JATOBÁ REDD+ PROJECT

Jatobá
Boca do Acre – AM

Document Prepared By Terra Vista Gestora de Recursos Ltd.

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Project Title	Jatobá REDD+
Version	1.0
Date of Issue	April 26, 2023
Project Location	Municipality of Boca do Acre, Amazonas State, Brazil
Project Proponent(s)	Terra Vista Gestora de Recursos Ltd. Gabriela Machado Magalhães projetos@terravista.eco.br +55 (11) 98108-3823 Seringal São Miguel SPE Ltd. Ubiraci Benute Jaime jbbenutte@gmail.com +55 (11) 98169-2222

Prepared By	Terra Vista Gestora de Recursos Ltd.
Validation Body	SCS Global Services
Project Lifetime	30-year lifetime
GHG Accounting Period	April 26, 2020 – April 25, 2050
History of CCB Status	Not applicable
Gold Level Criteria	The Jatobá project plays an important role in reducing the impacts of climate change, mitigating social differences, and conserving biodiversity. The project area presents a dense hydrographic network composed of springs and watercourses and will contribute to the conservation of water resources in the Amazon River basin. The project will therefore contribute to preventing the biome from reaching the point of no return, which is when the ecosystem is no longer able to sustain itself from the point of view of its hydrological cycle, according to IPCC: Climate change 2021(GL1) . The Gold Level for exceptional community benefits is achieved because it has been identified that the project zone is in an administrative area of a medium human development country where at least 50% of the households within the communities are below the national poverty line. Infrastructure and sanitation programs will provide access to water, electricity, education and information to low-income traditional extractive communities, enabling them to adapt to local climate change impacts (GL2). The project provides exceptional biodiversity, in accordance with the vulnerability criteria described by the CCB for being located in a Key Biodiversity Area (KBA), as it presents threatened fauna and flora species classified in the “Endangered” category in the region (IUCN Red List) such as: *Virola surinamensis*, *Handroanthus serratifolius, Rinorea longistipulata, Crax globulosa, Inia geoffrensis, Pteronura brasiliensis, Sporophila maximiliani, Sotalia fluviatilis, Ateles chamek* and *Lagothrix lagothricha* ssp. *cana.*
Expected Verification Schedule	April 2023 until April 2050

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1 SUMMARY OF PROJECT BENEFITS

The Jatobá project will be developed in the municipality of Boca do Acre, state of Amazonas, Brazil, within the Agriculture, Forestry and Other Land Uses (AFOLU) sector under the Reducing Emissions from Deforestation and Forest Degradation (REDD+) category. The project will conserve 94,090.42 hectares of native Amazon rainforests in a region where deforestation pressure is mainly due to land use conversion activities from forests to pastures aimed at raising livestock. The project area (18,017.19 ha) will be allocated to Avoided Planned Deforestation (APD) (Table 1), and it is estimated that at the end of the project the emission of 5,440,804 tons of Greenhouse Gases (GHG) (tCO_2e) will have been avoided.

The project will be developed considering the **CCB** Standards, with benefits for the **Climate**, **Community** and **Biodiversity**. As benefits to the climate, the maintenance of forest cover results in exceptional benefits for adapting to the impacts caused by climate change, such as changes in the rainfall regime, as the area presents a dense hydrographic network that contributes to the provision and quality of water in the Amazon River basin.

As benefits to the communities, the project will implement underground water collection and distribution systems, install solar panels for electricity generation and provide satellite internet service in people's residences. These measures will enable water security and access to information to minimize the impacts caused by climate change in traditional, low-income extractive communities.

The maintenance of forest cover ensures the conservation of biodiversity, the maintenance of ecosystem functioning (e.g., nutrient cycling) and of ecosystem services provisioning (e.g., carbon sequestration) performed by living organisms. It is noteworthy that the project includes a high priority area for biodiversity conservation, as it is located within a Key Biodiversity Area (KBA), harboring species endemic to the Brazilian Amazon and species classified as Vulnerable (VU), Critically Endangered (CR) and Endangered (EN) with extinction according to the IUCN.

Table 1. Distribution of areas of the Jatobá project.

Area Description	Hectare	(%)
Property Area	94,090.42	100
Legal Reserve - including Permanent Preservation Area (PPA)	76,073.23	80.85
Project area: Multiple Use Area - Avoided Planned Deforestation (APD)	18,017.19	19.15

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1.1 Unique Project Benefits

The expected outcomes or impacts of the activities of the Jatobá project during its lifetime are shown in Table 2.

Table 2. Summary of the expected benefits from the Jatobá project.

Outcome or Impact Estimated by the End of Project Lifetime	Section Reference
1) Provide water security and access to electricity to improve the quality of life of local communities, based on the pillars of sustainability.	4.5.2
2) Increase the number of children, youth and adults with internet connection, and more access to information.	4.5.2
3) Avoid the emission of 5,440,804 tons of Greenhouse Gases (GHG) (tCO2e), contributing to the mitigation of climate change.	2.1.5
4) Maintenance of ecosystem functions (e.g., nutrient cycling), as well as the provision of ecosystem services (e.g., carbon sequestration) performed by living organisms.	2.1.5

1.2 Standardized Benefit Metrics

The estimates of the net benefits that the Jatobá project intends to generate during its lifetime is presented in Table 3 below.

Table 3. Estimates of the net benefits of different metrics that Jatobá project aims to achieve during the project lifetime.

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	5,440,804 tCO_2e	3.2.4
Forest cover	For REDD projects: Estimated number of hectares of reduced forest loss in the project area measured against the without-project scenario	18,017.19	3.1.4
	For ARR projects: Estimated number of hectares of forest cover increased in the project area measured against the without-project scenario	not applicable	
Improved land management	Number of hectares of existing production forest land in which IFM practices are expected to occurred as a result of project activities, measured against the without-project scenario	not applicable	
	Number of hectares of non-forest land in which improved land management practices are expected to occurred as a result of project activities, measured against the without-project scenario	not applicable	
Training	Total number of community members who are expected to have improved skills and/or knowledge resulting from training provided as part of project activities	120	2.3.14
	Number of female community members who are expected to have improved skills and/or	60	2.3.14

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
	knowledge resulting from training as part of project activities		
Employment	Total number of people expected to be employed in project activities, expressed as number of full-time employees	1	2.3.15
	Number of women expected to be employed as a result of project activities, expressed as number of full-time employees	not applicable	
Livelihoods	Total number of people expected to have improved livelihoods or income generated as a result of project activities	240	4.2.3
	Number of women expected to have improved livelihoods or income generated as a result of project activities	120	4.2.3
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	240	4.2.3
	Number of women for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	120	4.2.3
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	120	4.2.3
	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	60	4.2.3
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	240	4.2.3

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	120	4.2.3
Well-being	Total number of community members whose well-being is expected to improve as a result of project activities	240	4.5.2
	Number of women whose well-being is expected to improve as a result of project activities	120	4.5.2
Biodiversity conservation	Expected change in the number of hectares managed significantly better by the project for biodiversity conservation, measured against the without-project scenario	94,090.42	2.1.5
	Expected number of globally Critically Endangered or Endangered species benefiting from reduced threats as a result of project activities, measured against the without-project scenario	10 species (3 flora; 7 fauna)	5.5.1

2 GENERAL

2.1 Project Goals, Design and Long-Term Viability

2.1.1 Summary Description of the Project (G1.2)

The Jatobá project is located in the western region of the municipality of Boca do Acre, in the state of Amazonas, Brazil. The municipality of Boca do Acre is located in the region with the highest rates of deforestation in the Amazon, the so-called Arch of Deforestation[1]. With one of the highest deforestation rates in the state of Amazonas, Boca do Acre is among the ten municipalities in the Legal Amazon that deforested the most in 2021[2]. According to data from the PRODES system[3], between 2008 and 2021, the municipality had an average rate of deforestation of 10.58% and an increase in accumulated deforestation of 1,133.20 km² (Figure 1).

With the aim of generating benefits for the climate, communities and biodiversity through the implementation of carbon projects, the Seringuei project expects to contribute to the mitigation of climate change by avoiding the net emission of more than 5.4 millions tCO_2e over the 30-year crediting period, and expects to bring positive net benefits to communities and biodiversity through the implementation of activities that prevent planned deforestation (APD).

The project aims to generate economic incentives for landowners to conserve Amazon rainforests on their private lands, providing positive net impacts for traditional communities and for biodiversity conservation. According to the Brazilian Forest Code (Law No. 2.651/12)[4], landowners must conserve 80% of the forest cover in properties located in the Legal Amazon. This guarantees the legality of converting 20% of forest cover to other commercial uses, such as livestock or agriculture, with the proper authorization from the responsible environmental agencies.

Additionally, the project seeks to contribute to local social development by offering benefits to traditional communities, achieved through actions of social engagement, education, digital inclusion, health, access to water, employment and income generation, training and qualification, rural extension, and infrastructure.

[1] O arco do desmatamento e suas flechas. Available at: <https://acervo.socioambiental.org/acervo/documentos/o-arco-do-desmatamento-e-suas-flechas>. Accessed on: 25/10/2022.

[2] PRODES. Desmatamento nos Municípios da Amazônia Legal para o ano de 2008-2021. Available at: <http://www.dpi.INPE.br/prodesdigital/prodesmunicipal.php>. Accessed on: 25/10/2022.

[3] PRODES. Desmatamento nos Municípios da Amazônia Legal para o ano de 2008-2021. Available at: <http://www.dpi.INPE.br/prodesdigital/prodesmunicipal.php>.

[4] Brazilian Forest Code - Law N°. 12,651, 2012. Available at: <http://www.planalto.gov.br/ccivil_03/_ato2011-2014/2012/lei/l12651.htm>.

Finally, the project aims to guarantee the conservation of forest areas, resulting in the maintenance of forest cover under pressure from planned deforestation (allowed by Law). Forest monitoring will be done through satellite images, forest biomass inventory associated with the use of drones and innovative aerial photogrammetry techniques (e.g., drone LiDAR), patrimonial vigilance, monitoring of forest fires, fire prevention and firefighting activities, protection of threatened species and social orientation activities with traditional communities residing in and around the project area.

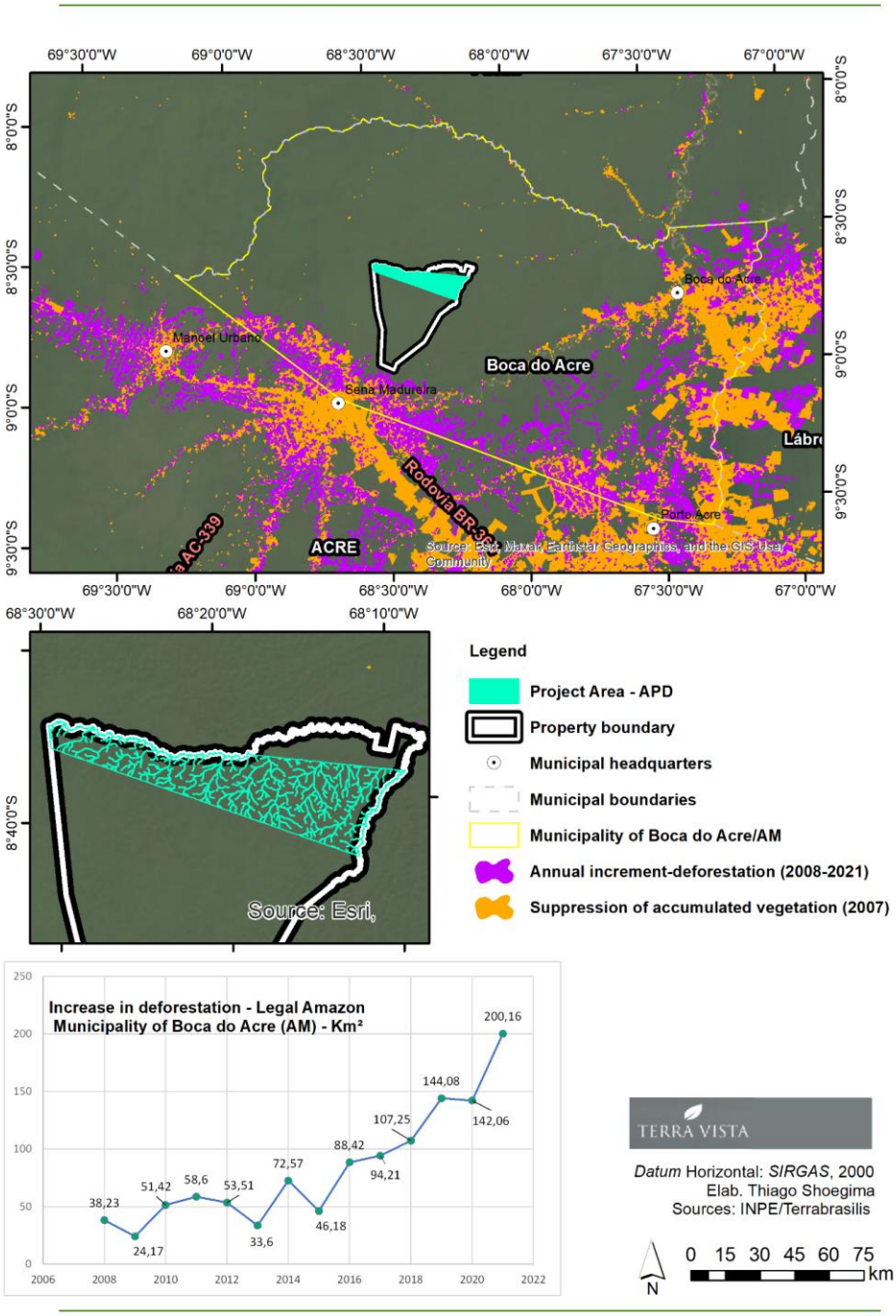

Figure 1. Annual increase in deforestation (2008-2021) in the municipality of Boca do Acre (AM) where the Jatobá project is located.

In the absence of the project, the advance of deforestation and degradation in the area would cause negative impacts on biodiversity. Habitat loss and landscape fragmentation can result in the loss of species,

especially those that are less mobile (e.g., species that depend on large dispersing animals) and have more specialized characteristics (e.g., species adapted to dense, closed, undisturbed forests).

Therefore, the implementation of the project guarantees the conservation of the forest in a region with a high rate of deforestation and of recognized biological importance, since the region presents a mosaic of Conservation Units with a great diversity of species of animals and plants, some of which are endemic to the Amazon and threatened with extinction. In addition, protecting the area favors the maintenance of continuous forest environments, ensuring the maintenance of gene flow of the species and the ecosystem services performed by species (e.g. provision of food, fresh water, wood), which favors local communities.

The development, implementation, monitoring and certification of the Jatobá project is the responsibility of Terra Vista Gestora de Recursos Ltd. The counterpart of the landowner is to allow the project activities to be implemented on his property and to freely commit to its long-term conservation.

