using the same technique applied in the monitoring of changes in carbon stock due to the conversion of forest areas to non-forest areas by unplanned deforestation in the Project Area.

Data/Parameter	Description	Unit	Source	Frequency
$\Delta BSLLK_{icl,t}$	Forest cover areas of the initial icl forest class converted to non-forest cover areas within the Leakage Belt in year t	ha (hectare)	Calculated using remote sensing and data available from reliable sources	Annual
$\Delta CADLK_t$	Total reduction in carbon stocks due to displaced deforestation in year t in the Leakage Belt	tCO_2-e	Calculated from the detected areas of forest loss in the Leakage Belt, the average carbon stock and the estimated loss in carbon stock projected by the baseline	Annual
$EADLK_t$	Emissions from forest fires displaced to the Leakage Belt in year t of the Tueré REDD+ Project	tCO_2-e	Calculated using the areas affected by forest fires in the Leakage Belt and estimated average carbon stock for the initial land use class	Only when applicable

c) Brief description of data collection procedures

Changes in carbon stocks and GHG emissions associated with leak prevention activities

As explained in item a), it is not expected that there will be changes in the carbon stock and GHG emissions associated with leak 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, the 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 in each verification event using Tables 30b, 30c, 31, 32 and 33 of the VM0015 Methodology version 1.1.

Monitoring, considering 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 the carbon stock;

- The existing non-forest classes in these areas in the baseline case will be identified;

Carbon stocks in the identified classes will be measured or a literature conservative estimate will be used;

- Changes in carbon stock in leak 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;

- Calculation results will be reported by Table 30 of Methodology VM0015 approved.

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, which will be evaluated for data quality and accuracy requirements. If in the Leakage Belt there is a deforestation event greater than expected for the baseline scenario and it is attributed to deforestation agents in the Project Area, losses in carbon stock will be accounted for and reported using Table 22c or Table 21c of the VM0015 Methodology version 1.1.

d) Quality control and quality assurance procedures

Quality control and assurance in relation to the monitoring of changes in carbon stock and GHG emissions associated with leak prevention activities will be determined according to the activity, if implemented. In relation to the changes in carbon stock and GHG emissions associated with the leakage due to the displacement of activities, they will be carried out through the accuracy analysis, as indicated by the VM0015 version 1.1 methodology.

The classification accuracy analysis will be carried out through the analysis of general accuracy and the kappa index obtained from a confusion matrix such as that of Congalton and Green (2008)[84], in which at least 100 will be generated through a geographic information system. points distributed randomly in relation to the analyzed area. Validation will be performed using high spatial resolution satellite images and/or data collected in field. The minimum mapping accuracy, according to VM0015, for each class or category in the land use and land cover map, must be 80%.

e) Data archiving

The Biofílica Ambipar Environment will store all data and reports of the Tueré REDD+ Project in digital files throughout the duration of the Project.

All documents relating to Project monitoring will be made available to auditors at each verification event.

f) Organization and responsibilities of the parties involved in all of the above points

The procedures described will be responsibility of the Project proponents: Biofílica Ambipar Environment and Brascomp Compensados do Brasil S.A.

1.3 Monitoring ex-post reductions in net anthropogenic GHG emissions

Details on monitoring are presented below.

a) Technical description of monitoring tasks

In the verification procedures, results will be represented using Table 36 of Methodology VM0015 version 1.1, together 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	Frequency
ΔREDD,t	Reductions in net GHG emissions attributable to Project AUD activities year t	tCO_2-e	Calculated by subtracting ex post carbon stock changes from the baseline scenario	Annual

[84] Congalton, R. and Green, K. (2008) Assessing the Accuracy of Remotely Sensed Data: Principles and Practices. Second Edition, CRC Press, Boca Raton.

Data/Parameter	Description	Unit	Source	Frequency
VCU,t	Number of Verified Carbon Units (VCU's) to be made available for commercialization in year t	tCO_2-e	Calculated by subtracting ex post Project net GHG emission reductions from the buffer	Annual

PART 2. MONITORING BASELINE PROJECTIONS IN THE FUTURE

2.1 Updating information on agents, drivers and underlying causes of deforestation

The Project baseline will be updated and used in revising 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 the Steps 2 and 3 of Approved Version of Methodology VM0015.

2.2 Updating the component of land use change and land cover of the baseline

The Project will monitor 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 Methodology VM0015 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 area of annual deforestation and the location of deforestation in the baseline are the two main components to be reviewed.

Assumptions and hypotheses considered in modeling the dynamic component of future deforestation (population data) as well as data used in the spatial projection (update of roads, location and distance of new deforestation) will be reviewed and updated.

The Project will also monitor the updates regarding the methodologies used, making the necessary adaptations determined for the VCS Program.

2.3 Baseline carbon component update

According to the results generated during changes in the carbon stock monitoring processes throughout the Project, the spatial estimate of the carbon component can be revised in Methodology VM0015 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 in the baseline revisitation period.

3.3.4 Dissemination and Results of the Monitoring Plan (CL4.2)

The Monitoring Plan, as well as the results obtained by monitoring the Tueré REDD+ Project, will be made available to the public through a page on the official website of Biofílica Ambipar. The summary documents related to the monitoring plan, its results and other relevant information will be made available to the communities and other interested parties through meetings, lectures and by physical means (printed) at the premises of Fazendas Santo Antônio and Terra Alta of Brascomp.

3.4 Optional Criterion: Climate Change Adaptation Benefits

Under development.

3.4.1 Regional Climate Change Scenarios (GL1.1)

Under development.

3.4.2 Climate Change Impacts (GL1.2)

Under development.

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

Under development.

4 COMMUNITY

4.1 Community Landscape Without the Project

4.1.1 Description of the Communities at the Beginning of the Project (CM1.1)

The riverside communities located around the farms were formed between 1955 and 1970, while the PDS Virola Jatobá settlement was officially constituted in 2002, but its history of formation is older. According to Porro and Parise (2021, p. 153)[85], the PDS is “an environmentally differentiated settlement project [that] emerged with the support of social movements to integrate environmental conservation into land reform projects and sustainable agricultural production. In the case of Anapu, a municipality located in the microregion of Altamira, in the so-called region of the Transamazônica highway, the option for this differentiated instrument was mainly due to the work carried out by the religious Dorothy Stang and the Pastoral Land Commission (CPT)". Dorothy Mae Stang, known as Sister Dorothy, was a naturalized Brazilian American nun, member of the Congregation of the Sisters of Notre Dame de Namur, murdered on February 12, 2005. In Anapu, the nun was responsible for the implementation of the PDS Esperança, located next to the PDS Virola Jatobá, helping to organize the farmers of this settlement for years. The

[85] PORRO R., PARISE F. J. O. Paradoxes in impeding the licensing of traditional agriculture in an environmentally differentiated settlement in Anapu, Pará. Retratos de Assentamentos Magazine. Vol. 24 N.2, 2021 ISSN: 1516-8182. Available at: https://www.alice.cnptia.embrapa.br/bitstream/doc/1136852/1/Retratos-de-Assentamentos.pdf. Access on: 2/16/2023

areas of the two PDS were targets of dispute by loggers and landowners in the region, who ordered the death of the activist. (SARRAF, 2018)[86].

The population of this group of communities studied around the Tueré REDD+ project area totals 1,335 inhabitants, grouped into about 250 families, according to information provided by the communities during the participatory diagnosis (Table 44).

Table 44 - Number of families and residents in communities around the Tueré REDD+ Project.

Community	Number of families	Number of residents
Vila Jatobá	10	63
Bom Futuro	11	74
Ipixuna	12	96
Canada	17	192
PDS Virola Jatobá	200	910
Total	**250**	**1,335**

Source: Field research, 2022. Elaboration: STA, 2023.

The number of people by age groups is shown in Table 45, as informed by the communities themselves during the application of the research.

Table 45 - Number of people by age groups in the communities around the Tueré REDD+ Project.

Community	Elderly	Adults		Teenagers	Children
		Women	Men		
Vila Jatobá	3	22	18	5	15
Bom Futuro	2	20	22	8	22
Ipixuna	1	30	30	13	22
Canada	2	60	70	10	50
PDS Virola Jatobá	90	190	200	80	350

Source: Field research, 2022. Elaboration: STA, 2023.

In general, the communities were historically made up of local families who were born in the surrounding rural region, in the municipalities of Marajó, with little or no migration process, with the exception of some families from the PDS Virola Jatobá who migrated from the Municipality of São Miguel do Tocantins, state of Tocantins.

The communities are located in the Marajó Archipelago region, a region historically occupied by Indigenous populations and which, throughout the colonial period, was occupied by Portuguese, their descendants and black and mestizo populations. Given this, all riverside communities located around the Tueré REDD+ Project area are of mixed ethnic origin. According to IBGE, pardo is one of the five ethnic color groups that

[86] SARRAF, Moisés. Dorothy's Virola-Jatobá settlement is threatened by farmers in Anapu. Amazônia Real, Belém – Pará, October 22, 2018. Available at: < https://amazoniareal.com.br/assentamento-virola-jatoba-projeto-de-dorothy-esta-ameacado-por-fazendeiros-em-anapu/> Accessed on March 2, 2023.

make up the Brazilian population, along with yellows, whites, Indigenous people and blacks. The brown category is given to a person with different ethnic backgrounds and who are based on a mixture of skin colors between whites, blacks and Indigenous people. According to the 2010 IBGE census (PARÁ, 2021)[87], for the population as a whole in the municipalities of Anapu, Pacajá and Portel, 72.2% declared themselves to be brown or brown, 17.5% white, 8.7% black, 1.1% yellow and 0.4% Indigenous, which explains the process of miscegenation of the population in the region.

There is low social organization within the riverside communities, only in the PDS Virola Jatobá there is a formal organization constituted, the Association of the Sustainable Development Project Virola Jatobá (AVJ). The other communities located on the banks of the Tueré and Alto Anapu rivers did not present a social organization that represents the community as a whole, being the only existing organizations linked to the evangelical church, such as the Vila Jatobá Women's Group and the Canada Book and Prayer Group. This reality may explain the dynamic within communities that is more focused on church-related activities and with little sociocultural activity linked to local traditions, such as the ancient feasts of saints.

The municipalities that form the region where the studied communities are located have little school infrastructure and low levels of general education with high dropout rates, which is associated with the lack of structure for young people from rural communities to remain and complete their studies. In municipal data, the illiteracy rate of the population aged 15 years or older is high when compared to that of the state of Pará, which according to the 2010 Census was 11.7%: in the municipality of Portel the rate was 30.1%, Anapu 19.2% and Pacajá 21.5%.

Regarding the infrastructure and education services in the riverside communities, the places that function as schools are houses or buildings provided by the communities to the municipal governments, as is the case of the Ipixuna and Canada communities. Only in the PDS Virola Jatobá settlement is there a public elementary and high school built by the government to serve students. Students from the Vila Jatobá community travel to the nearby Monte Moriah community school to attend the school. Students from the Bom Futuro community attend the school located at Fazenda Terra Alta, maintained by Brascomp.

Access to health services in riverbank communities is precarious. The Ipixuna community is the only one that has a health center within the community, which also receives people from Vila Jatobá and Canada. Brascomp has a technician from the specific municipality for the diagnosis and treatment of malaria, a service used by workers and residents of the surroundings, mainly from the Bom Futuro community. In the PDS Virola Jatobá there is a Basic Health Unit, linked to the Health Department of Anapu, which has visits from a community health agent and a family doctor. Associated with the great difficulty of traveling to hospitals in urban centers, families often use traditional knowledge to treat diseases in communities, using a variety of herbs and medicinal plants for treatment.

Regarding the infrastructure of buildings available, most families have their own or community flour houses and all communities have facilities of Catholic churches or evangelical temples.

Within the productive structure of the communities, subsistence agriculture is the basis of productive-economic activities, associated with extractivism and the raising of small animals to dairy cattle, as well as a large part of the families that live on social benefits and retirement or pension. The main product produced is cassava for flour for own consumption and the surplus for sale. The technique used is called cutting and burning, which includes cutting, felling and burning the forest, where fire plays a fundamental role in soil

[87] PARÁ. FAPESPA – AMAZON FOUNDATION FOR SUPPORT TO STUDIES AND RESEARCH. Municipal Statistics – Portel, Anapu and Pacajá. Belém, 2021. Available at: <https://www.fapespa.pa.gov.br/node/201> Accessed at: 01/23/2023

nutrition, with preparation of the land mostly manual. Non-timber extractivism is also a source of subsistence and income for families, from the extraction of açaí, bacaba, Brazil nuts, bacuri, uxi and piquiá, as well as various vines and straws. Other than that, there is the sale of wooden stakes, called billets, which are taken from forest areas close to the families' homes and in areas farther from third parties. The stakes are sold to an intermediary, the Regatão – a river trade boat that transports products from the city to the most isolated regions and negotiates with the communities, often creating a financial dependence on exchange relations.

It was noted through the diagnosis that all families use natural resources from forest areas around their homes, which are fundamental to meet social, economic and cultural needs, and from where they obtain the resources for cultural, religious, social and economic reproduction. Families in riverside communities are accustomed to using forest areas close to the project area. These places are fundamental for the supply of the basic needs of families, mainly related to food (hunting of wild animals and collection of fruits that contribute to the diet) and the reserve of medicines. Families also use these forest areas for the removal of materials for domestic use and use in the construction of houses, traps, corrals, chicken coops, etc.

Areas critical to the socio-cultural identity of communities were identified, such as the areas they occupy and from which they obtain natural resources for cultural, social and economic reproduction. They are areas of provision of resources and ecosystem services to families such as food, medicinal resources, fiber, vines, wood, in addition to biodiversity maintenance services, such as forests and watercourses. For the communities located on the Tueré and Alto Anapu rivers, the water resources of these rivers and their small watercourses are fundamental to maintaining their basic needs. In the PDS Virola Jatobá, the heritage identified by the families is the forest reserve area of 3,000 hectares within the settlement, which was destined for preservation at the time of creation of the PDS and is reserved for community use by the PDS families.

4.1.2 Interactions between Communities and Community Groups (CM1.1)

The riverside communities located on the banks of the Tueré River and the Upper Anapu River have good interaction and communication mainly due to religious relationships, as they carry out activities in common with visits on days of religious worship in any of the communities. In addition, there is interaction between students who attend schools in communities to which they do not belong and communities that use health facilities in communities that do not reside. The settlement, on the other hand, because it has better infrastructure and is located on dry land, has no interaction with riverine communities. The Tueré REDD+ Project can help to strengthen relations between community groups.

4.1.3 High Conservation Value Attributes (CM1.2)

The concept of High Conservation Values (HCV) was developed by the Forest Stewardship Council (FSC, 1996)[88] for the certification of wood 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)[89]. High Conservation Value Attributes (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, threatened and rare ecosystems,

[88] Forest Stewardship Council (FSC). FSC principles and criteria for forest stewardship. FSC-STD-01-001 (version 4-0) EN. FSC, Bonn. 1996.
[89] Forest Stewardship Council (FSC). International generic indicators. FSC-STD-BRA-01-004. V1-0 PT. FSC, Bonn. 2014.

presence of endangered species, provision of essential ecosystem services, social, historical and cultural values, among others.