2.1.2 Project Scale

Table 4. Jatobá project scale.

Project Scale	
Project	
Large project	X

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2.1.3 Project Proponent (G1.1)

Table 5. Contact information for the proponents of the Jatobá project.

Organization name	Terra Vista Gestora de Recursos Ltd.
Contact person	Alan de Brito
Title	Project Coordinator
Address	Rua Gumercindo Saraiva, nº 54, Sala 04, Jardim Europa, São Paulo, Zip Code: 01449-070, Brazil
Telephone	+55 11 4883-1165
Email	projetos@terravista.eco.br

Organization name	Terra Vista Gestora de Recursos Ltd.
Contact person	Guilherme Rosseto Nunes de Oliveira
Title	Legal Director

Address	Rua Gumercindo Saraiva, nº 54, Sala 04, Jardim Europa, São Paulo, Zip Code: 01449-070, Brazil
Telephone	+55 11 4883-1165
Email	projetos@terravista.eco.br

Organization name	Seringal São Miguel SPE Ltd.
Contact person	Ubiraci Benute Jaime
Title	Landowner
Address	Av. Julio Toa, 184, Plato do Piquia, Boca do Acre, Amazonas, Zip Code: 69850-000, Brazil
Telephone	+55 (11) 98169-2222
Email	jbbenutte@gmail.com

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2.1.4 Other Entities Involved in the Project

Table 6. Contact information for other entities involved in the Jatobá project.

Organization name	GUAXINIM Environmental Solutions Ltd.
Contact person	Crasso Paulo Bosco Breviglieri
Title	Elaboration and execution of forest inventory and fauna diagnosis
Address	Rua Célia Alonso Pereira, 16, Guaiuba, Guarujá, São Paulo, Brazil
Telephone	+55 (13) 99180-1426
Email	guaxinimambiental@gmail.com

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2.1.5 Physical Parameters (G1.3)

Project Location

The property where the Jatobá project is inserted has a total area of 94,090.42 ha, and the area corresponding to the project has 18,017.19 ha destined for Avoided Planned Deforestation (APD) and is inserted in the western region of the municipality of Boca do Acre, in the southwest portion of the Amazonas State, Brazil (8°38'46.92"S and 68°19'35.38"W) (Figure 2).

The municipality of Boca do Acre is located between the geographic coordinates, longitude 69º12'45" and 67º03'24”W and latitude 8º33'49" and 8º30'34”S, with an area of 21,938 km² and an estimated

population of 34,958 inhabitants[5]. The municipality borders the state of Acre at its southern end, the municipality of Lábrea to the east and the municipality of Pauini to the northwest.

The main access routes to Boca do Acre are via the BR-317, BR-364 highways and the Purus, Acre, Pauini rivers, among others. The BR-317, through the BR-364, connects with Acre, with the rest of Brazil and with the Interoceanic road or Pacific road, which has the purpose of connecting Brazil, Peru and Bolivia to the international economic markets across the Pacific Ocean, being an important economic corridor[6]. Preferential access is from the municipality of Rio Branco, capital of Acre State, on the BR-364 road towards Porto Velho, which is traveled for approximately 30 km until the junction with BR-317, it continues towards to the north, for another 190 km, crossing the boundaries between the states of Acre and Amazonas, up to the municipality of Boca do Acre, totaling about 220 km.

Access to the Jatobá project area is by river from the municipality of Boca do Acre. To reach the area, it is necessary to go down the Acre River, down the Purus River, then up the Inauini River to the São Francisco creek (igarapé), and follow it until reaching the Curupati creek (igarapé).

[5] IBGE. Instituto Brasileiro de Geografia e Estatística. Panorama 2021. Available at: <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/panorama>. Accessed on: 22/09/2022.

[6] Mendoza, E; Perz, S.; Schmink, M.; Nepstad, D. 2007. Participatory stakeholder workshops to mitigate impacts of road paving in the southwestern Amazon. In: Rangarajan, M.; Shahabuddin, G. Conservation and society. v. 5 no. 3, Cap. 7, p. 382-407.

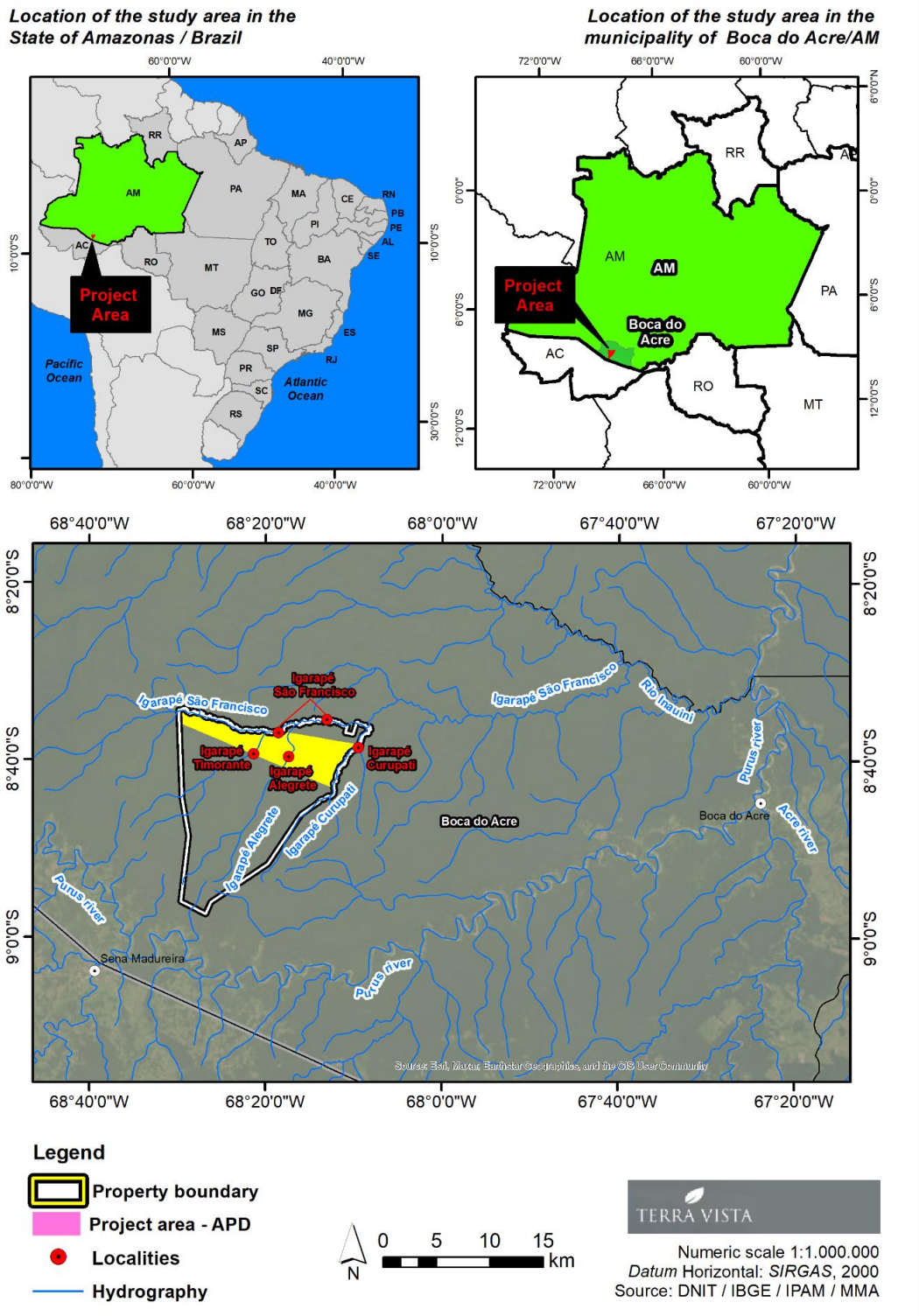
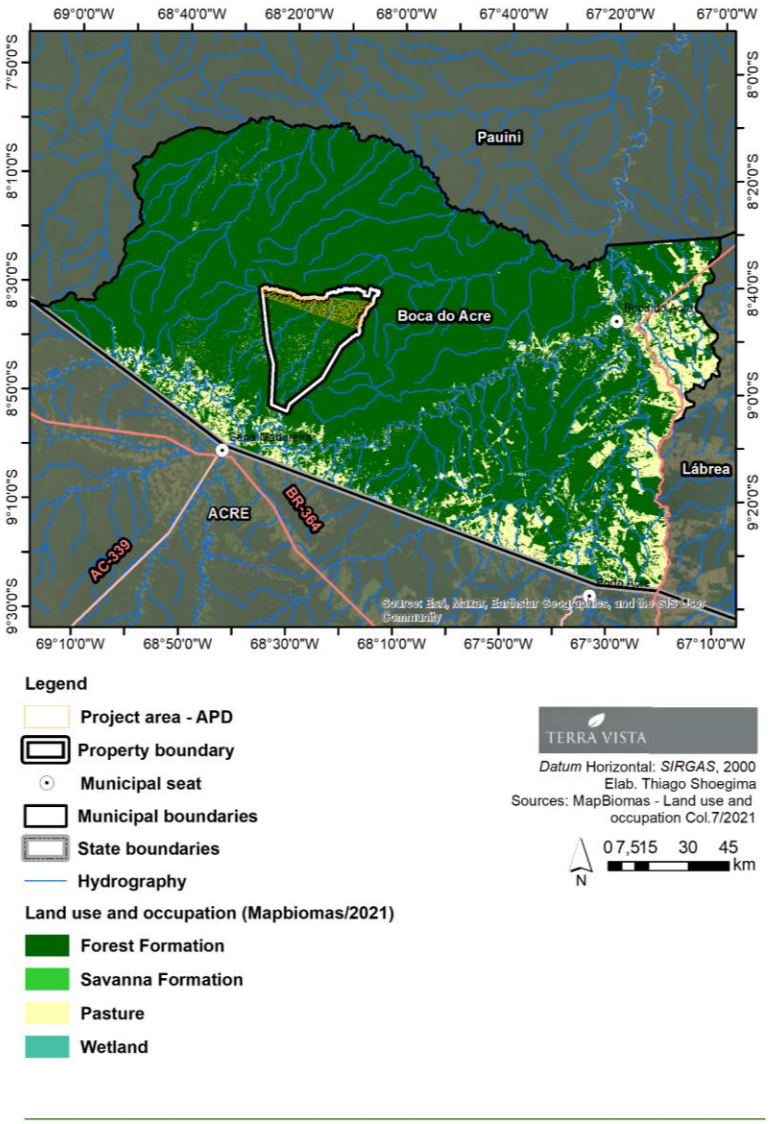


Figure 2. Location of the Jatobá project in the municipality of Boca do Acre in the Amazonas State, Brazil.

The municipality of Boca do Acre has livestock as its economic base, being among the ten largest cattle breeders in the state of Amazonas[7], and presents extractivism and family farming to a lesser extent. About 86.2% of the municipality's territory is made up of natural forest formations and 12.8% of areas dedicated to agriculture and pastures[8] (Figure 3). The property, as well as the project area, are predominantly composed of forested areas (97.2 ± 0.57%).



[7] IBGE. Instituto Brasileiro de Geografia e Estatística. Pecuária 2022. Available at: <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/pesquisa/18/16459>. Accessed on: 22/09/2022.

[8] MapBiomas. Coleções MapBiomas Brasil. Available at: <https://mapbiomas.org/>. Accessed on: 22/09/2022.

Figure 3. Land use types in the municipality of Boca do Acre, where the Jatobá project is located.

Geology, Geomorphology and Topography

The state of Amazonas is characterized by an extensive Phanerozoic sedimentary cover (covering the last 542 million years) deposited on a Precambrian rocky substrate (spanning from 4.5 billion years ago to the Phanerozoic). The municipality of Boca do Acre is located on the Amazon Craton, a Precambrian basement composed of nine structural provinces[9]. The Jatobá project area is inserted mainly in the Amazonas-Solimões Province on the Solimões Formation (54.6%), but is also on Holocene Terraces (43.5%) and to a lesser extent on Holocene Alluvial Deposits (1.9%) (Figure 4). The Solimões Formation emerged in the Cenozoic Era around 65.5 million years ago, resulting from a Plio-Pleistocene deposition and is composed of a set of rocks and minerals, such as claystones with intercalations of siltstones, sandstones, limestones and material carbonaceous, of fluvial and fluviolacustrine origin[10]. The Holocene Terraces are fluvial plain deposits composed of lenticular channel bottom gravels, unconsolidated quartz sands, silts and overflow clays[11]. The Holocene Alluvial Deposits are constituted by conglomerates, sandstones and claystones[12].

The Amazon has reliefs of different shapes that are defined from the variation of altitudes of its plains. The relief of the project area is quite uniform, without accentuated topographical contrasts, formed on Sedimentary Basins and Phanerozoic Sedimentary Covers (55.9%) and on Quaternary Sedimentary Deposits (44.1%) (Figure 5a). The Jatobá project area lies mostly on the Juruá-Iaco Depression (45.5%) and on the Amazonian Plain (44.1%), and to a lesser extent on the Purus - Juruá Depression (10.3%) (Figure 5b). The Amazon Plain is the largest plain in the world and is represented by the floodplain area of the Amazon River and its main tributaries[13]. In addition, the predominant relief of the project area is Dissected with Convex Top (55.9%) with Terrace sections (42.2%) and a small area of Plain (1.9%) (Figure 5c).

[9] Santos, J.O.S. Geotectônica dos Escudos da Guiana e Brasil Central. In: L.A. Bizzi, C. SCHOBBENHAUS, R.M. VIDOTTI, J.H. GONÇALVES (Eds.) Geologia, tectônica e recursos minerais do Brasil. Texto, mapas e SIG. CPRM-Serviço Geológico do Brasil, 2003. p.169-226.

[10] IBGE. Geologia do Estado do Amazonas. Available at: <https://geoftp.ibge.gov.br/informacoes_ambientais/geologia/levantamento_geologico/mapas/unidades_da_federacao/am_geologia.pdf>. Accessed on: 13/10/2022.

[11] IBGE. Geologia do Estado do Amazonas. Available at: <https://geoftp.ibge.gov.br/informacoes_ambientais/geologia/levantamento_geologico/mapas/unidades_da_federacao/am_geologia.pdf>. Accessed on: 13/10/2022.

[12] IBGE. Geologia do Estado do Amazonas. Available at: <https://geoftp.ibge.gov.br/informacoes_ambientais/geologia/levantamento_geologico/mapas/unidades_da_federacao/am_geologia.pdf>. Accessed on: 13/10/2022.

[13] ICMBIO. 2010. Plano de Manejo Participativo da Reserva Extrativista Arapixi. Volume I – Diagnóstico e Caracterização

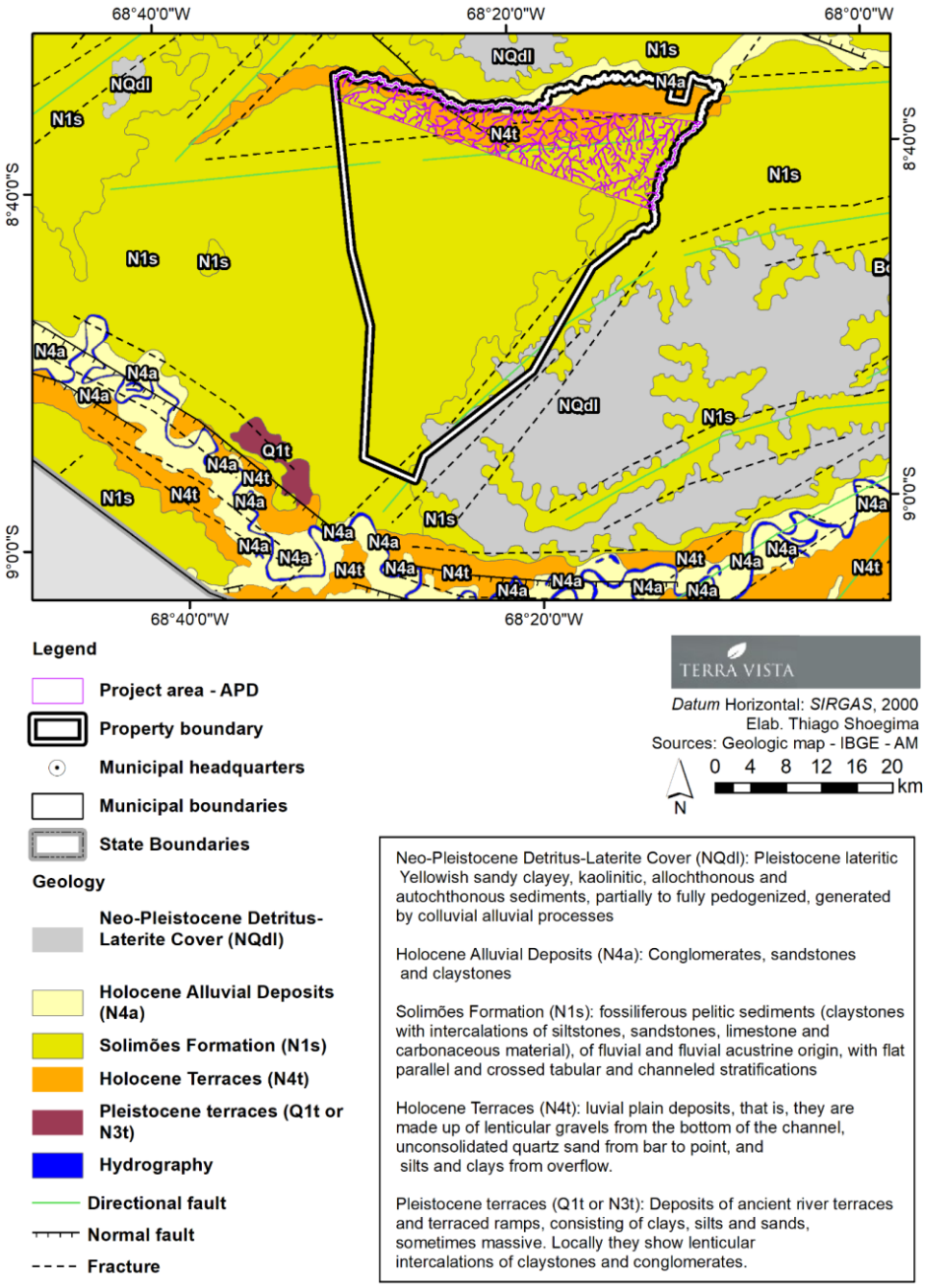


Figure 4. Geology of the region where the Jatobá project is located.

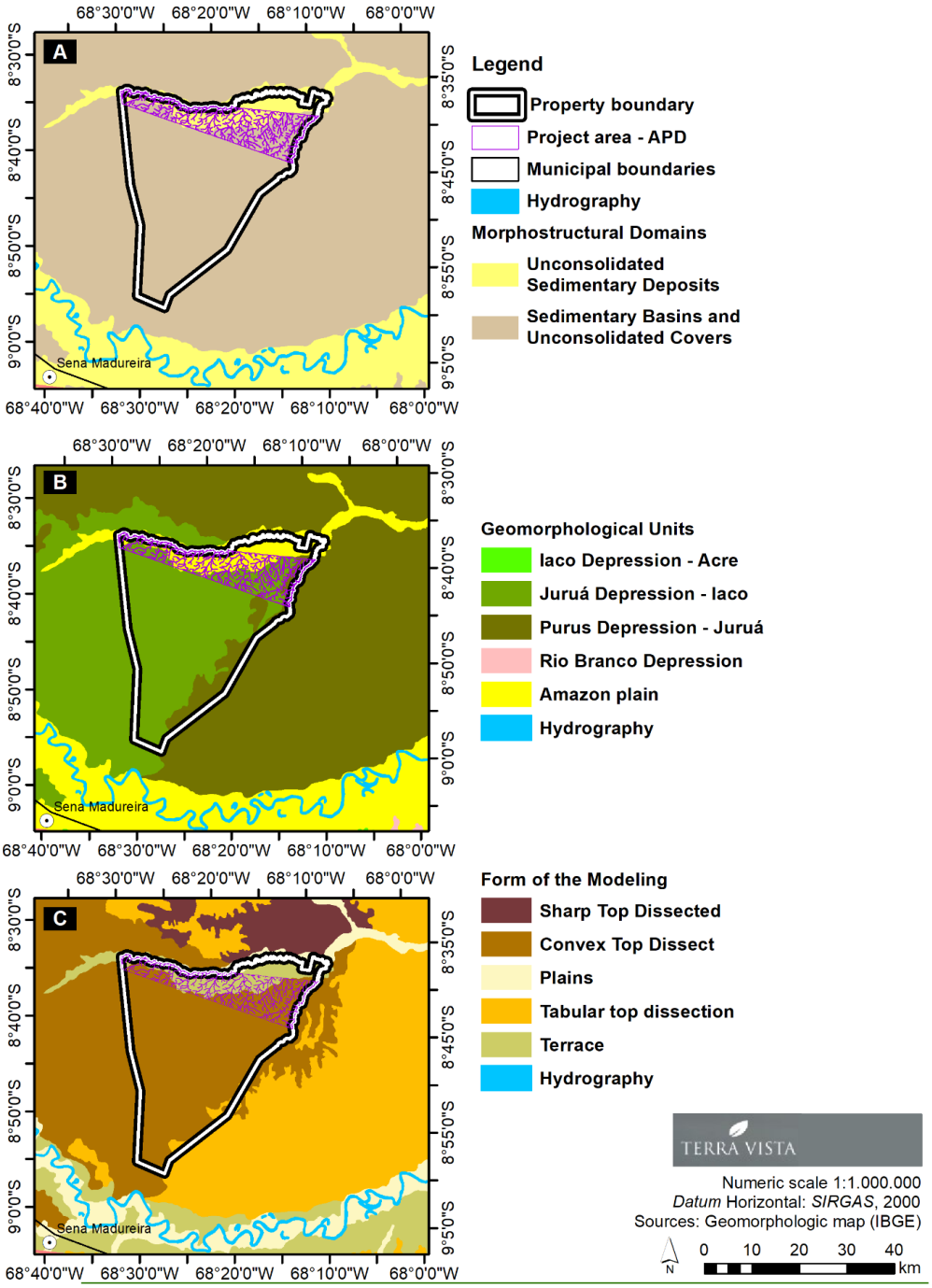
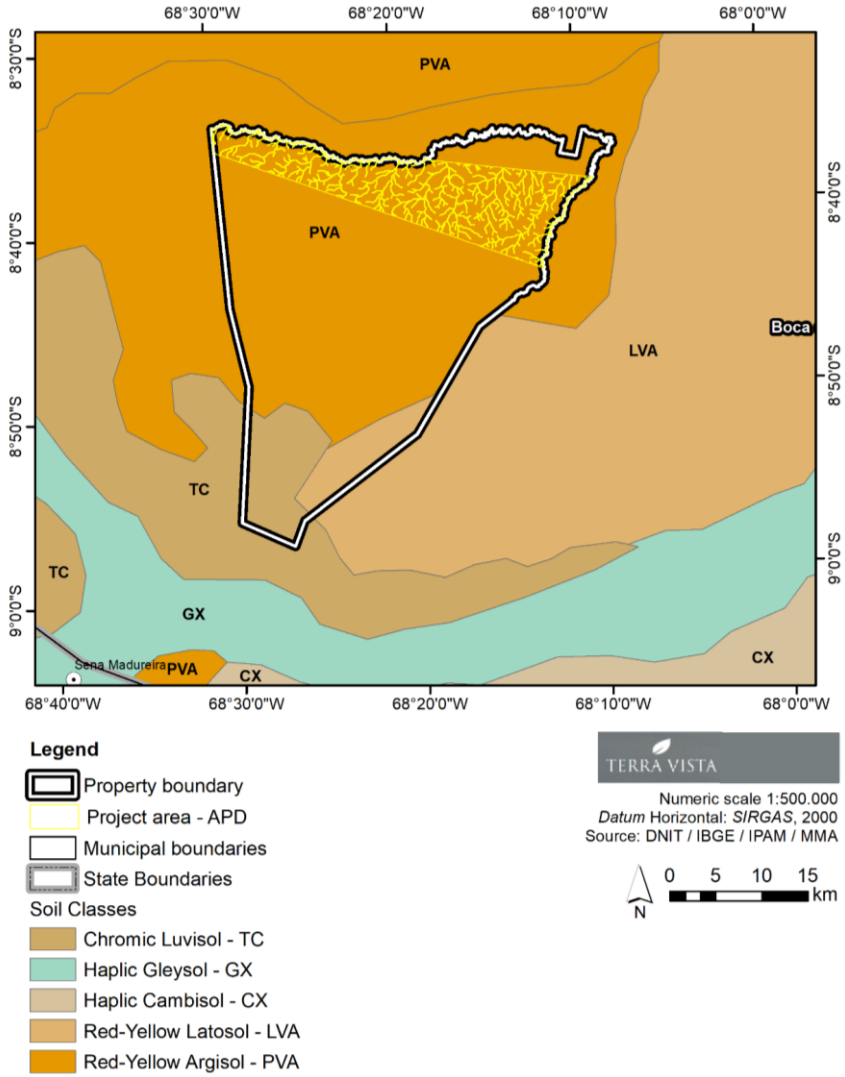


Figure 5. Geomorphology of the region where the Jatobá project is located.

Soil

Natural factors such as climate, relief, time, and parent material, combined in different intensities, form the various soil types observed in the region of the Jatobá project. The predominant soil type in the Jatobá project area is the Red-Yellow Argisol (PVA) (Figure 6). Argisols (Ultisols) are also mineral soils, non-hydromorphic with a textural B horizon immediately below the A or E horizon, however, in contrast to Luvisols, they present clay of low activity or high activity as long as it is combined with low base saturation or with aluminum character. In addition, they are deep and low fertility soils (dystrophic, low base saturation), strongly to moderately acidic, with medium or sandy texture[14].



[14] EMBRAPA. 2018. Sistema Brasileiro de Classificação de Solos / Humberto Gonçalves dos Santos … [et al.]. – 5. ed., rev. e ampl. − Brasília, DF : Embrapa. Available at: <https://www.embrapa.br/solos/sibcs>. Accessed on: 25/09/2022.

Figure 6. Soil classes in the region where the Jatobá project is located.

Climate

The climate in the municipality of Boca do Acre is classified as humid tropical with a short dry season, type "Am" in the Köppen classification (1948). The average annual precipitation varies between 2000 and 2250 mm [15]. The rainy season extends from October to May, with the months of December to April being the rainiest of the year (> 300mm) and the months of June to August being the driest with average precipitation not exceeding 100 mm[16].

According to INMET[17], the annual thermal amplitude is small, with an average temperature during the year varying between 24.9°C and 26.1°C. The hottest period of the year (average temperature above 25.8°C) is concentrated in the months of September and November, however, the highest temperatures (> 32°C) occur between August and October. The lowest temperatures were registered in the months of June to August, with minimums between 19 and 20°C. During this period, the climatic phenomenon called *friagem* occurs, characterized by a sudden drop in temperature and air humidity, with reasonably cold winds throughout the western Amazon[18]. This happens because of the entry of the Atlantic Polar mass, usually in the less rainy period (June to August) [19].

The average monthly precipitation of the historical series from 1950 to 2000 for the project region is shown in Figure 7 below.

[15] ICMBIO. 2009. Plano de Manejo da Floresta Nacional dos Purus. Volume I – Diagnóstico e Caracterização.

[16] INMET. Available at: <https://clima.inmet.gov.br/GraficosClimatologicos/DF/83377>. Accessed on: 13/10/2022.

[17] INMET. Available at: <https://clima.inmet.gov.br/GraficosClimatologicos/DF/83377>. Accessed on: 13/10/2022.

[18] ICMBIO. 2010. Plano de Manejo Participativo da Reserva Extrativista Arapixi. Volume I – Diagnóstico e Caracterização

[19] ICMBIO. 2009. Plano de Manejo da Floresta Nacional dos Purus. Volume I – Diagnóstico e Caracterização.