Within the scope of the socioeconomic context of the Tueré REDD+ Project, some cultural and historical aspects are discussed that are relevant to the surrounding traditional communities, which may characterize High Conservation Value Attributes, which must be identified and managed in order to guarantee their maintenance and improvement (BROWN et al., 2013)[90]. Of the six criteria listed by the FSC, three of them are directly related to the communities surrounding the Project:

HCVA4: Ecosystem services, including watercourse protection and hydrological maintenance.

HCVA5: Fundamental areas and resources to maintain the basic needs of communities (food, water, utensils, etc.).

HCV 6: Areas of special traditional cultural significance of riverside communities (use of medicinal plants, fruits and vines).

The forest areas of Fazendas Santo Antônio and Terra Alta and all their surroundings are of paramount importance for the extraction of forest products for the income of the communities and for their basic needs. The misuse of natural resources can cause their depletion. Thus, the focal area identified is forest areas that communities use for subsistence, such as for food and water, health, medicinal medicines, income generation and house building.

High Conservation Value	Forest areas provide ecological services for the protection of watercourses and hydrological maintenance (AACV4), provide natural resources for subsistence and household income (AACV5) and provide natural resources for the traditional reproduction of cultural values (AACV6).
Qualifying Attribute	In all the communities studied, it was identified that forest areas are critical to the traditional identity of the communities, as this is where families obtain the natural resources for cultural, social and economic reproduction (HCVA 6). Fundamental areas for the subsistence of communities linked to the supply of basic needs were identified, such as for subsistence, mainly linked to the feeding of families and the reserve of medicines and construction materials (HCVA 5). Likewise, it is assessed that the project area as a whole provides critical ecosystem services for the survival of surrounding riverside families, due to the potential to maintain preserved forest areas, improving water quality and availability (HCVA 4).
Focal Area	Project area and surroundings.

[90] 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.

	For families of riverside communities, the water resources of rivers and their small watercourses are the greatest resource to maintain the basic needs of these communities. Areas of native vegetation are used by communities for logging and vines, for hunting and subsistence fishing, and for the extraction of medicinal plants. Areas within the project used by the communities need continuous monitoring to verify the maintenance of the structure of the environment and non-depletion of forest resources. In addition, it is necessary to monitor the activities carried out by the communities in these areas, so that the rational and sustainable use of resources is made. Surveillance actions carried out on the Farms help to protect foreign exchange and contain illegal resource extraction. The Tueré REDD+ Project aims to improve these activities to ensure the continuity of HCVAs, as well as to implement other actions such as promoting sustainable environmental and agricultural practices and raising awareness among local actors regarding the protection of biodiversity.

4.1.4 Scenario in the Absence of the Project: Community (CM1.3)

Current socioeconomic indicators characterize a region with low welfare conditions for communities, low education, lack of representative organization and few productive economic alternatives, causing families to seek better living conditions. From this, certain contexts can lead to the advance of deforestation in the region:

Schooling level: the municipalities in the Project region have little school infrastructure, low levels of general schooling and high rates of school dropout and illiteracy. In riverside communities, the places that function as schools are buildings provided by the communities for municipal governments, and many students have to move to access education. Low levels of education represent a perpetuation of current conditions, with social fragility, lack of institutional structure of the state, deforestation and violence;

Economic activities: economic activities, mainly related to agriculture, are carried out with the absence of technologies and good production practices, the swidden technique used is the traditional slash and burn, which contributes to deforestation and gradual erosion of the land. Communities practice hunting and fishing for subsistence using surrounding forest areas, contributing to the loss of local biodiversity. In addition, some families sell wooden stakes, billet, through middlemen, these being the only option for the flow and purchase of products, creating a relationship of financial dependence, in addition to the fact that the woods are removed from surrounding forest areas, increasing deforestation in the region;

Difficulty in access: the riverside communities only have access to other places by river, and it can take more than 20 hours to get to the municipality of Portel, for example. In this scenario, families take a long time to reach the center of cities to have access to public infrastructure and services, such as health, since the availability of this type of service in riverside communities is precarious. The difficulty in displacement

causes an isolation of this population, which makes daily life difficult and, consequently, the permanence of families, and there may be a gradual departure in search of places with higher levels of interaction with the surroundings, education, health services and opportunities for work and income. The departure of families can lead to the sale of lots or cause a rural exodus with abandonment of the land, leaving areas susceptible to irregular occupations and the predatory exploitation of natural resources.

In view of this, it is possible to perceive that the region's socioeconomic and infrastructure conditions can stimulate illegal activities, such as the predatory extraction of timber and non-timber forest products, as well as hunting and fishing, leading to a series of negative impacts on the ecological processes of the forest. and the depletion of natural resources of interest (ASNER et al., 2009)[91]. It is also confirmed that agricultural activities with traditional cutting and burning techniques and forest exploitation are the basis of subsistence, and may represent a potential for increased deforestation. This factor configures a future scenario in which the depletion of agricultural areas by the repeated techniques of using fire and mowing requires the opening of new areas. As a consequence, in the medium and long term, the pressure on the forest areas of the Santo Antônio and Terra Alta farms may increase.

Given the above situation, we can foresee two possible scenarios for deforestation in the Reference Region of the Project: scenario 1 represents the continuity of the status quo (business as usual) without the REDD+ Project, leading to increasing pressure on forest resources and consequent increase in deforestation; Scenario 2 highlights actions aimed at socioeconomic development that can mitigate impacts on forest resources and prevent deforestation in the region from the implementation of the REDD+ Project.

In the scenario considering no significant improvement in public management models, the trend would be for the deforestation rate to increase and thus the socioeconomic context would remain stagnant or worsen due to increased pressures from hidden causes of deforestation. The unfeasibility of the Tueré REDD+ Project would result in the continuity of the problems encountered in the communities, such as:

a) Social: continuity of low levels of education and health, access to public policies for goods and services, communication and infrastructures in an incipient way and an increase in violence and social insecurity;

b) Economic: stagnation or decrease in household income, low productivity, lack of alternatives for diversifying agricultural production, sustainable production and options to process the products generated, lack of market reach and difficulty in implementing new technologies;

c) Environmental: degradation of forests, increased invasions by illegal loggers, looting of existing natural resources, increased illegal hunting and fishing, non-compliance with current legislation and lack of inspection.

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 levels of income, little diversification of production combined with low productivity and unsustainable economic activities, difficulty in accessing public policies and public services, among others. In the scenario with the presence of the Tueré REDD+ Project, communities are seen increasing levels of socioeconomic conditions, reaching levels of development from their production to access to public policies that guarantee the continuity of families in the place, avoiding rural exodus. In addition, from the promotion of the activities proposed by the Project, an innovation process is created in the development of strategies for a business structure with

[91] ASNER, G. P.; RUDEL, T. K.; AIDE, T. M.; 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.

socio-environmental 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)

The Project's impacts were mapped during field research in the communities and with other agents surrounding the Project and estimated based on the theory of analysis of changes and causal relationships between activities, results and consequent impacts, detailed in the Section 2.1.11 of this document. For the evaluation of such social impacts, the methodology developed by Richards and Panfil (2011)[92], Richards (2011) and Pitman (2011) was followed, presenting an impact matrix relating the group directly involved, the impact, the benefit, the costs and risks associated with each impact, and likely changes in group well-being.

Positive impacts

Community Group	- Portel riverside communities located on the banks of the Tueré and Alto Anapu rivers that are closest to the Project Area: Bom Futuro, Canadá, Ipixuna and Vila Jatobá - Families of the PDS Virola Jatobá settlement
Impact(s)	- Strengthening human capital through access to training, training and technical assistance to encourage environmental practices and sustainable and adaptive agricultural production models; - Higher level of cooperativism and associativism; - Integration in value chains; - Environmental awareness and permanence of families on their lands; - Income generation and diversification.
Type of Benefit/Cost/Risk	• Expected benefits: - Direct and indirect positive impact on the community. • Costs: - Human and physical resources related to training actions, training and technical assistance. • Risk: - Low adherence of community groups to training processes; - Few families practicing sustainable production techniques; - Little engagement of families in collective and community activities in the search for public policies and services.
Change in Well-being	- Improved access to health, education, communication and transportation; - Improvement of income;

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

	- Food security; - Territorial belonging.

Community Group	Project Area surveillance workers
Impact(s)	- Strengthening human capital through access to professional training and qualification; - Greater access to information on labor rights; - Improvement of the facilities and infrastructure of the Farms; - Greater efficiency in field surveillance operations.
Type of Benefit/Cost/Risk	• Expected benefits: - Direct positive impact on workers. • Costs: - Human and physical resources related to training and qualification actions. • Risk: - Low worker engagement during training processes.
Change in Well-being	- Expansion of the professional quality of workers; - Improvement in the quality and working conditions of employees

Negative impacts

Community Group	- Portel riverside communities located on the banks of the Tueré and Alto Anapu rivers that are closest to the Project Area: Bom Futuro, Canada, Ipixuna and Vila Jatobá.
Impact(s)	- Loss of access to products of timber, fruit and medicinal species; - Loss of access to subsistence hunting and fishing areas
Type of Benefit/Cost/Risk	• Risk: - Illegal and uncontrolled entry into forest areas of the Tueré project for the search for wood and other non-forest products, such as medicinal plants and vines, in order to guarantee the income and subsistence of families, in addition to their way of living; - Illegal and uncontrolled entry into areas of native forest and waterways to search for food, such as game animals and fish, in order to guarantee the food subsistence of some families.
Change in Well-being	- Negative impact on the maintenance and subsistence system, due to the use of some forest and non-forest products by families

4.2.2 Negative Community Impact Mitigation (CM2.2)

As verified in the Socioeconomic Diagnosis, although there was no specific identification of community use of the Project Area by the three riverine communities surveyed in Portel (Bom Futuro, Canada and Ipixuna), the families reported the use of forest products, such as timber, fruit and medicinal species, as well as animal hunting and fishing for subsistence consumption, but no community has a community forest reserve area. Thus, it is assumed that families use areas of third-party forests around the communities, which may even be the areas of the Tueré Project. Thus, with the restrictions and monitoring of the Project's forest area, there may be loss or restriction of access, reducing the use of some forest and non-forest products by families, negatively impacting the maintenance and subsistence system, as well as causing an imbalance in the way of life with loss of non-timber forest resources.

In order to mitigate these risks, some measures can be taken, such as the consolidation of mechanisms that promote transparency and encourage the involvement of all parties involved in the decision-making processes of the Project's activities, in addition to implementing communication tools for the improvement of social relations between the bidders and the impacted parties.

Regarding the risks and negative impacts raised, a mitigating measure is to prioritize the involvement of the most affected communities in alternative activities such as the promotion of diversified and sustainable agricultural production practices and models, the development and strengthening of value chains for agricultural or forest products, which aim to guarantee income and food security while minimizing possible negative impacts and reducing pressure for deforestation.

Finally, the Improvement of the surveillance of Farms, with actions that prevent deforestation and forest degradation, such as remote and continuous monitoring and the presence of forest guards, help in the maintenance of forest cover in the Project Area and in the generation of ecosystem services essential for the survival of the surrounding communities.

4.2.3 Net Positive Community Well-Being (CM2.3, GL1.4)

The Tueré REDD+ Project, through the proposed activities, encourages socioeconomic and sustainable development for the communities involved, focusing on training, capacity building and assistance for the promotion of sustainable production practices and models, the development and strengthening of value chains and engagement through a mechanism of transparency, communication and encouragement of collective participation in the actions developed by the Project.

In the scenario without the Project, as described in Section 4.1.4, the low-income context, the precariousness of infrastructure services and the absence of technical assistance and rural extension services, make families belonging to the communities seek alternatives to increase their income, based on economic and subsistence activities practiced in an unsustainable and unplanned way.

Based on this scenario, the Project plans to create opportunities for the communities, causing the following net positive impacts:

- Encourage the adoption of sustainable practices and diversified and adaptive agricultural production models that integrate protection of forest resources with sustainable production, ensuring the environmental preservation and food security of families;

- Increase community engagement through participation in the Project's activities, in addition to promoting actions to strengthen local governance and the empowerment of local leaders;

- Strengthening of human skills, knowledge and capacities related to sustainable economic activities, management and productive organization, in order to develop and strengthen value chains;

- Increase levels of knowledge about sustainable practices, such as hunting and fishing activities, promoting the protection and conservation of forest cover and biodiversity, promoting alternative livelihoods and income generation for impacted families;

- Permanence of families in communities;

- Implementation of strategic partnerships for the on-site execution of the proposed actions.

The main problems that will be faced in this context are:

- Low access to public policies, related to goods, basic services and infrastructure;

- Unsustainable economic activities, with low technification, productivity and little assistance;

- Difficulty in mobility and access.

Thus, the Project intends to influence the social issues and the living conditions of communities surrounding the Project area, in order to reduce social vulnerability and rural exodus of those families that make up the surrounding communities, providing improvement in the quality of life and income stability, in addition to allowing conditions for access to goods and services that promote economic and social well-being.

4.2.4 High Conservation Values Protected (CM2.4)

So far, during the preliminary assessment conducted with the DSEA studies (socioeconomic and environmental diagnosis), no negative impacts were identified on high conservation value attributes related to social issues (HCVAs 4 - Section 4.1.3). However, if these are identified at some future time, measures must be taken to ensure that there are no negative net impacts to such attributes.

To ensure that the HCVA related to the well-being of the communities will not be negatively affected, the activities proposed by the Tueré REDD+ Project incorporate measures and actions with the purpose of protecting and conserving forest areas in order to guarantee the essential ecosystem services to the communities, the which will be contemplated by the activities designed for the Project (Section 2.1.11).

4.3 Other Stakeholder Impacts

4.3.1 Impacts on Other Stakeholders (CM3.1)

For the Tueré 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 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 from the opportunities generated by the Project's activities, improving the quality of life and well-being;

- All stakeholders in the region will benefit not only from the project activities, but also from 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 Project activities and other articulations;

- Failure to communicate the Project's actions and establishment of 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, negative impacts on other actors in this Project are not expected to occur. 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 activities to be carried out in relation to the surrounding communities are mainly based on articulation with government agencies and other local institutions precisely for the promotion of improvement in living conditions, greater access to public policies, in addition to activities related to the improvement of 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)

This section presents the community variables to be monitored, the types of measurement and the sampling methods considering the scope of the Project related to this topic. The minimum monitoring frequency is two years, that is, once in each monitoring cycle. The monitoring variables are directly linked to the Project objectives for the communities and surveillance workers of the Project Area and to the predicted products, results and impacts identified in the causal model of the project related to the well-being of the communities. Monitoring will assess differentiated impacts for each of the community groups, considering an evaluation of them in the follow-up reports. The communities, community groups and other stakeholders to monitor are those identified under the initial Socioeconomic Diagnosis.

Also, the plan will seek to protect the High Conservation Value Areas (HCVA) through socio-environmental activities (description in Section 2.1.11) that seek to contain deforestation and degradation of these areas, as well as organizing and improving alternative traditional economic and subsistence activities, as the promotion of sustainable practices. As explained in Section 5.1.2, the identified High Conservation Value Attributes are related to (i) the existence of endemic species at the regional level and significant concentrations of threatened species that meet the vulnerability criteria, on a global, national or regional scale and (ii) for constituting a forest ecosystem that is large and preserved enough to house viable populations of the inventoried species and (implicitly) the vast majority of other environmental values that occur in the ecosystem. The evaluation of the effectiveness of the measures adopted to maintain and

improve such HCVA is linked to the remote and on-site monitoring of forest areas within the Project Area that offer ecosystem services to communities and the promotion of alternative activities to deforestation and forest degradation contemplated by the indicators described below.