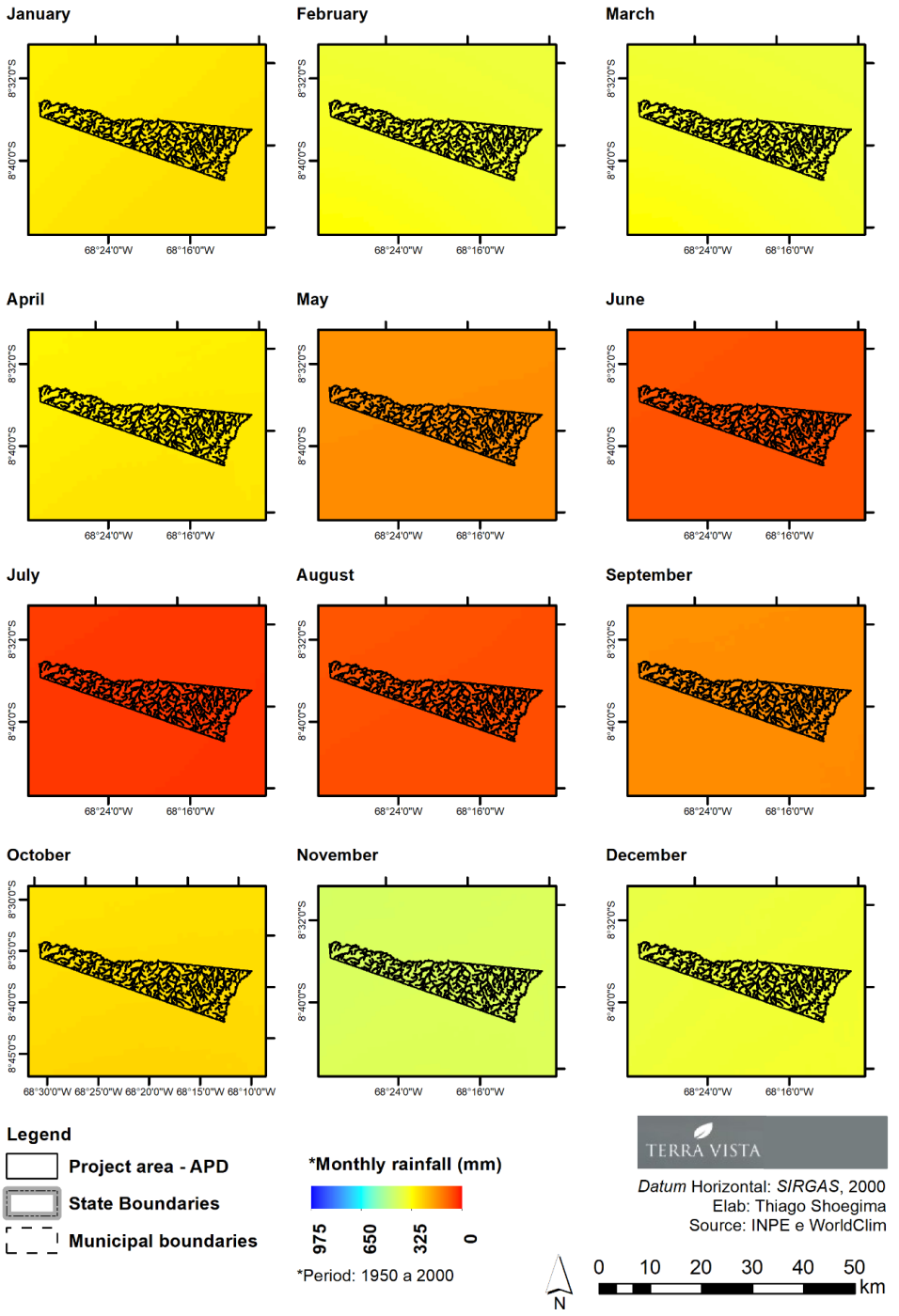


Figure 7. Average monthly rainfall in the region (historical series 1950 to 2000) where the Jatobá project is located.

Hydrology

The region where the Jatobá project is located in the largest hydrographic basin in the world, the Amazon Basin, with an estimated area of 5.8 million km^2, of which 3.9 million km^2 are in Brazilian territory[20]. The Amazon Basin is formed by several secondary basins that are named according to the main tributary that compose it. Among the most important is the Purus River Basin[21], where the Project area is located (Figure 8). The Purus River is a tributary of the right bank of the Solimões River, which further downstream meets the Negro River to form the Amazon River, the main river of the Amazon basin[22]. On the property where the project is located, there are several watercourses, totaling approximately 1,559.9 km in length. The main *igarapés* (creeks) that cross and limit the property where the project area is located are the igarapé São Francisco, Valparaíso, Timorante, Alegrete, Curupati and Capanã.

[20] ICMBIO. 2010. Plano de Manejo Participativo da Reserva Extrativista Arapixi. Volume I – Diagnóstico e Caracterização

[21] ICMBIO. 2009. Plano de Manejo da Floresta Nacional dos Purus. Volume I – Diagnóstico e Caracterização.

[22] ICMBIO. 2010. Plano de Manejo Participativo da Reserva Extrativista Arapixi. Volume I – Diagnóstico e Caracterização

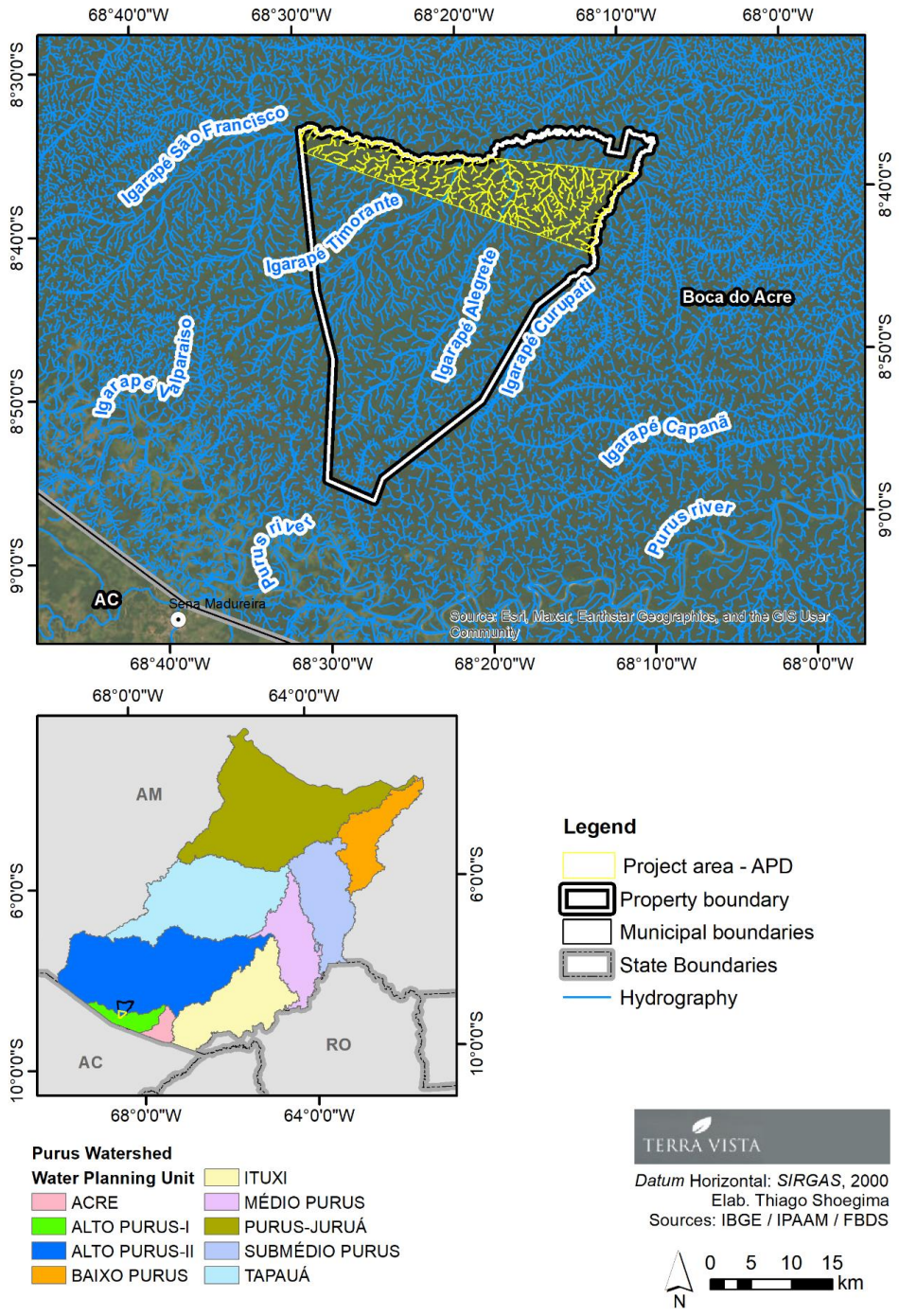


Figure 8. Hydrographic network and hydrographic basin of the Jatobá project area.

Vegetation Types

The Jatobá project area is located in the Amazon Biome, and it contains predominantly Dense and Open Ombrophylous Forests, classified, according to the Technical Manual of Brazilian Vegetation[23], by the following classes: (i) Lowland Open Ombrophylous Forest (Lo) and (ii) Alluvial Open Ombrophylous Forest (Ao) (Figure 9; Table 7).

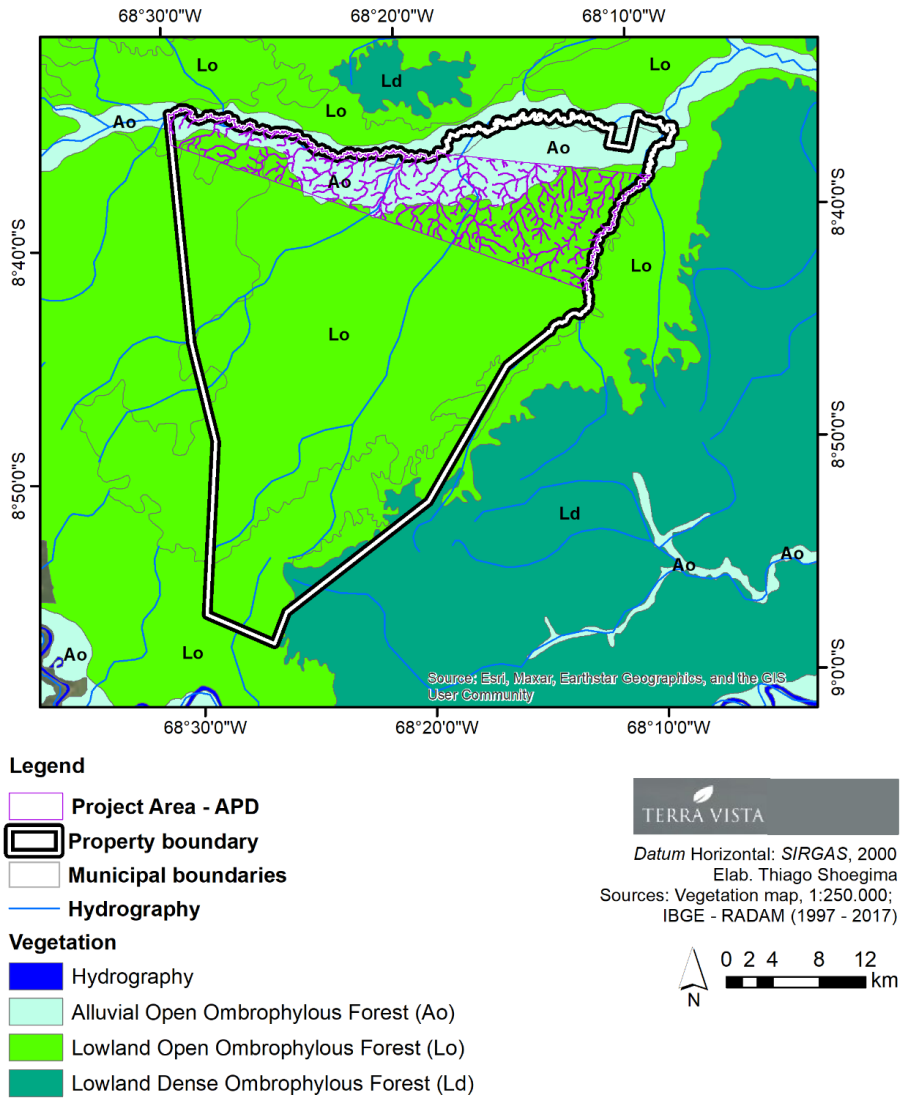


Figure 9. Vegetation types of the region where the Jatobá project is located.

[23] IBGE 2012. Manual Técnico da Vegetação Brasileira. 2ªed. Available at: <https://biblioteca.ibge.gov.br/index.php/biblioteca-catalogo?view=detalhes&id=263011>. Accessed on: 13/10/2022.

The Open Ombrophylous Forest[24] is composed of more widely spaced trees, with a low-density shrub layer and characterized sometimes by rosulate phanerophytes, sometimes by woody lianas. The Lowland Open Ombrophylous Forest is a formation that occurs at altitudes ranging from 5 to 100m, and is the most representative vegetation in the project area (about 55.9% of the total area). On the other hand, the Alluvial Open Ombrophylous Forest, also with great representation in the project area (about 44.1% of the total area) is characterized by presenting formations along the water courses, occupying the plains and terraces periodically or permanently flooded, which according to the Technical Manual of Brazilian Vegetation[25], in the Amazon constitute physiognomies of floodplain forests or igapó forests.

Table 7. Types of vegetation found in the Jatobá project area based on Brazilian vegetation classification (IBGE).

Type of Vegetation	Area (ha)	Area (%)
Lowland Open Ombrophylous Forest (Lo)	10,066.17	55.9
Alluvial Open Ombrophylous Forest (Ao)	7,951.02	44.1
Total	18,017.19	100

2.1.6 Social Parameters (G1.3)

For the analysis of secondary data on the municipality of Boca do Acre, three main indices were selected: Firjan Municipal Development Index (IFDM), the Firjan Fiscal Management Index (IFGF) and the Social Progress Index (IPS). The use of these indices is justified because they present more recent and aggregated data at the municipal level at a time when the Census of the Brazilian Institute of Geography and Statistics[26], prepared in 2010, is outdated. Another advantage is to group official data around topics, facilitating the capture of the current conditions of the municipality in the areas of business, health, quality

[24] IBGE 2012. Manual Técnico da Vegetação Brasileira. 2ªed. Available at: <https://biblioteca.ibge.gov.br/index.php/biblioteca-catalogo?view=detalhes&id=263011>. Accessed on: 13/10/2022.

[25] IBGE 2012. Manual Técnico da Vegetação Brasileira. 2ªed. Available at: <https://biblioteca.ibge.gov.br/index.php/biblioteca-catalogo?view=detalhes&id=263011>. Accessed on: 13/10/2022.

[26] IBGE, Demographic Census 2010 Available at: <https://sidra.ibge.gov.br/pesquisa/censo-demografico/demografico-2010/amostra-caracteristicas-gerais-da-populacao-religiao-e-deficiencia>. Accessed on: 05/30/2022.

IBGE - Brazilian Institute of Geography and Statistics. Demographic Census 2010. Available at: <https://sidra.ibge.gov.br/pesquisa/censo-demografico/demografico-2010/inicial>. Accessed on: 05/30/2022.

IBGE - Brazilian Institute of Geography and Statistics IBGE - Brazilian Institute of Geography and Statistics. Censo Agropecuário 2017 - Definitive results. Available at: <https://sidra.ibge.gov.br/pesquisa/censo-agropecuario/censo-agropecuario-2017>. Accessed on: 05/30/2022.

of life, and municipal management, among others. Finally, these three indices were selected because they cover different aspects of their respective areas, as will be shown below. In this analysis, data from official research institutions were also mobilized, such as the Brazilian Institute of Geography and Statistics (IBGE), Ministry of Health[27], National Institute of Educational Studies and Research Anísio Teixeira (INEP)[28], Institute of National Artistic Heritage (IPHAN)[29] and the National Foundation for the Indian (FUNAI)[30]. Data from civil society organizations were also mobilized, such as the Socioenvironmental Institute[31], and two projects developed on the initiative of the Climate Observatory, MapBiomas[32], and the System of Estimates of Emissions and Removals of Greenhouse Gases (SEEG)[33] to address issues that are not sufficiently covered by the indices.

The IFDM is an index created from the monitoring of three main sectors: employment and income, education, and health[34]. For each sector, statistics are selected from the Ministry of Labor and Employment, Health, and Education, which are grouped and normalized on a scale ranging from 0 to 1, where the closer to 1 the higher the level of development for a given sector. Taking this range as a reference, the index ranks four stages of development: low (0 to 0.4); fair (0.4 to 0.6), moderate (0.6 to 0.8), and high (0.8 to 1). Its main objective is to provide a historical series that allows tracking whether the municipality has shown annual development in each of its aspects and in general. The components of each sector, taken from the IFDM 2018 publication, are shown in Table 8 below.

Table 8. Summary of the IFDM components by development area[35].

[27] Ministério da Saúde. DATASUS. Estabelecimento de Saúde. Available at: <http://cnes2.datasus.gov.br/>.

[28] INEP - instituto nacional de estudos e Pesquisas Educacionais Anísio Teixeira. Resultados Inep. Available at: <https://www.gov.br/inep/pt-br/areas-de-atuacao/pesquisas-estatisticas-e-indicadores/censo-escolar/resultados>.

[29] IPHAN – Instituto do Patrimônio Histórico Artístico Nacional. Patrimônio cultural imaterial em processo de registro. Available at: <http://portal.IPHAN.gov.br/>.

Plataforma SICG - Sistema Integrado de Conhecimento e Gestão. Sítios Arqueológicos. Available at: <https://sicg.IPHAN.gov.br/sicg/pesquisarBem>.

[30] Funai - National Indian Foundation. Available at: <https://www.gov.br/funai/pt-br>.

[31] ISA - Instituto Socioambiental. Available at: <https://www.socioambiental.org/>.

[32] Projeto MapBiomas. Mapeamento de cicatrizes de fogo no Brasil – Colection 1. Available at: <https://mapbiomas.org/estatisticas>

[33] Plataforma SEEG - Sistema de Estimativa de Emissões de Gases de Efeito Estufa. Available at: < https://seeg.eco.br/>.

[34] Firjan: Federação das Indústrias do Estado do Rio de Janeiro - FIRJAN. IFDM 2018: Índice Firjan de Desenvolvimento Municipal: ano base 2016. Metodologia. Available at: <https://firjan.com.br/data/files/E8/06/F0/D5/58E1B610E6543AA6A8A809C2/Metodologia%20IFDM%20-%20Final.pdf>.

[35] Firjan: Federação das Indústrias do Estado do Rio de Janeiro - FIRJAN. IFDM 2018: Índice Firjan de Desenvolvimento Municipal: ano base 2016. Metodologia. Available at: <https://firjan.com.br/data/files/E8/06/F0/D5/58E1B610E6543AA6A8A809C2/Metodologia%20IFDM%20-%20Final.pdf>

Employment and Income	Education	Health
Generation of formal employment	Early childhood education service	Proportion of adequate prenatal care
Labor market formalization rate	Elementary school dropout	Deaths from ill-defined causes
Income Generation	Age/grade distortion in elementary school	Child deaths from preventable causes
Real wage bill in the formal labor market	Elementary school teachers with higher education	
	Average daily class hours in elementary school	Primary Care Sensitive Hospitalization (ISAB)
Gini index of income inequality in formal work	Basic Education Development Index (IDEB) results in elementary education	

The Firjan Index of Fiscal Management (IFGF) provides an overview of the fiscal management efficiency at the municipal level[36]. It monitors four aspects of municipal management: Autonomy, which is the capacity to finance the administrative structure; Personnel Expenses, which means the degree of budget rigidity; Liquidity, which deals with the fulfillment of the financial obligations of the municipalities; and Investments, which is the ability to generate well-being and competitiveness. Each of these aspects receive the same weight, 25%, for the calculation of the general index, which is divided into four classifications: management excellence (> 0.8); good management (0.8 - 0.6); management in difficulty (0.6 - 0.4); critical management (<0.4).

Finally, the Social Progress Index (IPS) was created from the perception that the most famous indices used to measure development, such as the Gross Domestic Product (GDP) and the Human Development Index (HDI), place excessive emphasis on income component and, therefore, have limitations in capturing a social and environmental dimension of the countries represented. The IPS therefore aims not only to include income, but also to measure the social and environmental performance of territories.

[36] Firjan: Federação das Indústrias do Estado do Rio de Janeiro - IFGF, Índice Firjan de Gestão Fiscal. Edição 2021. Metodologia. Available at: <https://www.firjan.com.br/data/files/BA/F4/E3/6A/752CC710CCD10AC7A8A809C2/IFGF%20-%20Anexo%20Metodologico%20-%202021-v2.pdf>. Accessed on: 23/09/2022.

For the IPS, the concept of social progress is understood as "the ability of a society to meet the basic human needs of its citizens, to establish the essential elements for improving and maintaining the quality of life of people and communities, and to create the conditions for all individuals to achieve full potential" [37].

The IPS Amazônia was the first initiative created to adapt this index, until then performed for countries, to sub-national scale, at the level of states and municipalities. Similar to the IPS Global, the index is aggregated into three dimensions: Basic Human Needs, Foundations for Well-Being and Opportunities − and 12 components namely: Nutrition and Basic Medical Care; Water and Sanitation; Housing; Personal Security; Access to Basic Knowledge; Access to Information and Communication; Health and Wellness; Environmental Quality; Individual Rights; Individual Freedoms and Choice; Social inclusion; Access to Higher Education[38].

The complementation of the data from official institutions intends to draw the general panorama of the municipality in its population, educational, economic, territorial, services and public administration, and cultural and archaeological heritage aspects. For the contextualization of the municipality with the Brazilian climate and environmental issue, data from the projects were also used: MapBiomas[39], which aims to annually map the coverage and use of land in Brazil and monitor changes in the territory; and SEEG[40], an initiative that aims to document and analyze the evolution of greenhouse gases emissions and removals in Brazil. These two projects were developed on the initiative of the Climate Observatory, a network of Brazilian civil society entities formed with the objective of discussing climate change in the context of Brazil and global warming.

For community-level characterization, the Sustainable Livelihoods (MVS)[41] methodology was adopted with auxiliary tools of Rapid Participatory Rural Diagnosis (DRP)[42]. The MVS was consolidated in Brazil under the leadership of the United Kingdom's sustainable development support agency (DFID)[43]

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[37] Mosaner, M.; Santos, D.; Seifer, P. Índice de Progresso Social na Amazônia Brasileira - IPS Amazônia 2021. Resumo Executivo. Belém: Imazon, 2021ª. Available at: <https://amazonia2030.org.br/wp-content/uploads/2021/12/Resumo-executivo-IPS-Amazonia-2021-Numerado-site-AMZ2030.pdf>

[38] Mosaner, M.; Santos, D.; Seifer, P. Índice de Progresso Social na Amazônia Brasileira - IPS Amazônia 2021. Resumo Executivo. Belém: Imazon, 2021ª. Available at: <https://amazonia2030.org.br/wp-content/uploads/2021/12/Resumo-executivo-IPS-Amazonia-2021-Numerado-site-AMZ2030.pdf>.

[39] Projeto MapBiomas. Mapeamento de cicatrizes de fogo no Brasil – Coleção 1. Available at: <https://mapbiomas.org/estatisticas>.

[40] Plataforma SEEG - Sistema de Estimativa de Emissões de Gases de Efeito Estufa. Available at: <https://seeg.eco.br/>.

[41] Brill, L; Brown, G; Cooper, N; May, C. The Sustainable Livelihoods Handbook: An asset based approach to poverty - Oxfam Policy & Practice Guidelines and toolkits The Sustainable Livelihoods Handbook: An asset based approach to poverty 2009. Available at: The Sustainable Livelihoods Handbook: An asset based approach to poverty - Oxfam Policy & Practice

[42] Brose, M. (org.) Metodologia participativa – Uma introdução a 29 instrumentos. Porto Alegre: Tomo Editorial, 2001, 306p KLAUSMEYER, Afonso; RAMALHO, Luiz. Introdução a metodologias participativas. Recife: SACTES/ABONG, 1995. 249 p. WHITESIDE, M. Diagnóstico rápido participativo: manual de técnicas. Moçambique: Comissão Nacional do Meio Ambiente, mar. 1994.

[43] Sigla em inglês para “Department for International Development” (Departamento para Desenvolvimento Internacional) que foi substituído em 2020 pelo Foreign, Commonwealth & Development Office (FCDO). UNITED KINGDOM. The Department for

already in the version adapted to the Brazilian context in partnership with CARE – Brasil (an entity created after the Second World War to contribute to overcoming disasters by vulnerable communities, fighting the causes of poverty and promoting sustainable local development).

Considering that in impact assessments of socio-environmental strengthening projects in communities that are residents and users of areas that provide environmental services, among which are non-wood forest products or those with a high carbon sequestration potential, it is necessary to adopt a methodology capable of describing and measuring the ways of life of local communities and their relationship with the environmental conservation of the territory. This methodology provides an integrating axis of indicators that allows us to mark out and guide what is expected to be accomplished in probable carbon credit projects that should be defined in a participative way and have a positive impact on the conservation of the contracted forest fragments and on the livelihoods of the residents who help in this conservation. In accordance with the certification standards for carbon credit projects such as the CCB, the MVS is understood as a participatory approach, which favors the generation of information with autonomy and criticism by the people, families and communities to be beneficiaries, making them co-responsible for the process of environmental conservation and generation of carbon credits.

The methodology brings in a theoretical construct that helps to organize the categories of the ways of life of people, families and communities in order to look at the situation before, during and after the projects that will be chosen for implementation, considering the material and immaterial factors of these community ways of life and the standards derived from the principles of sustainability. This methodological proposal argues that livelihoods will be increasingly sustainable, healthy and lasting, when a dynamic and organic balance is reached between the assets that people, families and the community have access to and that drive and are driven by their aspirations and dreams. The assets are distributed over five dimensions that can be in balance or imbalance in direct relation to other interests in dispute within the development of society as a whole. The dimensions and indicators that will be used to capture and monitor the livelihoods of communities are presented in Table 9 below.

Table 9. Dimensions and indicators that comprise sustainable livelihoods[44].

Types of assets / dimensions	Information to be obtained for baseline description
Human Dimension	Family food security
	Use and appreciation of traditional/local ecological knowledge

International Development has closed. It's been replaced by the Foreign, Commonwealth & Development Office (FCDO). About us. S/D. Available at: <https://www.gov.uk/government/organisations/department-for-international-development/about#history-of-dfid>. Accessed on: 17/10/22.

[44] Brill, L; Brown, G; Cooper, N; May, C. The Sustainable Livelihoods Handbook: An asset based approach to poverty - Oxfam Policy & Practice Guidelines and toolkits The Sustainable Livelihoods Handbook: An asset based approach to poverty 2009. Disponível em: The Sustainable Livelihoods Handbook: An asset based approach to poverty - Oxfam Policy & Practice.

	Access to new knowledge
	Satisfaction and motivation with work and life in the territory
	Occupational safety
Social Dimension	Relations with communities, partners and institutions
	Visibility and opportunity for young people
	Participation and appreciation of women in productive activities
	Access to public policies aimed at strengthening their ways of life
Environmental Dimension (or Natural Dimension)	Access to water for human and animal consumption
	Access to land suitable for the various traditional uses and their aspirations
	Maintenance of other natural resources of the activity
	Forest conservation and use
	Wildlife conservation and use
Physical Dimension	Individual production infrastructure
	Collective production infrastructure
	Individual/family infrastructure for housing, transportation and welfare
Financial Dimension	Income
	Product pricing and working capital, when applicable
	Commercialization
	Access to credit lines and other financial aid policies

Capturing the dimensions of community livelihoods serves as a baseline for creating indicators and subsequent monitoring throughout the project lifetime. The application of the MVS was planned in two ways in order to encompass the quali-quantitative approach in the data collection process: a) collective application in meetings with community members who were encouraged to make a justified assessment of the five dimensions (human, social, environmental/natural, physical/material and financial), obtaining records viewed by community members about their considerations on the asset base they dispose living in that territory; b) application of a formal questionnaire with the support of the Kobo Toolbox and Kobo

Collect[45] applications, through which registration and general characterization and dimension-specific questions were prepared. The use of tables with selected indicators of each dimension of the MVS would help consolidate a baseline assessment in a way that will facilitate future data collection for tracking the positive and negative impacts of carbon credit projects in each territory. Some tools of Rapid Participatory Rural Diagnosis (DRP) were also used according to the need to obtain information in the contacts with the communities, aiming to complete the characterization of ways of life and consolidate the description of use of the carbon credit projects areas. The main ones used were: cross walk, seasonal calendar, maps and sketches of areas of use and distances, and Venn diagram[46].

Population dynamics

According to estimates by the Brazilian Institute of Geography and Statistics (IBGE), the population of the municipality of Boca do Acre for the year 2021 was 34,958 people[47]. When considering the 2010 census, which counted 30,632 people, the municipality shows an upward trend in population growth[48].

The 2010 census[49] indicated that the municipality had a relatively balanced population between young people and adults, with 14,506 thousand young people and 14,007 thousand adults (Figure 10). According to the age distribution of the population of Boca do Acre, the group with the largest number of people ranges from 30 to 39 years old, which corresponds to 13% of the total population[50]. The observed population pyramid structure with wider bases differs from the pattern presented by Brazilian municipalities and the population pyramid of Brazil, which tend to represent broader bases of young adults than those of young people and children. The population pyramid of Boca do Acre with the lower age groups wider than

[45] O Kobo Toolbox permite a criação de questionários gratuitos, com sincronização simultânea entre contas por meio da internet. Available at: <https://www.kobotoolbox.org>.

[46] Brose, M. (org.) Metodologia participativa – Uma introdução a 29 instrumentos. Porto Alegre: Tomo Editorial, 2001, 306p

Klausmeyer, Afonso; Ramalho, Luiz. Introdução a metodologias participativas. Recife: SACTES/ABONG, 1995. 249 p.

Whiteside, M. Diagnóstico rápido participativo: manual de técnicas. Moçambique: Comissão Nacional do Meio Ambiente, mar. 1994.