Variable	Number of partnerships established
Area	Project Area
Description	Measurement of the number of partnerships that the Project carries out throughout its duration to contribute to the development and improvement of the Project's actions and activities
Measurement Type and Sampling Method	All documents produced will be stored in digital files throughout the crediting period of the Project. Thus, the realization of partnerships linked to the activities of the Project will be monitored and accounted for. To monitor the number of partnerships established effectively, some steps will be developed, according to the following examples: - Criteria Definition: Initially, clear criteria will be defined to consider that a partnership has been established, including formal agreements, collaborations on specific projects, sharing of resources, etc. - Creation of a Registration System: A registration system will be established to monitor partnerships, which can be done in spreadsheets, project management software, among others. - Documentation and Identification: When registering each partnership, relevant details such as partner organization name, partnership type, start date, partnership objectives and key contacts will be documented. - Regular Update: The registration system should be updated regularly. As new partnerships are established, relevant information will be added to the system. - Categorization of Partnerships: Partnerships will be categorized based on relevant criteria, such as: aspect (environmental, educational, community), level of involvement (formal, informal) or type of collaboration (joint projects, resource sharing), among others. - Follow-up reports: The data recorded will be used to generate reports showing the total number of partnerships established in a given period or under specific categories.

	- Progress Tracking: The progress of the partnerships will be monitored regularly over time, assessing their impact on the objectives of the Project. - Data Analysis and Interpretation: In addition to accounting for the number of partnerships, data will be analyzed to identify trends, patterns, and areas of success, which can help understand which types of partnerships are most effective and valuable to Project initiatives. - Communication of Results: The results of the partnership count will be shared with relevant partners and stakeholders. - Strategy Adjustment: Based on the data and analysis, the partnership strategy can be adjusted if necessary, which may involve seeking more collaborations in areas of success or refining the approach to attract more partners.
Frequency	At each verification period
Forms of registration	Reports (e.g. follow-up report of project activities that have been implemented), contracts, memos, emails, meeting minutes and/or other supporting documents as evidence that a partnership has been established and built
Related activity (Section 2.1.11)	Strengthening governance; Improving infrastructure; Fostering sustainable practices; Developing and strengthening value chains

Variable	Number of meetings/meetings held
Area	Project Area
Description	Measurement of the number of meetings that the Project holds throughout its duration to contribute to the development and improvement of actions and activities linked to the Project's social activities
Measurement Type and Sampling Method	All documents produced will be stored in digital files throughout the crediting period of the Project. Thus, the holding of meetings/gatherings linked to the Project's social activities will be monitored and accounted for. In order to monitor the number of meetings or meetings held in an effective and organized manner, some steps will be developed, according to the following examples: - Theme Definition:

Initially, the theme and objectives of the meetings will be defined, which will help determine what information will need to be collected during monitoring.

- Registration Tool:

A registration tool will be used, which can be an electronic spreadsheet, project management software, or even a meeting management system.

- Documentation and Identification:

For each meeting, relevant details will be recorded, such as the date, time, duration, place and topic, as well as a brief description of what was discussed or carried out.

- Categorization of Meetings:

Meetings will be classified into categories or types, such as stakeholder meetings, partner meetings, workshops, training sessions, etc. This will help to understand the variety of activities performed.

- Regular Update:

The registration system should be updated regularly. As new meetings or gatherings are held, relevant information will be added to the system.

- Participants:

Information about the participants of each meeting will be included, which can be useful to assess the involvement of different stakeholders over time.

- Scope and Impact Assessment:

In addition to recording the meetings, the scope and impact of these actions will be evaluated, allowing the monitoring of the decisions taken, agreed actions or results achieved.

- Follow-up reports:

The data recorded will be used to generate reports showing the total number of meetings/meetings held in a given period. These reports can also be prepared by category, participants or other criteria.

- Data Analysis and Interpretation:

The data will be analyzed to identify patterns, trends, or areas where you focus most of your meetings, which can help improve the efficiency and effectiveness of these actions.

- Strategy Adjustment:

	Based on the data and analysis, the meetings strategy will be adjusted if necessary, which may involve reviewing the categories of meetings, the frequency of meetings or the approach to ensure that goals are achieved.
Frequency	At each verification period
Forms of registration	Reports (e.g. follow-up report of project activities that have been implemented), contracts, memos, emails, meeting minutes and/or other documents that corroborate as evidence of the meetings/meetings held
Related activity (Section 2.1.11)	Strengthening governance

Variable	Number of trainings/actions carried out
Area	Project Area
Description	Measurement of the amount of training/actions that the Project carries out throughout its duration to contribute to the technical training of the Project's stakeholders
Measurement Type and Sampling Method	All documents produced will be stored in digital files throughout the crediting period of the Project. Thus, training or actions related to the Project's social activities will be monitored and accounted for. To monitor the number of trainings or actions carried out, some steps will be developed, according to the following examples: - Definition of Objectives and Types of Training/Actions: Initially, the objectives of the training or actions to be carried out will be defined, determining the types of training or actions that will be offered, such as workshops, courses, seminars, practical sessions, etc. - Registration Tool: A registration tool will be used, which may be an electronic spreadsheet, project management software, or a specific training monitoring system. - Documentation and Identification: For each training or action, relevant details such as the date, time, place, topic or subject covered and duration will be recorded. - Categorization of Training/Actions: Trainings or actions will be classified into relevant categories such as themes, target groups, skill levels, etc. This will help identify the areas where more effort is being focused.

	- Participants: Information about the participants of each training or action will be included, such as number of participants, group to which you belong, experience levels, feedback and other relevant details. - Regular Update: The registration system must be updated as new training or actions are carried out. - Impact Assessment: In addition to recording the number of trainings or actions, the impact of these actions will be evaluated, asking participants about the benefits and lessons learned from the trainings. - Follow-up reports: The data recorded will be used to generate reports showing the total number of trainings or actions carried out in a specific period. These reports can also be prepared by category, participants, or other metrics. - Analysis and Adjustment: The data will be analyzed to identify trends, such as the most popular topics, groups that are being served the most, etc. This information can be used to adjust the training strategy and improve the next activities. - Communication of Results: The results of counting trainings or actions will be shared with partners and other relevant stakeholders.
Frequency	At each verification period
Forms of registration	Reports (e.g. follow-up report of project activities that have been implemented), contracts, memos, emails, meeting minutes and/or other documents that corroborate as evidence of the meetings/meetings held
Related activity (Section 2.1.11)	Improving infrastructure; Fostering sustainable practices; Developing and strengthening value chains

Variable	Number of people benefited
Area	Project Area

Description	Accounting for anyone who has been able to benefit throughout the implementation and monitoring of the Project, through the planned actions and activities related to the social scope
Measurement Type and Sampling Method	All documents produced will be stored in digital files throughout the crediting period of the Project. Thus, the information on the people benefited by the activities of the Project's social scope will be monitored and the quantity accounted for. To monitor the number of people benefited, some steps will be developed, according to the following examples: - Definition of Beneficiary Criteria: Initially, the beneficiaries of the actions will be determined, such as community groups, workers in the Project Area, among others. - Registration Tool: A registration tool will be used, which may be an electronic spreadsheet, a project management system, database software or even a specific impact monitoring system. - Documentation and Identification: For each action, relevant details about the beneficiaries will be recorded, such as the name of the action, the date, the number of beneficiaries, their main characteristics, etc. - Classification of Beneficiaries: Beneficiaries will be classified into relevant categories such as age, gender, geographic location, educational level, etc., allowing for a more detailed analysis of impacts across different groups. - Regular Update: The system of record shall be updated as new actions are implemented. - Impact Assessment: In addition to counting the number of beneficiaries, the impact of actions on these people will be evaluated, which may involve collecting feedback, measuring behavior changes or analyzing qualitative results. - Follow-up reports: The data recorded will be used to generate reports showing the total number of beneficiaries reached in a given period. These reports can also be prepared by categories of beneficiaries. - Data Analysis:

	Data will be analyzed to understand the patterns of engagement of different groups of beneficiaries, which can help assess whether diversity and inclusion goals are being met. - Strategy Adjustment: Based on the data and analysis, an adjustment in the strategy may be made to reach a larger number of beneficiaries or to adapt the actions to the specific needs of different groups. - Communication of Results: The results of the number of people benefited will be shared with partners and other relevant stakeholders.
Frequency	At each verification period
Forms of registration	Reports (e.g. activity monitoring report), interviews, feedback on results and/or consultations, attendance lists, presentations, and other documents that corroborate as evidence that a person, whether community member or not, has benefited from the Project
Related activity (Section 2.1.11)	Strengthening Governance; Improving infrastructure; Fostering sustainable practices

Variable	Improvements made to infrastructures
Area	Project Area
Description	Accounting for the amount of improvements made to the Farms and promoted in the communities
Measurement Type and Sampling Method	Every document produced by the Project will be stored in digital files along Project crediting period. In this way, the number of improvements made to the infrastructure will be monitored and accounted for
Frequency	At each verification period
Forms of registration	Invoices for materials/equipment and hiring of personnel/specialized company, photographic records, reports of activities carried out, among others
Related activity (Section 2.1.11)	Infrastructure improvement

4.4.2 Dissemination of the Monitoring Plan (CM4.3)

The Monitoring Plan, as well as the results obtained by monitoring the Tueré REDD+ Project, will be made available to the public through a page on the official website of Biofílica Ambipar. The summary documents related to the monitoring plan, its results and other relevant information will be made available to the communities and other interested parties through meetings, lectures and by physical means (printed) at the premises of Fazendas Santo Antônio and Terra Alta of Brascomp.

4.5 Optional Criterion: Exceptional Community Benefits

Not applicable. Tueré REDD+ Project does not intend to be validated for the gold level of 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 Biodiversity Scenario in the Absence of the Project

5.1.1 Existing Conditions (B1.1)

The tropical forest of the Amazonian plain is the largest block of tropical forest on Earth with approximately 5.7 million km², it holds about 13% of all trees – with a diameter at breast height greater than 10cm – in the world and 49% of the that live in humid tropical forests (Crowther *et al*., 2015)[93]. The Amazon Biome contains about 10% of all known species in the world (Flores *et al*., 2010)[94] and it is estimated that about 15,000 plant species have already been described for this biome, accompanied by about 1,300 birds, 1,800 fish, more than 400 mammals, just under 400 reptiles and about 400 amphibians (Goeldi Museum)[95].

Continued degradation and loss of forest cover and biodiversity can undermine ecosystem resilience and accelerate an irreversible tipping point, posing a major threat (Beisner *et al*., 2003)[96], in particular to rare species, with low population density and limited spatial distribution (Hubbell *et al*., 2008[97]; Rivers *et al*., 2022[98]). All future scenarios for the Amazon show the need for actions that promote biodiversity conservation and help mitigate climate change (Gomes et al 2019)[99].

In this scenario, sustainable forest use, such as reduced impact forest management and carbon projects, are one of the few alternatives to reconcile economic gains with biodiversity conservation. The area of the Tueré REDD+ Project practically overlaps with the area of the Sustainable Forest Management Project (PMFS) managed by Brascomp, which has 42 Annual Production Units (UPAs) with an average area of 2,133.88 ha. In addition, the creation and maintenance of Conservation Units are essential to establish areas of refuge for fauna and protection of flora. The State of Pará has 90 Conservation Units (UCs), with emphasis on the Extractive Reserve and National Forest categories, with 23 and 18 UCs, respectively.

The Tueré REDD+ Project is located in the eastern region of the Amazon Biome, in the mesoregion of Marajó, belonging, within it, to the micro-region of Portel. It has three conservation units: Caxiuanã National Forest, Itatupã-Baquiá Sustainable Development Reserve and Gurupá-Melgaço Extractive Reserve, totaling an area of 385,212.03 hectares (ISA, 2023)[100]. All three are categorized as conservation units of

[93] Crowther, T.W.; Glick, H.B.; Covey, K.R., *et al*. (2015). Mapping tree density at a global scale. Nature, 525(7568): 201-205.

[94] Flores, M.; Lopes, U.; Panuncio, M., et al. (2010). WWF's Living Amazon Initiative. A comprehensive approach to conserving the largest rainforest and river system on Earth. WWF, Gland, Switzerland. Available at: <http://awsassets.panda.org/downloads/living_amazon_strategy_summary_final.Pdf>. Access on: 11/22/2022

[95] Emilio Goeldi Paraense Museum(2022). Biodiversity database. Available on: <http://censo.museu-goeldi.br:8080/museugoeldi-web-1.2.0/paginas/index.xhtml>. Access on Jun 12, 2023.

[96] Beisner, B.E.; Haydon, D.T.; Cuddington, K. (2003). Alternative stable states in ecology. Frontiers in Ecology and the Environment, 1(7): 376-382.

[97] Hubbell, S.P., *op cit*.

[98] Rivers, M.; Newton, A.C.; Oldfield, S.; Global Tree Assessment Contributors (2022). Scientists' warning to humanity on tree extinctions. Plants, People, Planet, ppp3.10314. DOI: 10.1002/ppp3.10314

[99] Gomes, V.H.; Vieira, I.C.; Salomão, R.P.; Ter Steege, H. (2019). Amazonian tree species threatened by deforestation and climate change. Nature Climate Change, 9(7): 547-553.

[100] Instituto Socioambiental. Conservation Units in Brazil. Protected Areas Monitoring Program. ISA, 2023. Available on: <https://uc.socioambiental.org/> Access on June 20, 2023.

the sustainable use group, which aims to make nature conservation compatible with the sustainable use of natural resources.

Table 46 - Existing Conservation Units in the Portel microregion.

Responsible Instance	Interested party	Type	Name	Date Created	Municipality	Area (ha)
Federal	ICMBIO	FLONA	Caxiuanã*	11/28/1961	Melgaço Portel	**129,127.43** **191,349.60**
Federal	ICMBIO	RDS	Itatupã-Baquiá	06/14/2005	Gurupá	**64,735.00**
Federal	ICMBIO	RESEX	Gurupá-Melgaço	11/30/2006	Gurupá-Melgaço	**145,297.00**
Portel Microregion Subtotal						**385,212.03**

*According to Decree No. 194 of 11/22/61 and Decree No. 239 of 11/28/61, the area is 200,000 ha; however, Article 3 says: "The final area of the National Forest will be fixed after the indispensable study and recognition of the region, to be carried out under the guidance and supervision of the Forest Service of the Ministry of Agriculture". ICMBIO (2012) says: "According to the interpretation of the limits, it has an area of approximately 317,736.61 ha according to the Federal Register of Public Forests, and an area of approximately 322,400 ha by another mapping." The value of 320,477.03 is the sum of the area in the two municipalities declared by ISA – Instituto Socioambiental (https://uc.socioambiental.org/arp/640);
ACRONYMS – FLONA: National Forest; RDS: Sustainable Development Reserve; RESEX: Extractive Reserve; ICMBIO: Chico Mendes Institute for Biodiversity Conservation.

Around the Project's reference region, there are some Conservation Units, namely: the Vitoria de Souzel Sustainable Development Reserve, the Tabuleiro do Embaubal Wildlife Refuge, the Caxiuanã National Forest, the Verde Para Sempre, Arióca Pruanã and Ipaú-Anilzinho Extractive Reserves, the Tucuruí, Paquiçamba, Arara da Volta Grande do Xingu and Trincheira/Bacajá Indigenous Lands, the Lago de Tucuruí Environmental Protection Area and seven other quilombola areas (ISA, 2023)[101] (Figure 30).

[101] Instituto Socioambiental, *op. cit.*

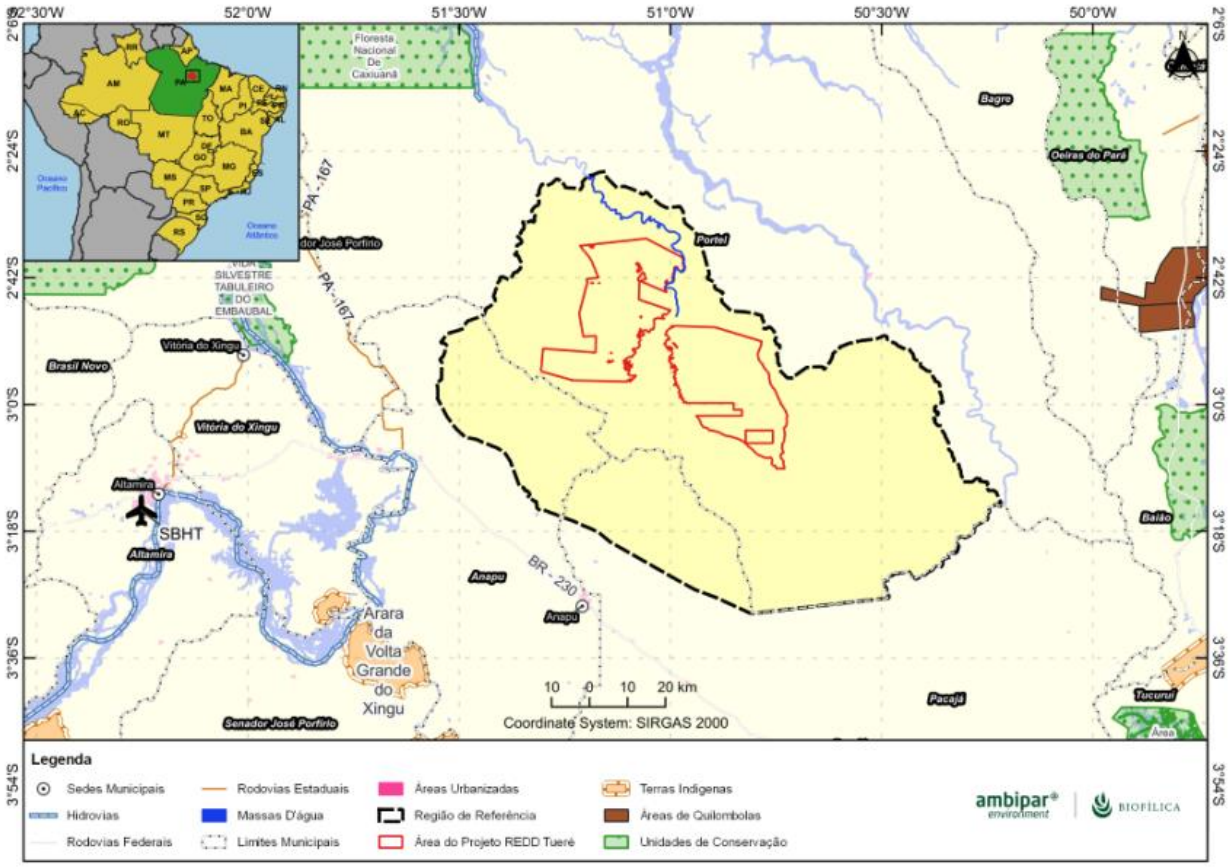


Figure 30 – Reference Region and Tueré REDD+ Project Area in the context of Conservation Units, Indigenous Lands and quilombola areas.

Due to the existence of several large rivers, the Amazon is composed of “islands” of forests separated by the rivers that cross the region. Each of these "islands" has a unique set of species that are only found in that part of the planet, which are called endemic species. Therefore, from a biological point of view, the Amazon was divided into 8 areas or centers of endemism, biogeographically differentiated sites that encompass high rates of species endemism, namely: Guiana, Imeri, Napo, Inambari, Rondônia, Tapajós, Xingu e Belém (Almeida, 2013)[102].

The Xingu Endemism Center, where the Tueré REDD+ Project area is located, is the biogeographic sub region of the Brazilian Amazon that covers the Tocantins River and Xingu River interfluve (Oliveira et al. 2017). This interfluve comprises an area of 392,468,517 km2, including 88 municipalities in the states of Pará, Mato Grosso and Tocantins and is composed of a combination of dense rainforest, open forest, *cerrado* [open pasture with patches of stunted vegetation], rocky fields and savannas, which provides a great diversity of habitats for the species that inhabit the region (Almeida, 2013)[103].

In Figure 31, it can be seen that the Tueré REDD+ Project area is located in the extreme northern portion of the Xingu Endemism Center, a region characterized by the majority presence of Submontane Open Ombrophilous Forest, but rivers, floodplain formations with igapós and lowland forests are also present in

[102] De ALMEIDA, A. S. Scenarios for the Amazon. Xingu Endemism Area. Executive Summary. Museu Paraense Emilio Goeldi, 2013.
[103] De ALMEIDA, A. S., *op. cit.*

the landscape (Biopará 2016[104], Queiroz et al. 2023[105]). Despite its biological richness, the Xingu Endemism Center is one of the most threatened areas in the Amazon, with high rates of deforestation, habitat fragmentation, hunting and overfishing. (Borges & Silva 2012)[106].

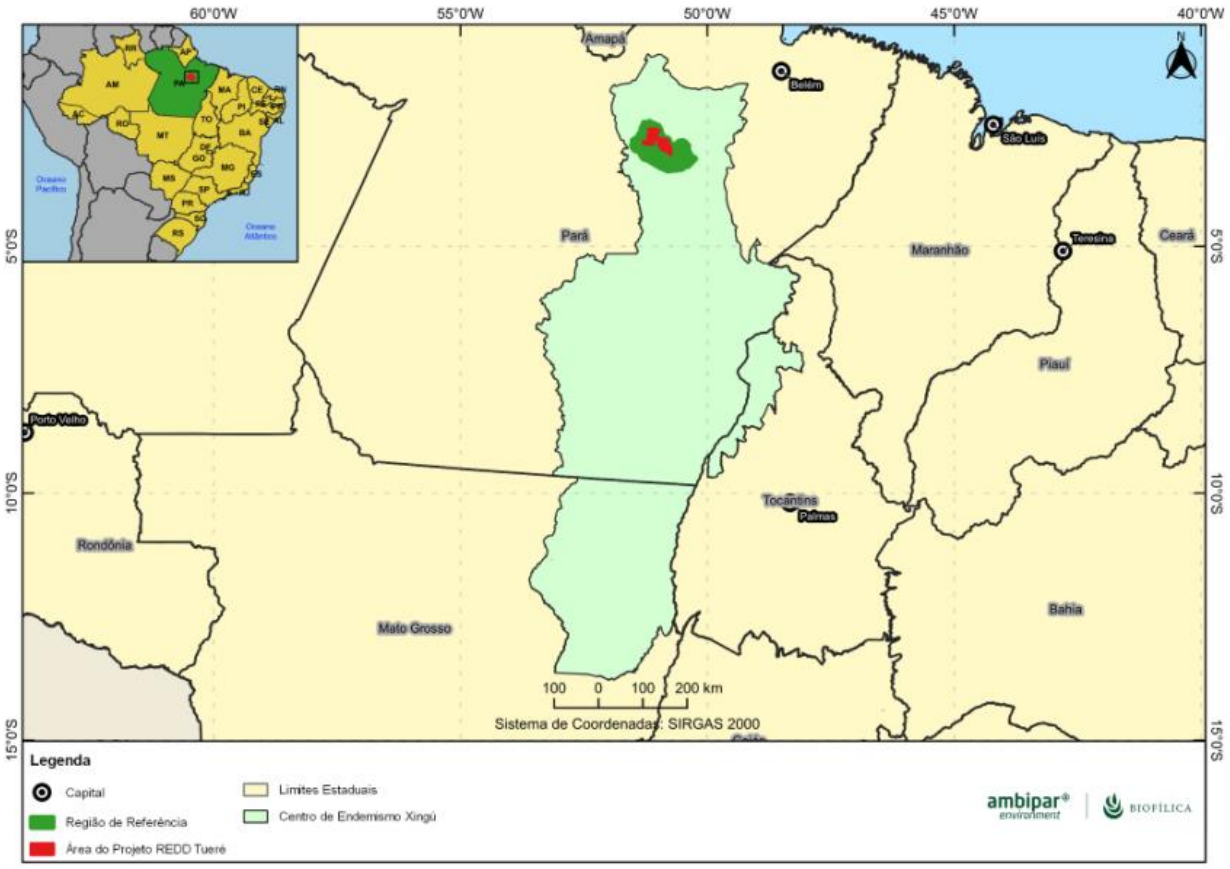


Figure 31 – Map of the Tueré REDD+ Project Area inserted in the Xingu Endemism Center.

The Project Area partially covers Priority Areas for the Conservation, Sustainable Use and Sharing of Benefits of Biodiversity, which are constituted as a public policy instrument for decision-making, in an objective and participatory manner, on planning and implementing appropriate measures conservation, recovery and sustainable use of ecosystems (MMA, 2020)[107]. As can be seen in Figure 32, the Priority Areas for Conservation intercepted by the Project Area have priorities for action and degrees of biological importance 'Extremely high', 'Very high' and 'High', with the main recommended actions being the recovery of degraded areas and the inspection and control of illegal activities in these territories.

[104] BIOPARÁ. Paraense Program to Encourage the Sustainable Use of Biodiversity. State Department of Science, Technology and Professional and Technological Education. SECTET, 2016.
[105] Queiroz, L.F.P.; Flores, M.S.; Sobrinho, M.V. The bioeconomy and its relationship with the Pará Amazon: a review based on the concept of development. (In: The Economics of Development, Janaildo Soares de Sousa, Ed.). Editora Científca Digital, SP 2023, pp 11-24. Doi 10.37885/221110922.
[106] Borges, S. H. & Silva, J. M. C. A New Area of Endemism for Amazonian Birds in the Rio Negro Basin. Wilson J. Ornithol. 124, 15–23, 2012.
[107] Ministry of the Environment. Priority Areas for the Conservation of Brazilian Biodiversity. MMA, 2020. Available on: <http://portalredd.mma.gov.br/> Access on June 16, 2023.

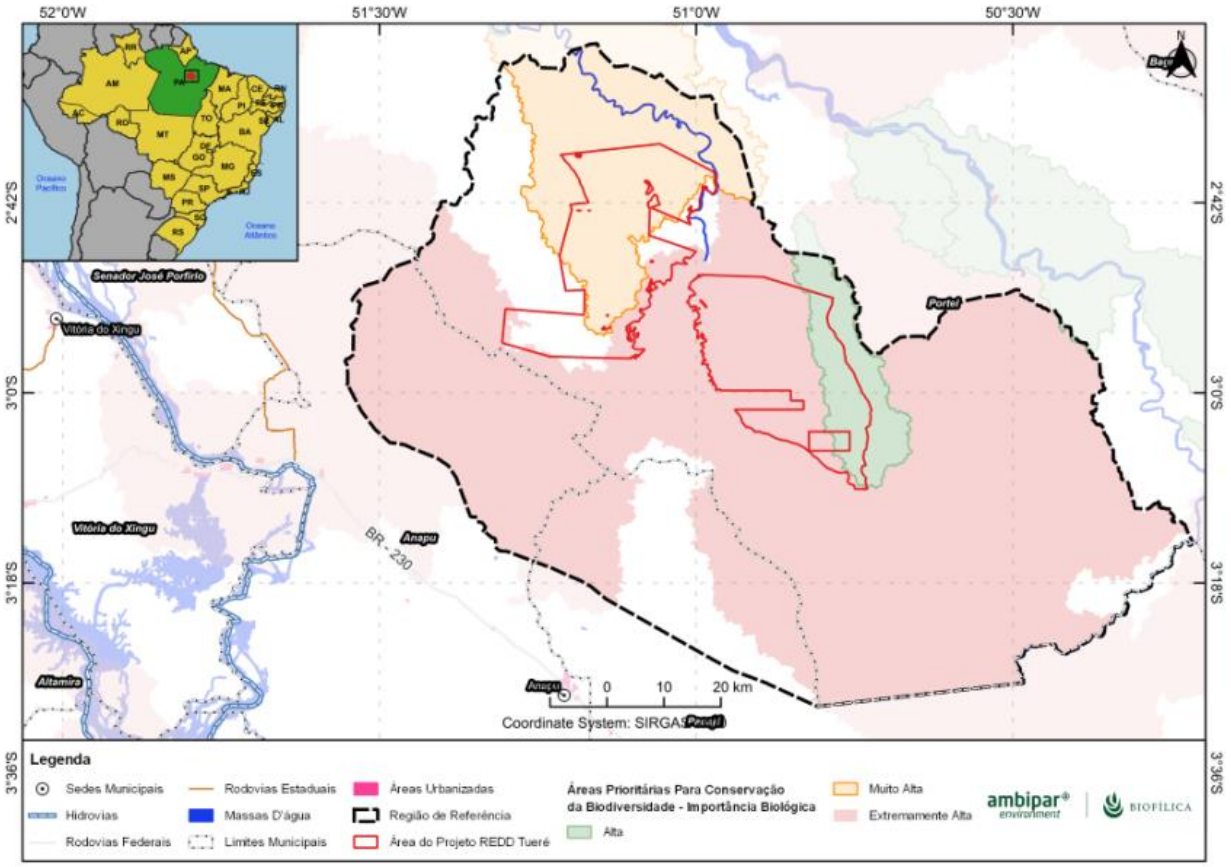


Figure 32 – Map of the Tueré REDD+ Project Area in relation to Priority Areas for Conservation in the Amazon.

Through 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.

5.1.1.1 Flora

To prepare the list of species in the REDD+ Project area and its surroundings, a list of species likely to occur was initially composed from bibliographic data from nine lists found in the literature, such as in published books and articles (Braga et al 2021[108]; Limeira et al. 2021[109]; Ramos et al. 2019[110]), Doctoral

[108] Braga, D.; Ruschel, A.; Kanashiro, M.; Vidal, E.; Cruz, E.; Miléo, R.; Porro, R. (2021). Forest management trees in the Virola-Jatobá Sustainable Development Project, Anapu, PA. Embrapa Eastern Amazon, Belém, 200p. Available on: <https://www.embrapa.br/busca-de-publicacoes/-/publicacao/1134517/arvores-do-manejo-florestal-no-projeto-de-desenvolvimento-sustentavel-virola-jatoba-anapu-pa> Access in: Sept. 15, 2022.

[109] Limeira, M.M.C.; Ramos, Y.A.; De Sousa, M.V.R.; Coelho, M.C.B.; Varavallo, M.A.; Ataide, Y.S.B., et al. (2021). Floristic structure and composition in an area of Dense Ombrophilous Forest under forest management. Advances in Forestry Science, 8(2): 1389-1401.