[47] IBGE - Instituto Brasileiro de Geografia e Estatística. População estimada. Diretoria de Pesquisas. Coordenação de População e Indicadores Sociais. Estimativas da população residente com data de referência 1o de julho de 2021. Available at: <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/panorama>. Accessed on: 22/09/2022

[48] IBGE - Instituto Brasileiro de Geografia e Estatística. Censo Demográfico 2010. População no último censo. Available at: <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/panorama>. Accessed on: 22/09/2022

[49] IBGE - Instituto Brasileiro de Geografia e Estatística. Censo Demográfico 2010. População no último censo. Available at: <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/panorama>. Accessed on: 22/09/2022

[50] IBGE - Instituto Brasileiro de Geografia e Estatística. Amostra. Características Gerais da População. População residente, por sexo, situação e grupos de idade. Available at: <https://sidra.ibge.gov.br/pesquisa/censo-demografico/demografico-2010/amostra-caracteristicas-gerais-da-populacao-religiao-e-deficiencia>. Accessed on: 06/10/2022.

those of young adults may be indicative of a high birth rate. The large leap in the young population between 25 and 29 years old to the 30 to 39 age group and a reduced population in the 20 to 24 age group indicates that the municipality has not generated regular opportunities for youth inclusion in the labor market and there are emigrations from these age groups, especially to seek their first job.

According to the 2010 Census, Boca do Acre follows the Brazilian population distribution pattern, with a mostly urban population. Around 63% of the inhabitants reside in the seat of the municipality[51]. However, even so, the urbanization rate in relation to the national average is much lower because in Brazil, according to PNAD 2015, almost 85% of the population lived in cities.

Regarding the origin of the population residing in Boca do Acre, the 2010 Census indicated that 97% of this population are people who were born in the northern region of Brazil[52]. Considering that the economic development of a municipality can act as an attraction for migrants, Boca do Acre presents few economic and financial incentives for populations from other locations. On the contrary, it has a tendency to export its young people in particular, as also indicated by the depression of the population in the 15 to 29 age groups (Figure 10).

[51] IBGE - Instituto Brasileiro de Geografia e Estatística. Amostra. Características Gerais da População. População residente, por sexo, situação e grupos de idade. Available at: <https://sidra.ibge.gov.br/pesquisa/censo-demografico/demografico-2010/amostra-caracteristicas-gerais-da-populacao-religiao-e-deficiencia>. Accessed on: 06/10/2022

[52] IBGE - Instituto Brasileiro de Geografia e Estatística. Amostra. Resultados da Amostra - Nupcialidade, Fecundidade e Migração. Available at: <https://sidra.ibge.gov.br/pesquisa/censo-demografico/demografico-2010/amostra-nupcialidade-fecundidade-e-migracao>. Accessed on: 06/10/2022

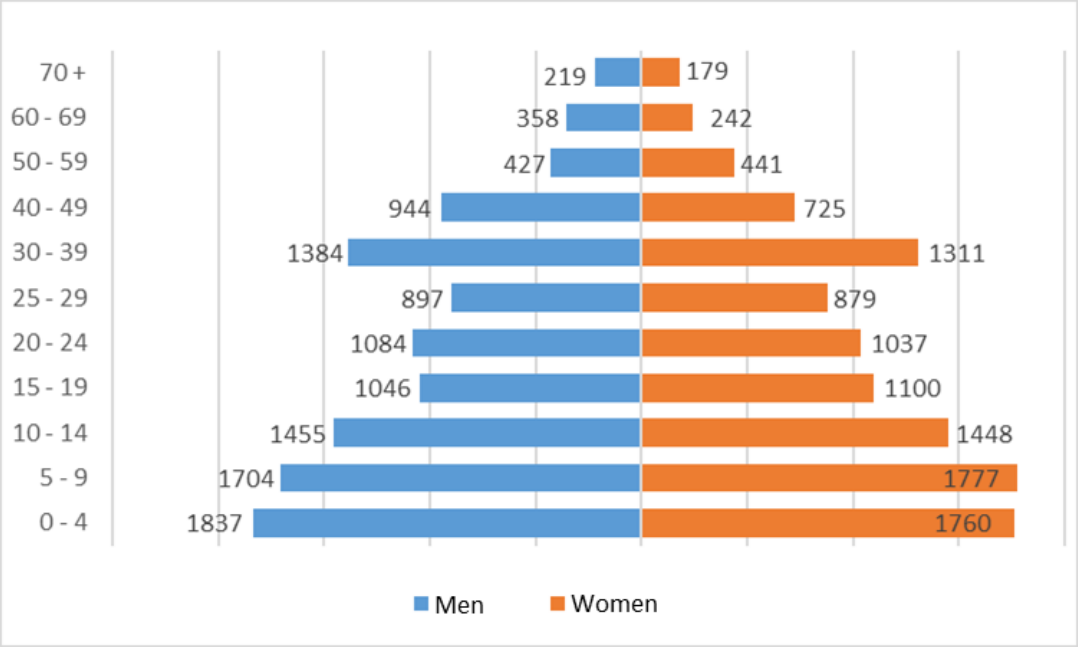

Figure 10. Population Pyramid (age-sex pyramid) showing the distribution by age groups and sex of the population of Boca do Acre, Amazonas State, Brazil.[53]

In self-identification by color or race, the 2010 Census showed that the population identified itself mostly as brown (*parda*). The percentage of people who declared themselves brown/mixed ("pardo") was 64.67%, followed by 23.46% white, 8.1% black, 2.99% indigenous and 0.78% yellow[54].

With a total area[55] of 21,938.583 km^2, the municipality had a demographic density of 1.40 inhabitants per kilometer for the year 2010[56]. Despite indicating that the population is sparsely distributed throughout the municipality, in comparison with the other Amazonian municipalities, the demographic density of Boca

[53] IBGE - Instituto Brasileiro de Geografia e Estatística. Amostra. Características Gerais da População. População residente, por sexo, situação e grupos de idade. Available at: <https://sidra.ibge.gov.br/pesquisa/censo-demografico/demografico-2010/amostra-caracteristicas-gerais-da-populacao-religiao-e-deficiencia>. Accessed on: 06/10/2022

[54] IBGE - Instituto Brasileiro de Geografia e Estatística. Resultados do Universo - Características da População e dos Domicílios. População residente, por cor ou raça, segundo a situação do domicílio, o sexo e a idade. Available at: <https://sidra.ibge.gov.br/pesquisa/censo-demografico/demografico-2010/universo-caracteristicas-da-populacao-e-dos-domicilios>. Accessed on: 06/10/2022.

[55] IBGE - Instituto Brasileiro de Geografia e Estatística. Área da unidade territorial: 2021. Rio de Janeiro: IBGE, 2022. Available at: <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/panorama>. Accessed on: 22/09/2022

[56] IBGE - Instituto Brasileiro de Geografia e Estatística. Densidade demográfica. Censo Demográfico 2010. Área territorial brasileira. Rio de Janeiro: IBGE, 2011 Available at: <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/panorama>. Accessed on: 22/09/2022

do Acre occupies the 32nd position in the ranking of the 62 municipalities[57]. Although it belongs to the state of Amazonas, Boca do Acre is linked to the region of influence of Rio Branco - Regional Capital, Acre[58]. In the Brazilian territorial division, the municipality is located in the intermediate and immediate region of Lábrea, in the South Amazonense, microregion of Boca do Acre[59].

Health

In 2009, the municipality of Boca do Acre had seven health facilities of the Unified Health System[60]. According to DATASUS, Boca do Acre has six Basic Health Units, one of which is rainwater, three specialty centers, a physiotherapy and rehabilitation clinic, a laboratory and a hospital unit that has specialized diagnostic services, emergency services and emergency[61].

The inhabitants of Boca do Acre rely on the Fluvial Health Unit, which can travel along rivers and streams to attend to the dispersed population, according to DATASUS data. In addition, there are also health facilities in the municipality that are located in the district headquarters, in Walterlândia, as is the case of the Hospital Unit in Boca do Acre, or distributed in locations close to the former headquarters, at the mouth of the Acre river with the Purus, in the localities of Macaxeiral and São Paulo[62]. Although the population is concentrated in Walterlândia, Macaxeiral and São Paulo, the communities are distributed along the Purus and Acre rivers, along creeks and lakes far from the city center and its main districts. Thus, the distribution of health facilities does not effectively cover the entire population of Boca do Acre, which is spread over an extensive municipal territory with low population density. Residents of the project area, who are located on the banks of the Purus River, turn to the municipality of Sena Madureira (AC), the closest place that offers medical care.

[57] IBGE - Instituto Brasileiro de Geografia e Estatística. Densidade demográfica. Censo Demográfico 2010. Área territorial brasileira. Rio de Janeiro: IBGE, 2011 Available at: <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/panorama>. Accessed on: 22/09/2022

[58] IBGE - Instituto Brasileiro de Geografia e Estatística. *Região de Influência*: IBGE. Regiões de Influência das Cidades 2018. Rio de Janeiro: IBGE, 2020. Available at: <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/panorama>. Accessed on: 23/09/2022.

[59] IBGE - Instituto Brasileiro de Geografia e Estatística. Região imediata: IBGE, Divisão Territorial Brasileira - DTB 2021. Available at: <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/panorama>. Accessed on: 23/09/2022.

[60] IBGE. Instituto Brasileiro de Geografia e Estatística Assistência Médica Sanitária 2009. Available at: <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/panorama>. Accessed on: 23/10/2022.

[61] Ministério da Saúde. DATASUS. Estabelecimento de Saúde. Available at: <http://cnes2.datasus.gov.br/Listar_Mantidas.asp?VCnpj=15811318000120&VEstado=13&VNome=PREFEITURA%20MUNICIPAL%20DE%20BOCA%20DO%20ACRE>. Accessed on: 27/10/2022

[62] Ministério da Saúde. DATASUS. Estabelecimento de Saúde. Available at: <http://cnes2.datasus.gov.br/Listar_Mantidas.asp?VCnpj=15811318000120&VEstado=13&VNome=PREFEITURA%20MUNICIPAL%20DE%20BOCA%20DO%20ACRE>. Accessed on: 27/10/2022

According to the IPS (2021)[63], the infant mortality rate was 5.52 deaths per thousand live births in 2019. Data from the Ministry of Health (2016) also pointed out 3.8 hospitalizations for diarrhea per thousand inhabitants[64]. The infant mortality rate pointed out by the IBGE for 2020 in Boca do Acre was 22.28 deaths per thousand live births[65]. In comparison with IBGE data from the other Amazonas municipalities, Boca do Acre ranked 8th out of 62nd in terms of deaths for live births, and 10th out of 62nd for hospitalizations due to diarrhea. In the national comparison, the positions were 765th and 927th of 5,570, respectively.

The municipality's IFDM for Health reached a score of 0.579 points for the year 2016, which is considered a regular development. In the IFDM historical series (Figure 11), it is possible to verify that Boca do Acre presented a development below the national average (0.765), but above the state average (0.546)[66]. By presenting an IFDM for health considered regular, the municipality occupied the 4,995th position in the national ranking out of a total of 5,570, indicating that, in this aspect, it is among those with the worst performance. Analyzing the historical series starting in 2005, it can be seen that the evolution of the IFDM for health in the municipality followed the development of the IFDM in the state of Amazonas, surpassing it from 2012.

[63] Mosaner, M.; Santos, D.; Seifer, P. Índice de Progresso Social na Amazônia Brasileira - IPS Amazônia 2021. Banco de dados exportados. Available at: <https://ipsamazonia.org.br/dashboard#aspects%5B%5D=1&aspects%5B%5D=2&aspects%5B%5D=3&aspects%5B%5D=4&map-view=city&map-type=performance&active-cat=1&page=1&tab=map>. Accessed on: 27/10/2022

[64] IBGE - Instituto Brasileiro de Geografia e Estatística. Internações por diarreia 2009. Available at: <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/panorama>. Accessed on: 07/10/2022.

[65] IBGE - Instituto Brasileiro de Geografia e Estatística. Mortalidade Infantil. Available at: <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/panorama>. Accessed on: 07/10/2022.

[66] FIRJAN. Federação das Indústrias do Estado do Rio de Janeiro IFDM 2018: Índice Firjan de Desenvolvimento Municipal: ano base 2016. Rio de Janeiro: Firjan, 2018, p. 9. Available at: <https://firjan.com.br/data/files/67/A0/18/D6/CF834610C4FC8246F8A809C2/IFDM_2018.pdf>. Accessed on: 10/10/2022.

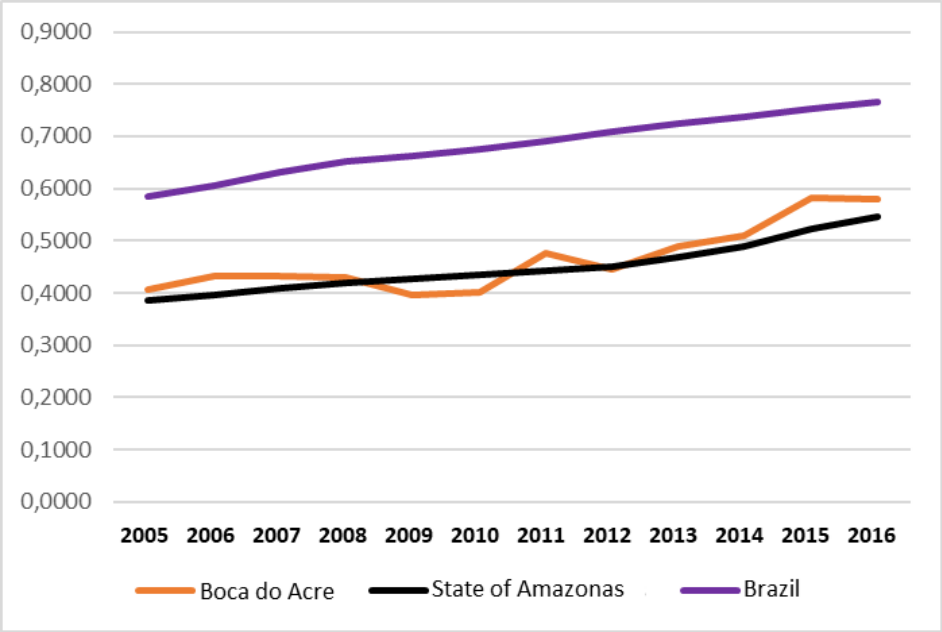

Figure 11. Historical line of the IFDM for health in the municipality of Boca do Acre, Amazonas State, Brazil [67].

In the nutrition and basic health care component of the IPS 2021[68], Boca do Acre had a maternal mortality rate of 5.15 deaths per 100,000 live births for the year 2019. In this component, for the same year, mortality due to malnutrition was 5.83 deaths per 100,000 live births. The malnutrition rate reached 4.35% of the population and deaths from infection reached a total of 137.93 deaths per 100,000 inhabitants.

According to the IPS 2021 of Health and Well-Being[69], the death rate from diabetes mellitus in 2019 was 23.32 per 100,000 inhabitants. Cancer mortality in the same year was 37.89 deaths per 100,000 inhabitants. Circulatory diseases totaled 78.70 deaths per 100,000 inhabitants. Finally, on a smaller scale,

[67] FIRJAN. Federação das Indústrias do Estado do Rio de Janeiro. IFDM 2018: Índice Firjan de Desenvolvimento Municipal: ano base 2016. Rio de Janeiro: Firjan, 2018, p. 9. Available at: <https://firjan.com.br/data/files/67/A0/18/D6/CF834610C4FC8246F8A809C2/IFDM_2018.pdf>. Accessed on: 10/10/2022.