[110] Ramos, Y. A., Aguiar, B. A. C., Silva, M. V. C., Matos, R. E. S., Coelho, M. C. B., & Giongo, M. (2019). Structure and floristic composition in a dense ombrophilous forest area under forest management. Floresta, 49(4), 793-802.

thesis (Maestri 2021[111]), Completion of course work (Silva 2021[112]; Jesus 2021[113]; Alvares and Carvalho 2022[114]; Costa e Silva 2022[115]) and Technical report (Seta 2012[116]). Of these works found in the literature, seven were carried out in the municipality of Portel and two in the area of the Virola-Jatobá Sustainable Development Project, located in Anapu, Pará.

Data analysis for the phytosociological study was performed based on the results of the forest inventory carried out by the STA Team, obtained from the sampling technique of seven plots of one hectare each, randomly chosen from the 34 plots established for the carbon stock inventory. One plot was allocated in the Alluvial Dense Ombrophilous Forest (FAluvieal) and six plots were allocated in the Lowland Dense Ombrophilous Forest (FTBaixas) due to the percentage difference in the presence of each of these phytophysiognomies in the project area, and the FAluvial corresponds to only 0.47%.

All trees and palms with DBH greater than 10cm were counted, measured at a circumference of 1.30 m (CAP, in centimeters) and marked with an aluminum plate. In the seven hectares, 3,725 individuals belonging to 224 species were inventoried. Of these, 21 were identified at the gender level and 23 individuals were not identified.

On endangered species, the MMA list (2022)[117], CNCFLORA (2022)[118] and Pará (2008)[119] follow the same IUCN Red List categories (2022)[120]. The updating of these lists is constant, although the State of Pará has not updated in recent years. 28 species with some degree of threat were found in the project area and surroundings, with 12 species of potential occurrence and 16 of confirmed occurrence. Of these 16, 11 were classified as vulnerable (VU), three as endangered (EN) and two as critically endangered (CR), namely: *Vouacapoua americana* (acapu) and *Euxylophora paraenses* (pau amarelo). These, plus *Virola*

[111] Maestri, M.P. (2021). Analyses and contributions to community forest management of the sustainable development project Virola Jatobá, Anapu, Pará. Doctoral Thesis (Forest Sciences), Federal Rural University of the Amazon, Belém. Available on: <http://repositorio.ufra.edu.br/jspui/handle/123456789/1160>. Access in: Sept. 15, 2022.

[112] Silva, J.S.P.D. (2021). Effect of minimal impact management for açaí production on the biodiversity of flooded forests in the Marajó mesoregion, Portel, Pará. Final Paper (Forest Engineering), Federal Rural University of the Amazon, Belém. Available on: <http://bdta.ufra.edu.br/jspui/handle/123456789/1875> Access in: Sept. 15, 2022.

[113] Jesus, A.C.B. (2021). Floristic Composition and Phytosociology in Flood Forests in the Marajó Mesoregion, Portel, Pará. Final Paper, Federal Rural University of the Amazon, Belém. Available on: <http://bdta.ufra.edu.br/jspui/handle/123456789/1926>. Access in: Sept. 15, 2022.

[114] Alvares, J.L.S.; Carvalho, R.C. (2022). Analysis of the Structure of a Dense Managed Ombrophilous Forest in the Municipality of Portel-PA. Final Paper, Federal Rural University of the Amazon, Belém. Available on: <http://bdta.ufra.edu.br/jspui//handle/123456789/2412> Access in: Sept. 15, 2022.

[115] Costa, I.C.S.D.; Silva, M.T.D. (2022). Technical indices on quantification of post-exploration waste from forest management plans in three municipalities in the state of Pará. Final Paper, Federal Rural University of the Amazon, Belém. Available on: <http://bdta.ufra.edu.br/jspui/handle/123456789/2303> Access in: Sept. 15, 2022.

[116] SETA (2012). Forest Carbon Inventory Report - Portel and Melgaço, Pará. Technical Report – Scientific. Environmental Technical Services (SETA), Belém. 67 p.

[117] MMA. MMA Ordinance No. 148, of June 7, 2022. Amends the Annexes of Ordinance No. 443, of December 17, 2014, Ordinance No. 444, of December 17, 2014, and Ordinance No. 445, of December 17, 2014, regarding the update of the National List of Endangered Species. DOU, Official Press of the Brazilian government. 2022. Available on: <https://www.icmbio.gov.br/cepsul/images/stories/legislacao/Portaria/2020/P_mma_148_2022_altera_anexos_P_mma_443_444_445_2014_atualiza_especies_ameacadas_extincao.pdf> Access in: nov. 02, 2022.

[118] CNCFLORA (2022). National Center for Flora Conservation. Available on: <http://cncflora.jbrj.gov.br/portal> Access in: nov. 30, 2022.

[119] PARÁ. 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.

[120] International Union for Conservation of Nature and Natural Resources. The IUCN Red List of threatened species. IUCN (2022b). Available on: <https://www.iucnredlist.org>. Access in: Nov. 02, 2022.

surinamensis (ucuúba da varzea), *Bertholletia excelsa* (Brazil nut), *Cedrela odorata* (cedro vermelho) and *Swietenia macrophylla* (mogno), form a set of six species that stand out from the rest and should be to occupy the first places in the actions of conservation of the species of that region.

Table 47 - List of species classified as threatened, with confirmed occurrence located on Terra Alta and Santo Antônio farms and with probable occurrence located in the municipalities of Portel and Anapu, in Pará. Key: Critically Endangered (CR); Endangered (EN); Vulnerable (VU); Near Threatened (NT); Least Concern (LC); Data not available (DD).

	CONFIRMED OCCURRENCE	PROBABLE OCCURRENCE	EXTINCTION THREAT LISTS (CA)			
SPECIES	**STA**	**BIBLIOGRAPHY**	**IUCN, 2022**	**MMA, 2022**	**CNCFLORA, 2022**	**PARÁ, 2008**
Apuleia leiocarpa (Vogel) J. F. Macbr.	X		LC	VU	VU	
Aspidosperma desmanthum Benth. ex Müll. Arg.	X		LC		LC	VU
Bertholletia excelsa Bonpl.	X		VU	VU	VU	VU
Cedrela odorata L.	X		VU	VU	VU	VU
Cordia ulei I. M. Johnst		X		EN		
Couratari atrovinosa Prance		X	EN		EN	
Couratari guianensis Aubl.	X		VU		LC	
Eriotheca longipedicellata (Ducke) A. Robyns		X	VU		VU	
Euplassa pinnata (Lam.) I.M. Johnst.	X		VU			
Euxylophora paraensis Huber	X		EN	EN	CR	VU
Handroanthus impetiginosus (Mart. ex DC.) Mattos (Synonym with *Tabebuia impetiginosa* (Mart. ex DC.) Standl.)	X		NT	NT	NT	VU
Hymenaea parviflora Huber		X	LC	VU	VU	
Hymenolobium excelsum Ducke (Synonym with *Hymenolobium elatum* Ducke)	X		DD	VU	VU	VU
Hymenolobium flavum Kleinhoonte		X	VU			
Inga sellowiana Benth.		X	EN		NT	
Manilkara elata (Allemão ex Miq.) Monach. (Synonym with *Manilkara huberi* Ducke)	X		EN		DD	
Mezilaurus duckei van der Werff		X	EN	EN		
Mezilaurus itauba (Meisn.) Taub. ex Mez		X	VU	VU	VU	VU
Ocotea douradensis Vattimo-Gil		X	EN	EN		
Ocotea fragrantissima Ducke	X		EN	EN		
Pouteria krukovii (A.C.Sm.) Baehni	X		VU		LC	
Pouteria latianthera T.D.Penn.		X	EN		DD	
Pouteria multiflora (A.DC.) Eyma		X		EN		
Pouteria oppositifolia (Ducke) Baehni (Synonym with *Syzygiopsis oppositifolia* Ducke)	X		VU	NT	NT	
Protium heptaphyllum (Aubl) March.		X	LT			VU
Swietenia macrophylla King	X		VU	VU	VU	VU

	CONFIRMED OCCURRENCE	PROBABLE OCCURRENCE	EXTINCTION THREAT LISTS (CA)			
SPECIES	**STA**	**BIBLIOGRAPHY**	**IUCN, 2022**	**MMA, 2022**	**CNCFLORA, 2022**	**PARÁ, 2008**
Virola surinamensis (Rol. ex Rottb.) Warb.	X		EN	VU	VU	
Vouacapoua americana Aubl.	X		CR	EN	EN	

In the area of the Tueré REDD+ Project, no local endemic species were found, however, several endemic species were found at regional level. Endemism centers have been proposed for fauna, but generally coincide with the areas of endemism identified for vascular plants, indicating good spatial congruence for the patterns of these different taxonomic groups (Silva et al. 2005) [121]. The Tueré REDD+ Project area is fully inserted in the Xingu Endemism Center, belonging to sub-region 12 as described by Silva-Souza e Souza (2020)[122] (Figure 33).

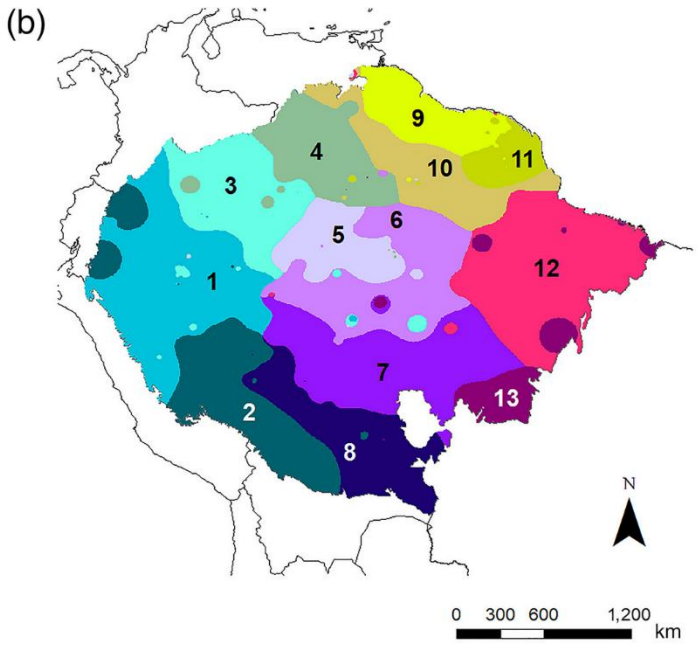


Figure 33 – The floristic sub-regions of the Amazon described by Silva-Souza and Souza (2020): corresponds to the authors' Figure 2b. Source: Silva-Souza and Souza (2020)[123].

Among the species of potential occurrence in the area of the Tueré REDD+ Project, three species have a restricted distribution to subregion 12: *Lindackeria paraenses* (pau-pereira), *Oenocarpus distichus* (bacaba) and *Exostyles amazonica*; *Lindackeria paraensis* being identified as an indicator species of this sub-region.

[121] Silva, J.M.C.; Rylands, A.B.; Fonseca, G.A.B.O (2005). Destination of Amazon endemism areas. Megadiversity, v.1, n.1, p. 124-131.

[122] Silva-Souza, K.J.P., Souza, A.F. (2020). Woody plant subregions of the Amazon forest. Journal of Ecology, 2020;00:1–15. DOI: 10.1111/1365-2745.13406

[123] Silva-Souza and Souza, *op. cit.*

Among the species of confirmed occurrence in the Tueré REDD+ Project Area, seven species have a restricted distribution to this sub-region: *Joannesia heveoides* (castanha-de-arara), *Cenostigma tocantinum* (inharé), *Dimorphandra multiflora* (fava), *Peltogyne lecointei* (pau roxo), *Mezilaurus lindaviana* (itaúba), *Euxylophora paraenses* (pau-amarelo) and *Pouteria oppositifolia* (guajara cinza), the latter being pointed out as an indicator species of the sub-region. All these species mentioned are endemic to sub-region 12 and this fact indicates the importance of the Tueré REDD+ Project in the context of regional endemism.

5.1.1.2 Fauna

The Vertebrate Inventory of Santo Antônio and Terra Alta Farms was carried out in an 8-day field expedition of data collection and its main objective was to confirm the occurrence of as many species as possible, in order to quantitatively and qualitatively characterize the fauna of the Project area. All vertebrate groups were sampled, including land mammals, birds, fish, reptiles and amphibians. For all groups, at least 6 sampling points were defined, distributed in the two farms.

As a complementary method, an exhaustive secondary survey was carried out using bibliographic data, database and scientific collection, in an attempt to record the maximum number of species with confirmed occurrence for the region of the Tueré REDD+ Project. For the bibliographic search, keywords related to taxonomic groups were used with the addition of names of regions, Conservation Units and municipalities close to the Project area.

For the construction of the species listing tables, the lists of threatened species in the state of Pará were consulted (2008)[124], the national of the MMA (2022)[125] and the IUCN international (2022)[126]. As a result, considering the species of probable and confirmed occurrence, the fauna presented 46 species that appear with some degree of threat (vulnerable-VU, endangered-EN and critically endangered-CR) in at least one of the lists (national or international). Among those of confirmed occurrence in the Project area, 20 species fall into any of the threat categories by the MMA or IUCN list, and one species is categorized as "endangered" according to the IUCN international list.

Herpetofauna

The methods of sampling reptiles and amphibians are varied and the combined application of some of them is important for the results of inventories to be satisfactory. One of the active search methods used in this diagnosis was the visual search, where the specialist searches under trunks and stones and searches the most varied potential habitats, such as bromeliads, tree hollows and termite mounds. This method allows registering species with different habits, that is, arboreal, aquatic, terrestrial and fossorial. For each sampling point, a 1000-meter stretch of straight track was delimited, whenever possible, where the search was carried out on both sides. The effort employed for each point was 2 hours daytime and 2 hours nighttime. Another method used was the search at reproductive sites, in which the specialist located and traversed the perimeter, banks and/or interior of swamps, streams, ponds and puddles during the twilight and night periods. In all searches, the species found by visualization or vocalization were recorded. Sampling on roads was also efficient for detecting especially snakes.

In all, 38 species were confirmed in 140 herpetofauna records. All species of reptiles and amphibians surveyed are native to the Amazon, and no exotic species have been recorded. In addition, all use the area

[124] PARÁ, *op. cit.*
[125] MMA, *op. cit.*
[126] IUCN, *op. cit.*

for breeding and nesting, and no migratory species are recorded in the primary survey. Reptiles showed greater richness, with 22 species, while amphibians accounted for 16 recorded species.

The group of anurans presented greater species richness than any group of reptiles, in addition to presenting a greater abundance of total records. Among the amphibians, the most commonly sampled species were *Adelphobates galactonotus* (sapo-venenoso-da-Amazônia), *Adenomera andreae* (rã-touro) and *Rhinella marina* (sapo-cururu). It is worth noting that Adenomera andreae is considered endemic to the Amazon region, but classified as "Least Concern" on the IUCN list because it is abundant in the area it occupies. (Rodrigues et al., 2010)[127]. The amphibian *Rhinella marina* is a species that can be quite common in the Amazon, however, in other places on the planet this species can be considered a voracious invasive species (Global Invasive Species, 2010)[128]. Despite this, the sapo-cururu can be very sensitive to toxicological effects resulting from organic and inorganic pollutants, being considered a bioindicator species (Cruz-Esquivel et al. 2017[129]; González-Mille et al., 2019[130]).