[68] Mosaner, M.; Santos, D.; Seifer, P. Índice de Progresso Social na Amazônia Brasileira - IPS Amazônia 2021. Banco de dados exportados. Available at: <https://ipsamazonia.org.br/dashboard#aspects%5B%5D=1&aspects%5B%5D=2&aspects%5B%5D=3&aspects%5B%5D=4&map-view=city&map-type=performance&active-cat=1&page=1&tab=map>. Accessed on: 10/10/2022

[69] Mosaner, M.; Santos, D.; Seifer, P. Índice de Progresso Social na Amazônia Brasileira - IPS Amazônia 2021. Banco de dados exportados. Available at: <https://ipsamazonia.org.br/dashboard#aspects%5B%5D=1&aspects%5B%5D=2&aspects%5B%5D=3&aspects%5B%5D=4&map-view=city&map-type=performance&active-cat=1&page=1&tab=map>. Accessed on: 07/10/2022

deaths from respiratory diseases and suicide accounted for 26.23 and 4.37 deaths per 100,000 inhabitants, respectively.

Thus, as represented by the municipality's IFDM - Health, Boca do Acre presents a precarious infrastructure to serve its citizens. Limitations in the local health care network are due both to the lack of qualified professionals to perform more sophisticated care and equipment, services that are only found in the city of Sena Madureira or in the capital of the state of Acre. This precariousness of the municipality's health system is also evidenced by the 2021 IPS data that show high rates of infant mortality, hospitalization due to diarrhea, mortality from infectious and circulatory diseases among the inhabitants of Boca do Acre.

Education

In terms of education, in 2010, Boca do Acre had a schooling rate of 88% of children aged 6 to 14 years[70]. According to INEP, in 2021 the municipality of Boca do Acre counted 6,335 elementary school enrollments and 1,676 high school enrollments[71]. For the same period, INEP pointed out that the 102 elementary schools had 377 teachers, while the 7 high schools had 96 teachers[72].

The municipality's IFDM for Education reached a score of 0.7089 points for the year 2016, which is considered a moderate development[73]. With this score, Boca do Acre occupied the 3,907th position in the national ranking, which, as pointed out for the education section, places the municipality among the ones that had average performances at the national level. Analyzing the historical series shown in Figure 12, from 2006 it is noted that the evolution of the Boca do Acre indicator surpasses that of the state of

[70] IBGE - Instituto Brasileiro de Geografia e Estatística. Taxa de escolarização de 6 a 14 anos de idade*: Censo Demográfico 2010*. Available at: <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/panorama>. Accessed on: 07/10/2022.

[71] INEP - Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira. Matrículas no ensino fundamental Sinopse Estatística da Educação Básica 2021. Brasília: Inep, 2022. Available at: <https://www.gov.br/inep/pt-br/areas-de-atuacao/pesquisas-estatisticas-e-indicadores/censo-escolar/resultados>. Accessed on: 07/10/2022.

[72] INEP - Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira. Sinopse Estatística da Educação Básica 2021. Docentes no ensino fundamental. Brasília: Inep, 2022. Available at: <https://www.gov.br/inep/pt-br/areas-de-atuacao/pesquisas-estatisticas-e-indicadores/censo-escolar/resultados>. Accessed on: 06/10/2022.

INEP - Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira. Sinopse Estatística da Educação Básica 2021. Docentes no ensino médio. Brasília: Inep, 2022. Available at: <https://www.gov.br/inep/pt-br/areas-de-atuacao/pesquisas-estatisticas-e-indicadores/censo-escolar/resultados>. Accessed on: 06/10/2022.

INEP - Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira. Sinopse Estatística da Educação Básica 2021. Número de estabelecimentos de ensino fundamental. Brasília: Inep, 2022. Available at: <https://www.gov.br/inep/pt-br/areas-de-atuacao/pesquisas-estatisticas-e-indicadores/censo-escolar/resultados>. Accessed on: 06/10/2022.

INEP - Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira. Sinopse Estatística da Educação Básica 2021. Número de estabelecimentos de ensino médio. Brasília: Inep, 2022. Available at: <https://www.gov.br/inep/pt-br/areas-de-atuacao/pesquisas-estatisticas-e-indicadores/censo-escolar/resultados>. Accessed on: 06/10/2022.

[73] Firjan: Federação das Indústrias do Estado do Rio de Janeiro. FIRJAN. IFDM 2018: Índice Firjan de Desenvolvimento Municipal: ano base 2016. Rio de Janeiro: Firjan, 2018, p. 9. Available at: <https://firjan.com.br/data/files/67/A0/18/D6/CF834610C4FC8246F8A809C2/IFDM_2018.pdf>. Accessed on: 10/10/2022

Amazonas. This development continued upwards, being higher than the evolution of the state of Amazonas, but still lower than the average for Brazil. Thus, compared to the state and national scenario, the municipality is in a moderate educational development position and in upward evolution, indicating a constant trend of improvement in education in the municipality.

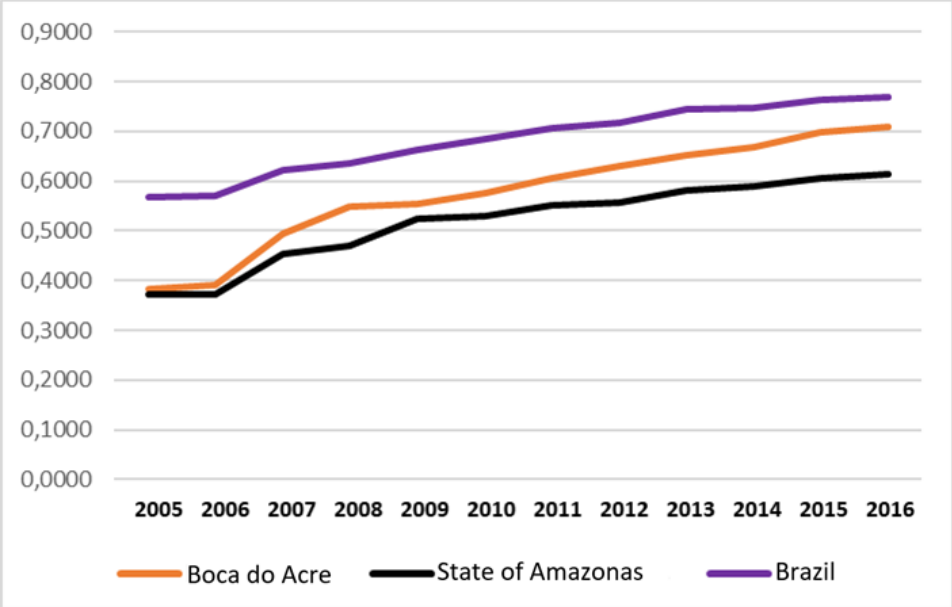

Figure 12. Historical series of the IFDM for education in the municipality of Boca do Acre, Amazonas State, Brazil[74].

For the municipality of Boca do Acre, the access to basic knowledge component of the 2021 IPS was 73.08 points[75]. This score is above the average for municipalities in the state of Amazonas and the Amazon. According to the IPS, in 2019, elementary school dropout and failure were 2.1% and 2.2% respectively. The age-grade distortion in elementary school was 18.4%, and in high school was 35.9% in relation to the total number of students.

[74] FIRJAN. Federação das Indústrias do Estado do Rio de Janeiro. IFDM 2018: Índice Firjan de Desenvolvimento Municipal: ano base 2016. Rio de Janeiro: Firjan, 2018, p. 9. Available at: <https://firjan.com.br/data/files/67/A0/18/D6/CF834610C4FC8246F8A809C2/IFDM_2018.pdf>. Accessed on: 10/10/2022.

[75] Mosaner, M.; Santos, D.; Seifer, P. Índice de Progresso Social na Amazônia Brasileira - IPS Amazônia 2021. Banco de dados exportados. Available at: <https://ipsamazonia.org.br/dashboard#aspects%5B%5D=1&aspects%5B%5D=2&aspects%5B%5D=3&aspects%5B%5D=4&map-view=city&map-type=performance&active-cat=1&page=1&tab=map>. Accessed on: 10/10/2022.

Income and public management

In terms of income and public management, the IFDM for Employment and Income of Boca do Acre for the year 2016 was 0.478 points, being considered a regular performance[76]. With this score, the municipality occupied the 2,286th place in the national ranking, and, in line with the health aspects, it is among the municipalities with average performance and above the average of the state of Amazonas.

In the period from 2005 to 2006, the evolution of the IFDM indicator for Employment & Income in Boca do Acre was ascending and was above the scores obtained by the state of Amazonas and Brazil (Figure 13). From that period on, there is a sudden drop in this indicator of Boca do Acre. In the historical series, the Employment & Income score for Boca do Acre oscillates with ascending and descending evolutions. In 2013, there was another sharp reduction in the IFDM of Employment & Income, taking the municipality of Boca do Acre to its worst score. After this period, between 2015 and 2016, Boca do Acre grew again, surpassing the scores of the state of Amazonas and Brazil.

[76] FIRJAN. Federação das Indústrias do Estado do Rio de Janeiro. IFDM 2018: Índice Firjan de Desenvolvimento Municipal: ano base 2016. Rio de Janeiro: Firjan, 2018, p. 9. Available at: <https://firjan.com.br/data/files/67/A0/18/D6/CF834610C4FC8246F8A809C2/IFDM_2018.pdf>. Accessed on: 10/10/2022.

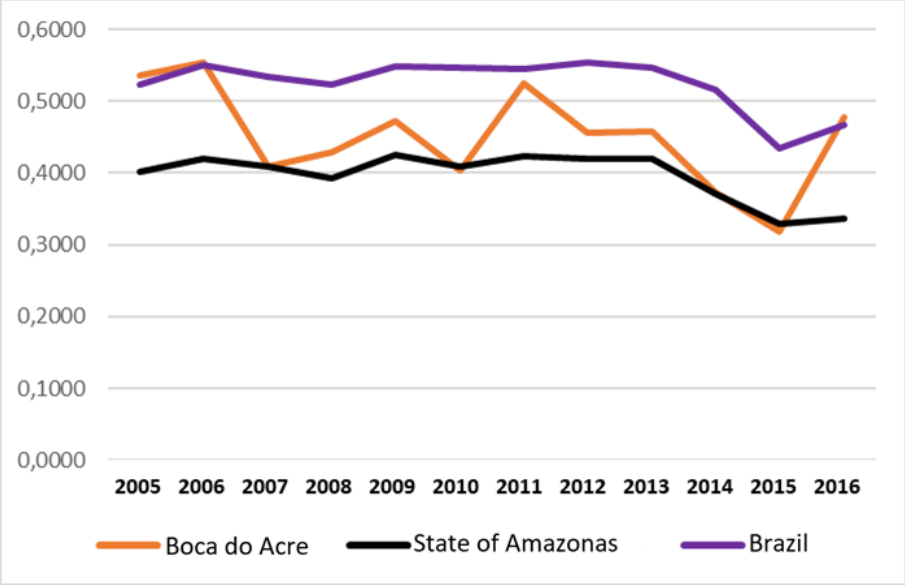

Figure 13. Historical series of the IFDM for employment and income in the municipality of Boca do Acre, Amazonas State, Brazil[77].

According to the Central Register of Companies, consulted through the IBGE's Cities portal, in 2020 the average monthly salary of formalized workers in Boca do Acre was 1.5 minimum wages[78]. However, only 7.2% of its population was engaged in a regular remunerated activity and, considering monthly income of up to half a minimum wage per person, Boca do Acre had 49.7% of its population in this situation[79]. This indicates a situation of wide wage inequality and a labor market characterized by high informality. When comparing the situation of the average salary with the average of the state of Amazonas, Boca do Acre occupies an average position, 48th out of 62, and when compared to other municipalities in Brazil, occupies the 4,887th position out of 5,570. Comparing the proportion of people employed in the labor market in the municipality with the average found in Amazonas and in Brazil, Boca do Acre occupied, respectively, the positions 14th out of 62 and 4,421st out of 5,570.

[77] FIRJAN. Federação das Indústrias do Estado do Rio de Janeiro. IFDM 2018: Índice Firjan de Desenvolvimento Municipal: ano base 2016. Rio de Janeiro: Firjan, 2018, p. 9. Available at: <https://firjan.com.br/data/files/67/A0/18/D6/CF834610C4FC8246F8A809C2/IFDM_2018.pdf>. Accessed on: 10/10/2022.

[78] IBGE - Instituto Brasileiro de Geografia e Estatística. Cadastro Central de Empresas 2020. Salário médio mensal dos trabalhadores formais. Rio de Janeiro: IBGE, 2022. Available at: <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/panorama>. Accessed on: 10/10/2022

[79] IBGE - Instituto Brasileiro de Geografia e Estatística. Boca do Acre: Panorama. Available at: <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/panorama>. Accessed on: 10/10/2022

According to data from IPS Oportunidades for 2021[80], when considering the proportion of jobs with higher education in relation to totals, only 17.9% are occupied by people with higher education. Among jobs with higher education occupied by women, the rate is 10.03% in relation to the total number of jobs, that is, more than half of jobs with higher education were occupied by women. Thus, the local economy, besides being largely uneven and informal, the existing formal jobs do not require higher education, which, as shown by Rocha et. al. (2017) [81], tend to pay lower wages.

In terms of public administration, the municipality of Boca do Acre scored 0.436 on the Firjan Index of Fiscal Management (IFGF) in 2020, being classified as a difficult management[82]. In the historical series that goes from 2013 to 2020, the municipality followed a trend of improvement in fiscal management in its first years, but from 2014 the IFGF decreased until the year 2016 (Figure 14). From 2016, the index returns to have an upward development with a small oscillation between 2018 and 2019. However, between 2019 and 2020, the municipality of Boca do Acre showed an upward development. Nevertheless, throughout the historical series, the IFGF of Boca do Acre was always lower than that found in the state of Amazonas and Brazil.

[80] Mosaner, M.; Santos, D.; Seifer, P. Índice de Progresso Social na Amazônia Brasileira - IPS Amazônia 2021. Banco de dados exportados. Available at: <https://ipsamazonia.org.br/dashboard#aspects%5B%5D=1&aspects%5B%5D=2&aspects%5B%5D=3&aspects%5B%5D=4&map-view=city&map-type=performance&active-cat=1&page=1&tab=map>. Accessed on: 10/10/2022

[81] Rocha, R.; Filho, N.; Oliveira, A.; Komatsu, B. A relação entre o ensino superior público e privado e a renda e emprego nos municípios brasileiros. Revista PPE, v. 47, n. 3, 2017, p. 39-69.