Among reptiles, the most common species were lizards, *Ameiva amoiva* (calango verde), *Arthrosaura reticulata* (calango) and *Mabuya nigropunctata* (lagarto-de-cauda-longa). In the group of snakes, the species *Lachesis muta* (surucucu) stands out, which can be considered a bioindicator species of environments, as it is strictly forest, occurring especially in the most remote forests of the Amazon and Atlantic Forest, being considered a rare animal (Diniz-Souza et al., 2020)[131]. All species identified in the inventory of the Tueré REDD+ Project Area, which are included in the lists of national or international threatened species, are categorized as "least concern" (LC), that is, none is classified as threatened, however, 12 are endemic to the Amazon biome, seven species of amphibians and 5 reptiles.

From the secondary survey in the literature, it was possible to catalog 135 species for the region, 98 reptiles and 37 amphibians. The chelonian species expected to occur in the area, *Chelonoidis denticulata* (jabuti amarelo) and *Podocnemis unifilis* (tracajá), are the only threatened species on the list, classified on the IUCN international list as vulnerable (VU). In addition, the species *Amphisbaena mitchelli* (cobra-de-duas-cabeças), *Helicops trivittatus* (surucucurana) and *Adelphobates galactonotus* (sapo-venenoso-dos-respingos), which are restricted to the Brazilian Amazon, were surveyed, in addition to 59 other species with described endemism for the Amazon region.

Table 48 - List of herpetofauna species likely to occur in the Project region, classified as threatened according to the IUCN Red List. Key: vulnerable (VU).

[127] Rodrigues M. T., Azevedo-Ramos, C., Hoogmoed, M. (2010). Adelphobates galactonotus. The IUCN Red List of Threatened Species 2010: Available on: <https://dx.doi.org/10.2305/IUCN.UK.2010-2.RLTS.T55185A11253730.en.> Access in: Mars 06, 2023.

[128] Global Invasive Species Database. Species profile: Rhinella marina. 2010. Available on: <http://www.iucngisd.org/gisd/speciesname/Rhinella+marina> Access in: Jan. 01, 2023.

[129] Cruz-Esquivel, Á., Viloria-Rivas, J., & Marrugo-Negrete, J. (2017). Genetic damage in Rhinella marina populations in habitats affected by agriculture in the middle region of the Sinú River, Colombia. Environmental Science and Pollution Research, 24, 27392-27401.

[130] González-Mille, D. J., Ilizaliturri-Hernández, C. A., Espinosa-Reyes, G., Cruz-Santiago, O., Cuevas-Díaz, M. D., Del Campo, C. C. M., & Flores-Ramírez, R. (2019). DNA damage in different wildlife species exposed to persistent organic pollutants (POPs) from the delta of the Coatzacoalcos river, Mexico. Ecotoxicology and Environmental Safety, 180, 403-411.

[131] Diniz-Sousa, R., Moraes, J. D. N., Rodrigues-da-Silva, T. M., Oliveira, C. S., & Caldeira, C. A. D. S. (2020). A brief review on the natural history, venomics and the medical importance of bushmaster (Lachesis) pit viper snakes. Toxicon: X, 7, 100053.

CLASS	FAMILY	SPECIES	EXTINCTION THREAT CATEGORY (IUCN)
Reptilia	Testudinidae	*Chelonoidis denticulata*	VU
	Podocnemididae	*Podocnemis unifilis*	VU

Avifauna

In the bird inventory, the census method by listening points was applied, in which a 1000 m long transect was established at each sampling point. Sampling was performed along this transect, where the specialists remained stationary for 10 minutes at each of the 3 listening points established equidistant at 500 m. In addition, active search between the listening points was used. The same methodology was applied in the daytime and twilight periods with a focus on nocturnal species. In the case of vocalizations, the quadrant system was used in order to avoid duplicate records, in which vocalizations of the same species coming from the same quadrant only record one record of that species. (Vielliard et al., 2010)[132].

From the secondary survey, it was possible to catalog 582 species for the region, and the most represented order was the Passariformes, with 303 species records. In the primary survey, 149 species were identified in 366 birdlife records in the study areas. All bird species are native to the Amazon, and no exotic species have been recorded. In addition, all use the area for breeding and nesting, and no migratory species are recorded in the primary survey.

Two species endemic to the Amazon were identified in the diagnosis, *Psophia interjecta* (jacamim-do-xingu) and *Guaruba guarouba* (ararajuba). Regarding endangered species, 13 species of confirmed occurrence were identified in some threat category of the international and national lists. Greater emphasis should be given to the *Penelope superciliares* (jacupemba) and *Celeus flavus* (pica-pau-amarelo) species, both considered critically endangered (CR) by the Brazilian list. In the secondary survey, 21 species were listed in some threat category, being endangered (EN) and vulnerable (VU).

Table 49 - List of avifauna species with proven and probable occurrence in the Project region, classified as threatened according to the IUCN Red List and the MMA National List of Threatened Species. Key: Critically Endangered (CR); Endangered (EN); Vulnerable (VU); Near Threatened (NT); Least Concern (LC).

ORDER/CLASS	SPECIES	CONFIRMED OCCURENCE	PROBABLE OCCURANCE	IUCN	MMA
Accipitriformes	*Harpia harpyja*		X	VU	VU
Accipitriformes	*Morphnus guianensis*		X	NT	VU
Anseriformes	*Lophornis gouldii*		X	NT	VU
Coraciforms	*Momotus momota*	X		LC	EN
Cuculiforms	*Neomorphus squamiger*		X	NT	VU
Galliforms	*Aburria cujubi*	X		VU	VU
Galliforms	*Crax fasciolata*		X	VU	LC
Galliforms	*Penelope pileata*		X	NT	VU

[132] Vielliard, J.M.E., Almeida, M.E.C., dos Anjos, L., Silva, W. (2010). Quantitative survey by scrutiny points and the punctual abundance index (IPA). Ornithology and Conservation. Applied Science, Research and Survey Techniques. 47-60.

ORDER/CLASS	SPECIES	CONFIRMED OCCURENCE	PROBABLE OCCURANCE	IUCN	MMA
Galliforms	*Penelope superciliaris*	X		NT	CR
Galliforms	*Tinamus tao*		X	VU	VU
Gruiformes	*Psophia interjecta*		X		VU
Nyctibiiformes	*Nyctibius leucopterus*		X	LC	EN
Passerines	*Attila spadiceus*	X		LC	VU
Passerines	*Campylorhamphus multostriatus*		X	LC	VU
Passerines	*Dendrocolaptes retentus*		X	LC	VU
Passerines	*Grallaria varia*	X		LC	VU
Passerines	*Hylexetastes brigidai*		X	LC	VU
Passerines	*Hylopezus paraensis*		X		VU
Passerines	*Lepidothrix iris*		X	VU	EN
Passerines	*Phlegopsis nigromaculata*		X	LC	VU
Passerines	*Thamnophilus aethiops*	X		LC	EN
Passerines	*Thamnophilus nigrocinereus*	X		NT	EN
Passerines	*Xiphocolaptes carajaensis*		X		VU
Pelecaniformes	*Agamia agami*		X	LC	VU
Piciforms	*Celeus flavus*	X		LC	CR
Piciforms	*Celeus torquatus*	X		NT	EN
Piciforms	*Pteroglossus bitorquatus*	X		EN	LC
Psittaciforms	*Anodorhynchus hyacinthinus*		X	VU	NT
Psittaciforms	*Guaruba guarouba*	X		VU	VU
Psittaciforms	*Pionites leucogaster*		X	VU	LC
Psittaciforms	*Pyrilia vulturina*		X	LC	VU
Psittaciforms	*Pyrrhura coerulescens*		X	NT	VU
Strigiformes	*Pulsatrix perspicillata*	X		LC	VU
Tinamiformes	*Tinamus tao*	X		VU	VU

Mastofauna

Visual census methods by linear transection and the search for traces are methods performed concomitantly (Buckland et al., 2001)[133], these methods are ideal for sampling medium and large terrestrial and arboreal mammals in a given area. The method consists of walking on previously built and cleared trails, at a constant speed of approximately 1 km/hour, in total silence, observing and noting any sightings

[133] Buckland, S.T., Anderson, D.R., Burnham, K.P., Laake, J.L., et al. Introduction to Distance Sampling: Estimating Abundance of Biological Populations. 2001. Oxford University Press.

or traces of mammals on the trail (Pardini et al., 2003[134]; Peres and Cunha, 2011[135]). Carcasses, feces, burrows, vocalization and other evidence are considered as traces that allow the recorded species to be reliably identified. This method was applied in the inventory of Santo Antônio and Terra Alta Farms and, to systematize the search, a 1 km long transection was traversed for each sampling point. Each trail was covered twice, in the daytime and in the twilight period.

Another complementary method used was photographic trapping with the installation of automatic cameras with heat sensor and monitoring. This methodology covers the detection of terrestrial mammals and a few arboreal ones that descend to the lower vegetation and favors the detection of nocturnal animals, difficult to be sampled by the linear transection method (Srbek-Araujo & Chiarello, 2007)[136]. Six camera traps were installed, one for each mammalian sampling point. Thus, the sampling and registration of medium and large terrestrial and arboreal mammals was carried out, however, some occasional records of small mammals were also recorded throughout the sampling in the field.

In all, 23 species were confirmed in 128 independent records of medium and large terrestrial and arboreal mammals. All mammalian species surveyed are native to the Amazon, and no exotic species have been recorded. In addition, all use the area for breeding and nesting, and no migratory species are recorded in the primary survey. From the secondary survey, it was possible to catalog 109 species for the region.

In the secondary survey, the most represented order was that of bats (Chiroptera) with 58 species records. In inventory, the orders most represented in the records were Carnivora, Artiodactyla and Primates. The most commonly recorded species were *Alouatta discolor* (guariba-de-mãos-ruivas), *Tayassu pecari* (porco-queixada) and *Dasyprocta leporina* (cutia).

Regarding endangered species, 7 species classified as vulnerable (VU) were identified in the field in at least one of the lists. In addition, four recorded species are endemic to this biome, they are the canid *Atelocynus microtis* (cachorro-do-mato-de-orelhas-curtas) and the primates *Saguinus niger* (sagui-preto), *Alouatta discolor* (guariba), and *Mico argentatus* (sagui-branco).

Certain species can be considered bioindicators because they occur preferentially in areas of preserved primary forest in the Amazon, although they also occur in other habitats, including other more open biomes. This is the case of the jaguar (*Panthera onca*) and the queixada (*Tayassu pecari*) (Teixeira-Santos et al., 2020)[137]. The cachorro-do-mato-de-orelhas-curtas (*Atelocynus microtis*) is also restricted to areas of more

[134] PARDINI, Renata et al. Rapid survey of medium and large land mammals. Methods of studies in conservation biology and wildlife management. Translation. Curitiba: Ed. UFPR, 2004.
[135] Peres C.A, Cunha A.A. Manual for census and monitoring of medium and large vertebrates by linear transection in tropical forests. 2011. Wildlife Conservation Society, Ministry of the Environment and ICMBio.
[136] Sberk-Araujo, A. C., Chiarello, A. G. Use of camera traps in mammal sampling: methodological considerations and comparison of equipments. Rev. Bras. Zool. 24 (3), 2007. Available on: <https://doi.org/10.1590/S0101-81752007000300016> Access on Jan. 15, 2023.
[137] Teixeira-Santos, J., Ribeiro ACdC, Wiig Ø, Pinto NS, Cantanhêde LG, Sena L, Mendes-Oliveira, A.C. et al. (2020). Environmental factors influence the abundance of four species of threatened mammals in degraded habitats in the eastern Brazilian Amazon. PLOS ONE 15(2): e0229459. https://doi.org/10.1371/journal. pone.0229459

conserved primary forests (Rocha et al. 2020)[138], in addition to all primate species, since neotropical primates are strictly arboreal and extremely sensitive to forest loss (da Silva et al., 2022)[139].

Table 50 - List of mammalian species with proven and probable occurrence in the Project region, classified as threatened according to the IUCN Red List and the MMA National List of Threatened Species. Key: Vulnerable (VU); Near Threatened (NT); Least Concern (LC).

ORDER/CLASS	SPECIES	CONFIRMED OCCURENCE	PROBABLE OCCURANCE	IUCN	MMA
Artiodactyla	*Tayassu pecari*	X		VU	VU
Carnivora	*Atelocynus microtis*	X		NT	VU
Carnivora	*Panthera onca*	X		NT	VU
Carnivora	*Concolor cougar*	X		VU	LC
Carnivora	*Speothos venaticus*		X	VU	NT
Cingulata	*Priodontes maximus*		X	VU	VU
Perissodactyla	*Tapirus terrestris*	X		VU	VU
Pilosa	*Myrmecophaga tridactyla*		X	VU	VU
Primate	*Alouatta discolor*	X		VU	VU
Primate	*Alouatta belzebul*		X	VU	VU
Primate	*Saguinus niger*	X		VU	VU

Ichthyofauna

In this survey, the fish inventory was carried out without the use of invasive specimen collection methodologies. Initially, the watercourses closest to the sampling points defined for the other terrestrial groups were visited. In addition to the active search in the streams for the sighting and recognition of fish species, a general assessment of the condition of the water bodies as indicative of fish fauna conservation was carried out. The evaluation of the measurements of the structure of the streams showed a good conservation of the analyzed stretches.

In all, records of 28 species were confirmed. All fish species surveyed are native to the Amazon, and no exotic species have been recorded. In addition, all use the area for breeding and nesting, and no migratory species are recorded in the primary survey. The most represented order was Characiformes with 8 species, this group includes piranhas, douradas and lambaris, and are exclusively freshwater. The most commonly recorded species was *Apistogramma regani* (ciclídeo-anão), from the order Cichliformes.

From the secondary survey of ichthyofauna species, it was possible to catalog 211 fish species for the region. The most represented order was also Characiformes, with 78 species records. Of the total, three

[138] Rocha DG et al. (2020). Wild dogs at stake: deforestation threatens the only Amazon endemic canid, the short-eared dog (Atelocynus microtis). R. Soc. Open Sci. 7: 190717. Available on: <http://dx.doi.org/10.1098/rsos.190717> Access on Jan. 15, 2023.

[139] da Silva, L.B., Oliveira, G.L., Frederico, R.G., Mendes-Oliveira, A.C. et al. (2022). How future climate change and deforestation can drastically affect the species of monkeys endemic to the eastern Amazon, and priorities for conservation. Biodivers Conserv 31, 971–988. Available on: <https://doi.org/10.1007/s10531-022-02373-1> Access in: Jan. 15, 2023.

species are bioindicators, namely the pirarucu (*Arapaima gigas*), the traíra (*Hoplias malabaricus*) and the piranha-preta (*Serrasalmus rhombeus*).

The species *Gymnorhamphichthys rondoni* (cascudo) stands out for preferring sandy substrates. The reduction of these substrates is usually caused by the removal of the riparian vegetation, in this way, the degradation or loss of the riparian forest can cause the decrease or even the disappearance of this species locally, despite its wide distribution in the Amazon (Virgilio et al., 2018)[140]. In addition, 5 endemic species of the Amazon were identified: *Apistogramma regani* (ciclídeo-anão), *Iguanodectes rachovii* (piaba), *Moenkhausia comma* (piaba), *Nannostomus trifasciatus* (peixe-lápis) and *Acanthodoras cataphractus* (peixe-gato).

5.1.2 High Conservation Value Attributes (B1.2)

As defined by the HCV Resource Network[141], there can be six types of high conservation values, three of which are directly related to the biodiversity of the Project Area:

HCV1: Significant global, regional or national concentrations of biodiversity values, protected areas, endangered species, endemic species and/or areas that support significant concentrations of a species during any period of its life cycle.

HCV2: Large areas at significant landscape level globally, regionally or nationally, where viable populations of most, if not all, of the naturally occurring species exist in natural patterns of distribution and abundance.

HCV3: Rare or threatened ecosystems.

Through the diagnostics carried out at Santo Antônio and Terra Alta Farms, the area of the Tueré REDD+ Project can be classified as HCV1 due to the existence of endemic species at the regional level and significant concentrations of threatened species that meet the vulnerability criteria, on a global, national or regional scale. It can also be classified as HCV2 because, following the guidelines of Brown et al (2013)[142], the area has more than 50,000 ha in extension, constituting a forest ecosystem large and preserved enough to house viable populations of the inventoried species and (implicitly) the vast majority of other environmental values that occur in the ecosystem.

As demonstrated, the forest present in the Project Area is rich in naturally occurring species, presents structural patterns of mature, stable, self-regenerative forests and without anthropogenic interference, only with low impact sustainable forest management. Another important characteristic for the identification as HCV2 is the fact that the Project area is within a region surrounded by conservation units such as FLONAs, RESEX and Indigenous Lands, thus, the Project area can play an important role in connecting existing Conservation Units and complementing the conservation of the fauna and flora of the region.

High Conservation Value	*Specify HCV (e.g., name the area and species it supports).* HCVA 1: according to the diagnostics carried out, 16 endangered species (at some threat level according to the international and nationals lists) and 7 endemic species of the Amazonian flora were identified; and

[140] Virgilio, L.R.; Gomes, R.S.; Suçuarana, M.S.; Vieira, L.J.S. (2018). Analysis of the use of microhabitats, spatial distribution and diet of Gymnorhamphichthys rondoni (Miranda-Ribeiro, 1920) (Rhamphichthyidae) in low-order streams in western Amazon. Revista Biotemas, 32(1):65-76.
[141] HCV Resource Network. Available on: <https://www.hcvnetwork.org/hcv-approach>.
[142] Brown, E., N. Dudley, A. Lindhe, D.R. Muhtaman, C. Stewart, and T. Synnott (eds.). 2013 (October). General guide for identification of High Conservation Values. HCV Resource Network.

	20 endangered species (at some threat level according to the international and nationals lists) and 23 endemic species of fauna were found in the Project Area. HCVA 2: forest ecosystem large and preserved enough to house viable populations of the inventoried species; rich in naturally occurring species; presents structural patterns of mature, stable, self-regenerative forest without anthropogenic interference. Forests with these attributes should be considered as areas with high conservation value.
Qualifying Attribute	*Provide rationale (e.g., if there are significant species concentrations or viable populations in natural patterns of distribution and abundance or threatened or rare ecosystems).* The project area is located within the Xingu Endemism Center; forest fragments and remnants and Permanent Preservation Areas in the project area and their area of influence are extremely important for the conservation of regional fauna and flora, presenting a High Conservation Value. It houses species of several fauna and floristic groups whose distribution area is restricted to the biome and/or the region, in addition to several species of fauna and flora in the categories of threat, considered endangered (EN), critically endangered (CR) and vulnerable (VU). 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.
Focal Area	*Identify the area(s) that need to be managed to maintain or enhance this HCV.* From the evidence pointed out above, it is understood that the entire Project Area must be contemplated, in order to guarantee 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 Scenario in the Absence of the Project: 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 high, being one of the characteristics of humid tropical forests such as the Amazon Forest. However, Fazendas Santo Antônio and Terra Alta are in a region that has high rates of deforestation. The Tueré REDD+ project area is located in the eastern portion of the Amazon, at the Xingu Endemism Center. Braz *et al.* (2012)[143] ranked that, among the Amazonian centers of endemism (CE), the Xingu CE is the second most worrying because it has high rates of deforestation and few areas with restricted use. This intense process of deforestation is due to the accelerated occupation of the Amazon in the region known as the “Arch of Deforestation”, mainly related to the existence of roads (ALVES, 2001; FERREIRA, 2001;

[143] Braz, L.C., Pereira, J.L.G., Ferreira, L.V., Thales, M.C. The situation of endemism areas in the Amazon in relation to deforestation and protected areas. Bol. geogr., Maringá, v. 34, n.3, p. 45-62, 2016. Available on: <http://dx.doi.org/10.4025/bolgeogr.v34i3.30294> Access on Jun. 23, 2023.

FERREIRA et al., 2005; ESCADA et al. , 2005; apud BRAZ et al., 2012)[144], such as the BR-230, Transamazônica Highway, which crosses the state of Pará and is located within the Reference Region and close to the Project area.

In the specific case of the Tueré REDD+ Project region, deforestation can be identified as the threat with the most significant impacts on biodiversity. Deforestation leads to habitat loss; the removal of vegetation cover directly affects the fauna and flora of the region, as many species depend on the forest for food, shelter and reproduction. Deforestation can also lead to habitat fragmentation, isolating populations of species in small areas of remaining forest and increasing the risk of local species extinction. (Laurance & Vasconcelos, 2009)[145]. It also has an impact on soil and water quality. (Panza et al., 2021)[146], because the removal of vegetation increases erosion and leaching causing the loss of soil nutrients and water pollution, which can affect the survival of species, especially those more sensitive to changes in the environment. In addition, deforestation contributes to greenhouse gas emissions and global climate change. (Xu et al., 2022)[147], which can affect the climate in the region of the Xingu center of endemism and the living conditions of many species.

Without the Tueré REDD+ project and in a more pessimistic scenario, the deforestation pressure in the Reference Region tends to increase and advance gradually towards the limits of the Farms. The socioeconomic characteristics of the region may favor the increase in deforestation, especially considering some agents and drivers, such as: the practice of slash and burn agriculture, which consists of opening areas of forest and cultivation for a period, followed by the abandonment of the degraded area due to soil depletion, thus, new areas are opened promoting deforestation; the presence of the Regatão river market, which generates an economic dependence of the families on the middlemen, who put pressure on the residents to exploit forestry and they may come to seek these resources within the Project Area; and livestock, a very common economic activity in the region, being a driver of deforestation as it promotes the conversion of forest areas to new pasture areas and which advances from the Transamazônica highway towards the Project area. Thus, scenarios without the implementation of the project maintain the pressure of deforestation of the remaining forest present in the Project Area, further increasing the risk of habitat loss of many endemic and endangered species of flora and fauna that occur in the Project region.

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 or causal model, better defined in Section 2.1.11. Based on this definition, we can better visualize the cause and effect relationship between the Project activities outlined, the actions involved and their expected results in the short, medium and long term.

[144] Braz, L.C., *op. cit.*

[145] LAURANCE, W.F.; VASCONCELOS, H.L. Ecological consequences of forest fragmentation in the Amazon. Oecologia Brasiliensis. v.13, n. 3, p. 434-451, 2009.

[146] Panza, M.R.; Souza, T.S.; Donegá, M.V.B.; Lima, M.M.; Goudinho, J.; *et al*. Hydrogeomorphometry and deforestation index of the Rio dos Veados watershed, Western Amazon, Brazil. Revista Ibero-Americana de Ciências Ambientais v. 12 n. 4, 2021. Available on: <https://doi.org/10.6008/CBPC2179-6858.2021.004.0031> Access in jun. 23, 2023.

[147] Xu, X.; Zhang, X.; Riley, W.J.; Xue, Y.; Nobre, C.A.; Lovejoy, T.E.; Jia, G. (2022). Deforestation triggering irreversible transition in Amazon hydrological cycle Environmental Research Letters, Volume 17, Number 3. DOI 10.1088/1748-9326/AC4C1D

All activities were defined with the objective of promoting the long-term preservation of the forest cover in the Project Area. For biodiversity, it is evident that the greatest changes, compared to the scenario without the Project, are associated with the preservation of natural habitats, providing the maintenance or increase of the diversity of floristic and faunal species, which would be threatened by unplanned deforestation, and that, without the intervention of the REDD+ mechanism, the threats tend to increase for the Amazon region as a whole.

Thus, it is clear that ensuring the protection of the forest through the activities of the Project and the REDD+ mechanism will enable the expected changes to biodiversity to be positive. Still, as an essential tool for this, the biodiversity monitoring plan will make it possible to verify and ascertain whether any changes are impacting biological diversity in a negative way, portraying the photograph of the local biota throughout the life cycle of the Project, providing greater lucidity about the population dynamics of species, including endemic and vulnerable ones, as well as the conflicts generated by the coexistence of man and nature.

As a result, the expected changes to the Project's biodiversity are:

- Maintenance and possible addition of species identified in the without-project scenario;

- Ensure the conservation of habitats and species of the Xingu Endemism Center;

- Ensure the conservation of habitats and species in the Brazilian Amazon;

- Reduce illegal activities through Project activities;

- Increase the awareness and sensitization of local communities in relation to environmental issues, reducing the pressure for hunting;

- Ensure the conservation of endangered and endemic animal and plant species;

- Promote an ecologically balanced environment;

- Maintain landscape connectivity.

Changes in key elements of biodiversity are described in the tables below.

Biodiversity Element	Flora
Estimated Change	Maintenance and/or increase of flora species by reducing deforestation and forest degradation
Justification of Change	- Preservation of flora species as a result of the activities of "Improvement of Farm Surveillance" and "Monitoring of deforestation via satellite images", through actions such as establishing procedures and surveillance improvements, as well as continuous and remote monitoring of deforestation and forest fires in the Project Area and Leakage Belt, contributing to the reduction of the loss of landscape connectivity, continuity of gene flows and the promotion and maintenance of ecologically balanced habitats.

	- Preservation of flora species as a result of the activities of "Promotion of sustainable practices" and "Development and strengthening of value chains" through actions that promote sustainable production models and agricultural practices, development and technical training, valorization of agricultural and forestry products and access to marketing channels, as strategies to reduce pressure for deforestation, either for the expansion of production areas or for the illegal trade in wood, from the promotion of alternative and sustainable economic activities.

Biodiversity Element	Fauna
Estimated Change	Maintenance of habitats by reducing deforestation and forest degradation
Justification of Change	- Preservation of habitats of interest to fauna as a result of the activities of “Improving Farm Surveillance” and “Monitoring deforestation via satellite images”, through actions such as establishing surveillance procedures and improvements, as well as continuous and remote monitoring of deforestation and forest fires in the Project Area and Leakage Belt, contributing to the reduction of the loss of landscape connectivity, continuity of gene flows and the promotion and maintenance of ecologically balanced habitats. - Preservation of habitats and fauna species as a result of the activities of "Promotion of sustainable practices" and "Development and strengthening of value chains" through actions that promote sustainable production models and agricultural practices, development and technical training, valorization of agricultural and forestry products and access to marketing channels, as strategies to reduce hunting and pressure for deforestation, either for the expansion of production areas or for the illegal trade in wood, from the promotion of alternative and sustainable economic activities.

Biodiversity Element	Fauna and Flora
Estimated Change	Biodiversity conservation in the Project Zone
Justification of Change	Preservation of species of fauna and flora as a result of the actions suggested by the activity "Biodiversity conservation program", providing for environmental education actions, with active participation and awareness campaigns in the communities, favoring the reduction of hunting and damage to populations of rare, endemic and endangered species. In

	addition, the continuous *in situ* monitoring of species in the Project Area offers indicators to monitor the effectiveness of activities in generating positive net benefits to biodiversity.

5.2.2 Mitigation Measures (B2.3)

The Tueré REDD+ Project aims to preserve an area belonging to the Amazon Biome, maintaining the habitat of the species present in the Project Area, avoiding deforestation through actions to reduce and control the threats suffered by the biotic community, such as: periodic monitoring of fauna and flora, monitoring deforestation via satellite images, improving the surveillance of Farms and the biodiversity conservation program. In addition, the Project's activities linked to community aspects will strengthen the local community in terms of environmental education and awareness and sustainable agricultural and environmental practices.

In this sense, all Project activities were designed and structured to act as mitigating measures for the main impacts and threats to biodiversity, internal and external, identified in the studies carried out in the Socioeconomic and Environmental Diagnoses, in addition to mitigating against negative adverse factors in the conservation and maintenance of HCVAs.

Therefore, no significant 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, thus being the mitigating and biodiversity protection measures.

Throughout the Project period, further mitigation actions and measures may be proposed as local requirements and impacts are identified. Thus, the proposals presented will be more effective and significant, resulting in relevant and beneficial changes for the region, its surroundings and biodiversity.

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

The activities proposed by the Tueré REDD+ Project seek to generate several benefits to the climate, communities and biodiversity. The main benefits generated for biodiversity are linked to the reduction of deforestation and forest degradation and conservation of biodiversity and habitats. In other words, the activities were designed mainly to reduce deforestation and forest degradation in the region of the Project Area and, therefore, most of the positive impacts on biodiversity will be evaluated based on the preserved forest cover and, in a complementary way, from the understanding of the dynamics of species, especially fauna, on a continuous and periodic basis.

The quantification of net positive benefits for biodiversity can be done over time, through an adequate monitoring plan (see Section 5.4.1). From these expeditions, which will provide a robust database throughout the implementation of the Project, the data regarding the Project's biodiversity before the start of activities, or the base scenario, can be compared with the biodiversity data after the start of the Project.

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 activity at different stages of implementation, being the indicators defined in this document an important instrument to evaluate positive impacts.

5.2.4 High Conservation Values Protected (B2.4)

The Project Area has two High Conservation Value attributes related to biodiversity, which have already been described in Section 5.1.2 and are related to (i) the existence of endemic species at the regional level and significant concentrations of threatened species that meet the vulnerability criteria, on a global, national or regional scale and (ii) for constituting a large and preserved forest ecosystem enough to support viable populations of the inventoried species and (implicitly) the vast majority of other environmental values that occur in the ecosystem.

The proposed measures to guarantee integrity of HCVs and thus maintain and improve these attributes, ensuring that they are not negatively affected by the Project, were considered and incorporated by the defined activities of the Project. Therefore, no negative impact was foreseen for these areas and, furthermore, the proposed activities as well as their implementation throughout the life of the Project will allow to generate positive impacts on these attributes.

Thus, it is not expected that the attributes of HCVs will 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 intact and appropriate habitats for the entire biotic community, even providing the recovery of ecological niches for endemic, rare or endangered species.

5.2.5 Species Used (B2.5)

This item is not applicable, since reforestation/revegetation activities are not foreseen in the Project.

5.2.6 Invasive Species (B2.5)

This item is not applicable, since reforestation/revegetation activities are not foreseen in the Project.

Furthermore, in the diagnosis carried out in the Project Area, evidencing the scenario without a Project for biodiversity, described in Section 5.1.1 from this document, it is possible to verify that there are no invasive alien species in the area and, in addition, the evaluated remnant has a well-preserved forest structure that is resilient to the entry of opportunistic exotic plant species.

5.2.7 Impacts of Non-native Species (B2.6)

There are communities in the Project Zone that use non-native species for subsistence. However, the main food crops and the producers' sources of income are mostly based on the development and exploitation of products from native species such as cassava, açaí, cocoa, among others.

Some non-native species, such as certain fruit species, are used by local communities and other stakeholders in small and, in some cases, medium-scale plantings. 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, it has not shown any evidence of significant negative impact on biodiversity. In addition, the introduction of new exotic species will not be encouraged by the activities of the Tueré REDD+ Project.

Therefore, it is possible to state that no impact from exotic species is foreseen.

5.2.8 GMO Exclusion (B2.7)

Through the Tueré REDD+ Project it is ensured that no genetically modified organisms (GMOs) will be used. The reduction or removal of greenhouse gas emissions will be achieved by reducing deforestation and forest degradation.

5.2.9 Inputs Justification (B2.8)

In the Tueré REDD+ Project Zone, where part of the Project activities will take place, there is no intention to use any chemical pesticides, biological control agents or other types of chemical inputs in the activities to be implemented.

5.2.10 Waste Products (B2.9)

Brascomp has a Waste Management Plan in place, which aims to minimize the generation of waste, involving the stages of identification/classification, packaging, temporary storage, and transportation to the appropriate destination, mitigating the effects of pollution caused by waste generated in the environment. Most of the waste generated by the company's activities is organic (leftover food) or solids such as metal, paper/cardboard, glass and plastic.

For the activities proposed by the Project, no additional generation of waste other than those described above is foreseen. Any waste produced will be separated for recycling or composting, whenever possible, considering the aforementioned Plan, as well as the environmental laws related to the subject. If separation for recycling or composting is not possible, the waste will be disposed of as ordinary waste. As new activities are selected to compose the Project, the identification, classification and management of its waste will be properly conducted.

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 assumptions of the methodology VM0015, has as its main objective the reduction of emissions from unplanned deforestation and forest degradation, in addition to maintaining forest carbon stocks. Therefore, it is undisputed that the conservation provided by this mechanism benefits the Project Zone as a whole.

Specifically, to the Tueré REDD+ Project, it is intended to obtain greater control in the occurrence of anthropogenic disturbances that would negatively impact biodiversity, mainly the loss of habitat due to deforestation for the practice of predominant economic activities in the region such as livestock and timber extraction. However, from the strengthening of measures aimed at the conservation of the forest and its resources, it may be that the displacement of these disturbances and activities to areas outside the Project Zone, which are more vulnerable to such events, occurs naturally.

Regarding the mitigation measures arising from the Project, we can mention the permanence and strengthening in the Project Zone of alternative economic activities that generate income and employment, such as the promotion of agricultural production models and sustainable practices, development of value chains and environmental education, that is, social activities with the potential to mitigate possible negative impacts, with emphasis on environmental awareness and awareness, forest appreciation and the sustainable use of forest resources by local communities.

It is valid to say that all Project activities were discussed and evaluated (Section 2.3.7) with communities and stakeholders to understand the scope of Project activities and forest conservation. Also, it is important to note that the activities proposed by the Project will extend to stakeholders located in the Project Zone, but with potential positive impact beyond these limits.

In addition, the Project will seek to strengthen the articulation of proponents, who must practice adaptive management and collectively address any additional negative impact on biodiversity outside the Project Zone.

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 large forest remnants that can function as ecological corridors, as well as refuge and protection for threatened species and ecosystems. 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 threatened species are benefits that justify the presence of the Tueré REDD+ Project in the region.

5.4 Biodiversity Impact Monitoring

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

This section presents the variables to be monitored, the types of measurement and the sampling methods related to the activities of the Project's biodiversity scope. The minimum monitoring frequency is two years, that is, once in each verification cycle. The monitoring variables are directly linked to the objectives of the Project for the conservation of biodiversity and to the expected products, results and impacts identified in the causal model of the Project related to the conservation of biodiversity.

Also, the plan will seek to protect the High Conservation Value Attributes (HCVA) through socio-environmental activities (description in Section 2.1.11) that seek to contain deforestation and degradation of these areas, as well as organizing and improving alternative traditional economic and subsistence activities, as the promotion of sustainable practices. As explained in Section 5.1.2, the identified High Conservation Value Attributes are related to (i) the existence of endemic species at the regional level and significant concentrations of threatened species that meet the vulnerability criteria, on a global, national or regional scale and (ii) for constituting a forest ecosystem that is large and preserved enough to house viable populations of the inventoried species and (implicitly) the vast majority of other environmental values that occur in the ecosystem. The evaluation of the effectiveness of the measures adopted to maintain and improve such HCVAs is linked to the remote and on-site monitoring of forest areas within the Project Area that offer ecosystem services to communities and the promotion of alternative activities to deforestation and forest degradation contemplated by the indicators described below.

Variable	Environmental education actions carried out
Area	Project Area
Description	Accounting for any action that aims to raise awareness and sensitize stakeholders to environmental issues, especially such as prevention of hunting and overfishing and actions that degrade the vegetation of the Project Area and the surrounding forest remnants

Measurement Type and Sampling Method	Environmental education actions will be developed from the establishment of partnerships, aiming to expand their reach and effectiveness. The methodology to be adopted can be decided jointly between bidders and strategic partners defined throughout the Project, and detailed before each action. However, this will basically include: - Target Audience Analysis: Identification of the public to be reached with environmental education actions, which may be children, young people, adults, specific community groups, etc. The characteristics, level of education, interests and concerns of the public will be considered to help adapt educational approaches. - Definition of Objectives: Clear objectives will be established for environmental education actions, increasing awareness of a specific environmental problem, promoting behavior changes, encouraging participation in sustainable practices, etc. - Content Development: Relevant and engaging educational materials will be developed, including presentations, videos, games, hands-on activities and demonstrations. The content will be tailored to the audience's level of understanding and highlight the importance of environmental issues. - Choice of Pedagogical Strategies: Appropriate pedagogical approaches will be selected for the target audience, including lectures, group discussions, practical activities, simulation games, field visits, workshops, among others. - Active Interaction: Participants' active participation will be promoted by encouraging questions, discussions and practical activities that engage participants in a meaningful way. - Practical Demonstration: Concrete and practical examples will be used during environmental education actions. - Evaluation of Results: The impact of environmental education actions will be assessed through questionnaires, surveys, observations and feedback from participants, verifying that the objectives have been achieved and that there have been changes in behavior. - Feedback and Continuous Improvement: Feedback from participants will be used to improve educational approaches.

Frequency	At each verification period
Forms of registration	Field sheets, photographs, monitoring reports, among other additional records
Related activity (Section 2.1.11)	Biodiversity conservation program

Variable	Number of partnerships established
Area	Project Area
Description	Measurement of the number of partnerships that the Project carries out throughout its duration to contribute to the development and improvement of the Project's actions and activities
Measurement Type and Sampling Method	All documents produced will be stored in digital files throughout the crediting period of the Project. Thus, the realization of partnerships linked to the activities of the Project will be monitored and accounted for. To monitor the number of partnerships established effectively, some steps will be developed, according to the following examples: - Criteria Definition: Initially, clear criteria will be defined to consider that a partnership has been established, including formal agreements, collaborations on specific projects, sharing of resources, etc. - Creation of a Registration System: A registration system will be established to monitor partnerships, which can be done in spreadsheets, project management software, among others. - Documentation and Identification: When registering each partnership, relevant details such as partner organization name, partnership type, start date, partnership objectives and key contacts will be documented. - Regular Update: The registration system should be updated regularly. As new partnerships are established, relevant information will be added to the system. - Categorization of Partnerships:

	Partnerships will be categorized based on relevant criteria, such as: aspect (environmental, educational, community), level of involvement (formal, informal) or type of collaboration (joint projects, resource sharing), among others. - Follow-up reports: The data recorded will be used to generate reports showing the total number of partnerships established in a given period or under specific categories. - Progress Tracking: The progress of the partnerships will be monitored regularly over time, assessing their impact on the objectives of the Project. - Data Analysis and Interpretation: In addition to accounting for the number of partnerships, data will be analyzed to identify trends, patterns, and areas of success, which can help understand which types of partnerships are most effective and valuable to Project initiatives. - Communication of Results: The results of the partnership count will be shared with relevant partners and stakeholders. - Strategy Adjustment: Based on the data and analysis, the partnership strategy can be adjusted if necessary, which may involve seeking more collaborations in areas of success or refining the approach to attract more partners.
Frequency	At each verification period
Forms of registration	Reports (e.g. follow-up report of project activities that have been implemented), contracts, memos, emails, meeting minutes and/or other supporting documents as evidence that a partnership has been established and built
Related activity (Section 2.1.11)	Strengthening governance; Improving infrastructure; Fostering sustainable practices; Developing and strengthening value chains

Variable	In situ monitoring campaigns carried out
Area	Project Area
Description	Data collection on fauna and flora populations in the Project Area, through pre-defined samples

Measurement Type and Sampling Method	To understand changes in ecosystems, assess the environmental quality of the region and take appropriate conservation measures, appropriate planning of monitoring campaigns will be required, including the following steps: - Definition of Objectives: Definition of the specific objectives of the campaign, such as identifying key species, assessing biodiversity, among others. - Selection of the Sample Area: Definition of the sample size, which meets the sampling sufficiency criteria, as well as the location of the sampling units. - Identification of Interest Groups: Definition of faunal and floristic groups of interest for monitoring, which have an intrinsic relationship with the environmental quality of the area. - Definition of Methods: The data collection methods that will be used will be defined. This may involve direct observation, traps, monitoring cameras, among others. - Data Collection: This step may involve secondary data, collected through specific literature, scientific articles, among others, as well as primary data, which include regular field departures, installation of camera traps, etc. - Data Logging: Detailed records will be made of all observations and data collected. This can be done manually or using data management software. - Data Analysis: The data collected will be analyzed to identify trends, patterns, and changes over time. This may involve the use of statistical software and biodiversity analysis techniques. - Reporting and Communication: Regular reports will be prepared to communicate the results of the campaign, and may be shared with other Project stakeholders. - Decision Making: Based on the results, informed decisions can be made about the conservation of fauna and flora.

	- Continuous Monitoring: The monitoring of fauna and flora shall be continuous throughout the duration of the Project to assess long-term changes and adjust conservation strategies as necessary.
Frequency	At each verification period
Forms of registration	Field sheets, photographs, monitoring reports, among other additional records
Related activity (Section 2.1.11)	Biodiversity conservation program

Variable	Wealth of species or morphospecies of flora with DBH > 10 cm
Area	Project Area
Description	Number of species or morphospecies of flora monitored within the Project Area. If there is difficulty in identifying an individual at a specific level, the richness of morphospecies can be considered, defined only by morphological similarity
Measurement Type and Sampling Method	To monitor the number of species with DBH > 10 cm existing in the Project Area, it will be necessary to identify in the field all trees with DBH above this inclusion limit present in transects of 20 x 100 m. Such an evaluation is suggested in 35 transects to maintain the number performed in the Flora Diagnosis, which may come as baseline data, but a different number can be evaluated by the team. The team can consider the plots established for PMFS monitoring. The richness estimation, called asymptotic, can be performed for the Hill series (with q=0, which represents the total number of species; with q=1, which represents the number of frequent species; and q=2, which represents the number of very frequent species) using the techniques of interpolation (or rarefaction) and extrapolation to up to twice the number of samples (or transects). If species richness stabilizes and the terminal slope of the curve tends to zero, then asymptotic estimation can reliably infer the true species richness of the community. The data can be analyzed in the iNext program available online, as well as in the R platform or in other programs that are feasible for the team. Other data collection methodologies can be established jointly between proponents and strategic partners defined throughout the Project and detailed prior to each monitoring campaign. The methods and procedures to be used should be similar, but not restricted to those used in the initial diagnoses, such as forest inventories in sample plots, among other methods that are effective in recording morphospecies of the plant community of interest.
Frequency	At each verification period
Forms of registration	Field sheets, photographs, monitoring reports, among other additional records
Related activity (Section 2.1.11)	Biodiversity conservation program

Variable	Species richness of fauna
Area	Project Area
Description	Number of species found in the Project Area in each monitoring campaign
Measurement Type and Sampling Method	Groups of species that may present ecological attributes of special interest to be monitored will be selected, and large herbivorous and frugivorous mammals, including tapirs, deer and pigs, can be highlighted for their contributions to the dispersal and predation of seeds and seedlings, as well as species of strictly arboreal frugivorous mammals such as primates, which help maintain the forest through seed flow and are dependent on the forest environment for their locomotion. Also, frugivorous species of birds, especially Psittaciformes and Tinamiformes that have a high participation in the maintenance of the forest through the flow of seeds and pollinating species. For these groups of mammals and birds, photographic trapping methodologies, census by linear transection and census by listening points are very efficient for monitoring. Other data collection methodologies can be established jointly between proponents and strategic partners defined throughout the Project and detailed prior to each monitoring campaign. The methods and procedures to be used should be similar, but not restricted to those used in the initial diagnoses, such as linear transects, active search, camera trap records, among other methods that are effective in recording the fauna of interest.
Frequency	At each verification period
Forms of registration	Field sheets, photographs, monitoring reports, among other additional records
Related activity (Section 2.1.11)	Biodiversity conservation program

Variable	Number of species of fauna and flora that have some degree of threat in the IUCN RedList
Area	Project Area
Description	Monitoring of fauna and flora species in the Project Area and monitoring of their status on the IUCN Red List of Endangered Species, with emphasis on Critically Endangered (CR), Endangered and Endemic species.
Measurement Type and Sampling Method	To monitor the number of fauna species that have some degree of threat in the IUCN RedList existing in the Project Area, the data collected during monitoring of the 'Wealth of fauna species' indicator will be used, and the Fauna Diagnosis data can be used as a basis for comparison. To monitor the number of flora species that have some degree of threat in the IUCN RedList existing in the Project Area, the data collected in the transects will be used where the indicator 'Wealth of species or morphospecies of flora with pad > 10 cm' will be monitored, and the Flora Diagnosis

	data can be used as a basis for comparison. This monitoring will allow the quantification of the percentage of species monitored in the Project Area with high relevance to be protected. The systematization and comparison of data and information collected in fauna and flora expeditions will be made with the IUCN Official List, available at: https://www.iucnredlist.org/. Other data collection methodologies can be established jointly between proponents and strategic partners defined throughout the Project and detailed prior to each monitoring campaign.
Frequency	At each verification period
Forms of registration	Field sheets, photographs, monitoring reports, among other additional records
Related activity (Section 2.1.11)	Biodiversity conservation program

5.4.2 Dissemination of the Biodiversity Monitoring Plan (B4.3)

The Biodiversity Monitoring Plan, as well as the results obtained by monitoring the Tueré REDD+ Project, will be made available to the public through a page on the official site of Biofílica Ambipar. The summarized documents related to the biodiversity monitoring plan, its results and other relevant information will be made available to communities and other interested parties through meetings, lectures and by physical means (printed) at the premises of Fazendas Santo Antônio and Terra Alta of Brascomp.

5.5 Optional Criterion: Exceptional Biodiversity Benefits

Under development.

5.5.1 High Biodiversity Conservation Priority Status (GL3.1)

Under development.

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

Under development.