[82] FIRJAN. Federação das Indústrias do Estado do Rio de Janeiro. IFGF 2021: Índice Firjan de Gestão Fiscal. Rio de Janeiro: Firjan, 2021. Rio de Janeiro: Firjan, 2021. Available at: <https://www.firjan.com.br/data/files/2E/D2/DD/93/82E9C7109125A9C7A8A809C2/firjan-IFGF-edicao-2021.pdf>. Accessed on: 10/10/2022.

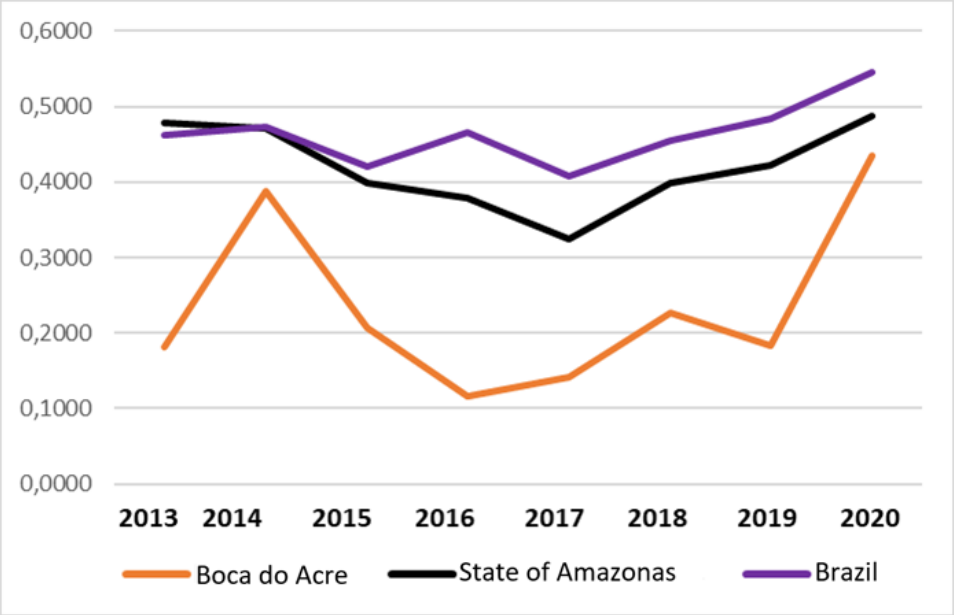

Figure 14. Historical series of the General IFGF of the municipality of Boca do Acre, Amazonas State, Brazil[83].

According to FIRJAN, liquidity and personnel expenses were the main factors responsible for the improvement in the index. From the point of view of liquidity, this improvement may be correlated with the fulfillment of the city government's financial obligations. Regarding personnel expenses, Boca do Acre showed a significant improvement from 2019, surpassing the scores of the state of Amazonas and Brazil. This improvement is related to a low level of commitment of the municipality's revenues to expenses with the payroll of municipal servants and postponement of payments by the municipal government. Regarding autonomy, Boca do Acre performed below the average of the state of Amazonas and Brazil, totaling a score of 0 from 2018 to 2020. That is, the city hall of Boca do Acre does not generate enough resources to cover its management and almost all of its revenues (95.9% in 2015) depend on external transfers[84]. Regarding the investment component, Boca do Acre presents a critical note below the note of the state of Amazonas

[83] FIRJAN. Federação das Indústrias do Estado do Rio de Janeiro. IFGF 2021: Índice Firjan de Gestão Fiscal. Rio de Janeiro: Firjan, 2021. Rio de Janeiro: Firjan, 2021. Available at: <https://www.firjan.com.br/data/files/2E/D2/DD/93/82E9C7109125A9C7A8A809C2/firjan-IFGF-edicao-2021.pdf>. Accessed on: 10/10/2022.

[84] IBGE - Instituto Brasileiro de Geografia e Estatística. Boca do Acre: Panorama. Available at: <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/panorama>. Accessed on: 10/10/2022

and Brazil[85]. In the evolution of the investment indicator, the municipality showed an improvement from 2016 to 2020 interspersed with another drop in 2018 (Figure 14).

As for the Municipal Gross Domestic Product, a survey by the IBGE in partnership with Superintendence of the Manaus Free Trade Zone (SUFRAMA) pointed out that in 2019, the administration and public services sector (defense, education, public health and social security) had the highest added value. The contribution from the public sector totaled 59.9%, with 23.4% from public services and 36.5% from public administration[86]. Agriculture and livestock contributed 20.2% of GDP, industry 13.9% and the remaining 5.8% came from taxes. This indicates that most of the local economy's resources revolve around and depend on jobs generated by the public service, while other productive sectors are relatively atrophied.

Land use and cover

According to the IPS Environmental Quality dimension, in the municipality of Boca do Acre, the protected areas (Conservation Units, Indigenous Lands and others) account for 31.9% of the total area of the municipality[87]. According to the 2017 Agricultural Census[88], the municipality had about 3,373 agricultural establishments occupying an area of 330,681 hectares, which corresponds to 15.07% of the municipal territory. The Census also pointed out that of the areas occupied by agricultural activities, around 60% were used for livestock and raising other animals, and that of these areas used for animal husbandry, 71.9% were pastures.

Although Boca do Acre has the legal protection and preservation of 31% of the total area of the municipality through indigenous lands and conservation units[89], the municipality has high rates related to deforestation and greenhouse gas (GHG) emissions. Boca do Acre is located on the Amazonian agricultural frontier, a huge strip that extends between the borders of the states of Acre, Rondônia, Amazonas, Pará

[85] FIRJAN. Federação das Indústrias do Estado do Rio de Janeiro. IFGF 2021: Índice Firjan de Gestão Fiscal. Rio de Janeiro: Firjan, 2021. Rio de Janeiro: Firjan, 2021. Available at: <https://www.firjan.com.br/data/files/2E/D2/DD/93/82E9C7109125A9C7A8A809C2/firjan-IFGF-edicao-2021.pdf>. Accessed on: 10/10/2022.

[86] IBGE - Instituto Brasileiro de Geografia e Estatística, em parceria com os Órgãos Estaduais de Estatística, Secretarias Estaduais de Governo e Superintendência da Zona Franca de Manaus – SUFRAMA. Produto Interno Bruto 2019. Available at: <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/pesquisa/38/46996>. Accessed on: 11/10/2022

[87] Mosaner, M.; Santos, D.; Seifer, P. Índice de Progresso Social na Amazônia Brasileira - IPS Amazônia 2021. Banco de dados exportados. Available at: <https://ipsamazonia.org.br/dashboard#aspects%5B%5D=1&aspects%5B%5D=2&aspects%5B%5D=3&aspects%5B%5D=4&map-view=city&map-type=performance&active-cat=1&page=1&tab=map>. Accessed on: 11/10/2022.

[88] IBGE - Instituto Brasileiro de Geografia e Estatística. Censo Agropecuário 2017 - Resultados definitivos. Available at: <https://sidra.ibge.gov.br/pesquisa/censo-agropecuario/censo-agropecuario-2017>. Accessed on: 11/10/2022

[89] Mosaner, M.; Santos, D.; Seifer, P. Índice de Progresso Social na Amazônia Brasileira - IPS Amazônia 2021. Banco de dados exportados. Available at: <https://ipsamazonia.org.br/dashboard#aspects%5B%5D=1&aspects%5B%5D=2&aspects%5B%5D=3&aspects%5B%5D=4&map-view=city&map-type=performance&active-cat=1&page=1&tab=map>. Accessed on: 11/10/2022.

and Mato Grosso, whose intense predatory agricultural activity on the forest has formed an arc of deforestation. According to the Agricultural Census, in the state of Amazonas, Boca do Acre emerges as a strong agricultural center with 3,373 establishments, the second largest number of agricultural establishments in the state[90]. In this way, the municipality presents itself as a strong agricultural and deforestation pole in the Amazon.

According to a survey carried out by MapBiomas, in 2020, Boca do Acre had an area of 33,576.32 hectares burned by anthropic fire[91]. The area burned in Boca do Acre in 2020 was the 5th largest among municipalities in the state of Amazonas[92]. Unlike what happens in other countries, where the largest share of carbon dioxide pollution is caused by the burning of fossil fuels, in Brazil, the largest GHG emitters are: changes in land use, which contribute with 41%, and agriculture with 29%[93]. As observed in other municipalities in the Legal Amazon where there is a large portion of preserved forest, changes and uses of soil and forest are the activities that most contribute to GHG emissions. In Boca do Acre, this pattern is no different, according to data from the Greenhouse Gas Emissions Estimation System (SEEG), in the municipality, soil change and use activities were responsible for 93% of total GHG emissions[94]. In the ranking of GHG emissions of Brazilian municipalities, Boca do Acre ranked 28th. In comparison with other Brazilian municipalities, Boca do Acre has a higher volume of GHG emissions than those found in capitals or mostly urban and large municipalities. The gross value of the total issued by the municipality was 6,839,709 tons of CO_2e (GWP-AR5)[95].

In the survey carried out by MapBiomas[96], in the period between 1985 and 2020, Boca do Acre presented a historical series of areas burned by anthropic fire in increasing evolution, with moments of more accentuated peaks in certain years. During this period, there was an increase in the burned area from 1985 onwards, which reached 34,319.64 hectares. Subsequently, there was a vertiginous fall and rise from

[90] IBGE - Instituto Brasileiro de Geografia e Estatística. Censo Agropecuário 2017 - Resultados definitivos. Available at: <https://sidra.ibge.gov.br/pesquisa/censo-agropecuario/censo-agropecuario-2017>. Accessed on: 11/10/2022

[91] Projeto MapBiomas. Mapeamento de cicatrizes de fogo no Brasil – Coleção 1. Available at: <https://mapbiomas.org/estatisticas>. Accessed on: 13/10/2022

[92] Projeto MapBiomas. Mapeamento de cicatrizes de fogo no Brasil – Coleção 1. Available at: <https://mapbiomas.org/estatisticas>. Accessed on: 13/10/2022

[93] Plataforma SEEG - Sistema de Estimativa de Emissões de Gases de Efeito Estufa. Participação das principais fontes de emissão de GEE do município em relação ao perfil nacional - Available at: <https://plataforma.seeg.eco.br/territories/am-boca-do-acre/card?year=2019&cities=true>. Accessed on: 13/10/2022.

[94] Plataforma SEEG - Sistema de Estimativa de Emissões de Gases de Efeito Estufa. Participação das principais fontes de emissão de GEE do município em relação ao perfil nacional. Available at: <https://plataforma.seeg.eco.br/territories/am-boca-do-acre/card?year=2019&cities=true>. Accessed on: 13/10/2022.

[95] Plataforma SEEG - Sistema de Estimativa de Emissões de Gases de Efeito Estufa. Perfil das Emissões nos municípios. Available at: <https://plataforma.seeg.eco.br/cities/statistics>. Accessed on: 13/10/2022.

[96] Projeto MapBiomas. Mapeamento de cicatrizes de fogo no Brasil – Coleção 1. Available at: <https://mapbiomas.org/estatisticas>. Accessed on: 13/10/2022.

2004 to 2005, resulting in 62,759.69 hectares, the largest burned area in the municipality's historical series. These two peaks of burned area occurred at different historical moments, but were related to the Brazilian economy such as the launch of the Real Plan, appreciation of the national currency and the price of commodities and land, which were conducive to deforestation. Later, with the creation of the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon, the indices regressed until 2011.

In the historical series, there were three other moments of peaks in the area burned due to human causes (Figure 15). In 2010, with 49,857.87 hectares, 2016 with 35,894.40 hectares and 2020 with 33,576.32 hectares. The fires of 2010 and 2016 may be associated with the relaxation of legislation and environmental inspection and the instability and economic uncertainties that occurred in Brazil. In the year 2020, the increase in the burned area may be related to the deterioration and fall in public investment in the State's environmental inspection apparatus and with impunity for environmental crimes.

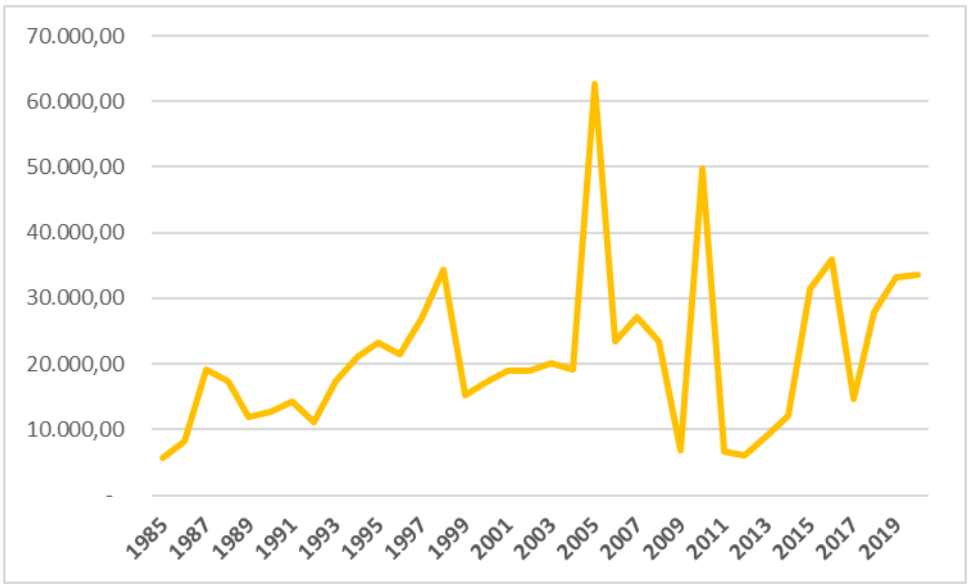

Figure 15. Historical series of burned area (hectares) per year in the municipality of Boca do Acre, Amazonas State, Brazil. [97]

The IPS data on the 'Environmental Quality' component corroborates the aforementioned data. In this regard, the municipality scored 68.72 points in 2021 and is below the state average[98] (Figure 16). The

[97] Projeto MapBiomas. Mapeamento de cicatrizes de fogo no Brasil – Coleção 1.Available at: <https://mapbiomas.org/estatisticas>. Accessed on: 13/10/2022

[98] Mosaner, M.; Santos, D.; Seifer, P. Índice de Progresso Social na Amazônia Brasileira - IPS Amazônia 2021. Banco de dados exportados. Available at: <https://ipsamazonia.org.br/dashboard#aspects%5B%5D=1&aspects%5B%5D=2&aspects%5B%5D=3&aspects%5B%5D=4&map-view=city&map-type=performance&active-cat=1&page=1&tab=map>. Accessed on: 13/10/2022

IPS 2021 index of total deforestation accumulated in 2020 corresponded to 13.05% of the municipality's area, the seventh largest in the state of Amazonas, and recent deforestation in 2019 and 2020 was 13.72% of the total accumulated deforestation[99]. In this sense, Boca do Acre occupied the sixth position of the largest recently deforested area in comparison with other municipalities in Amazonas.

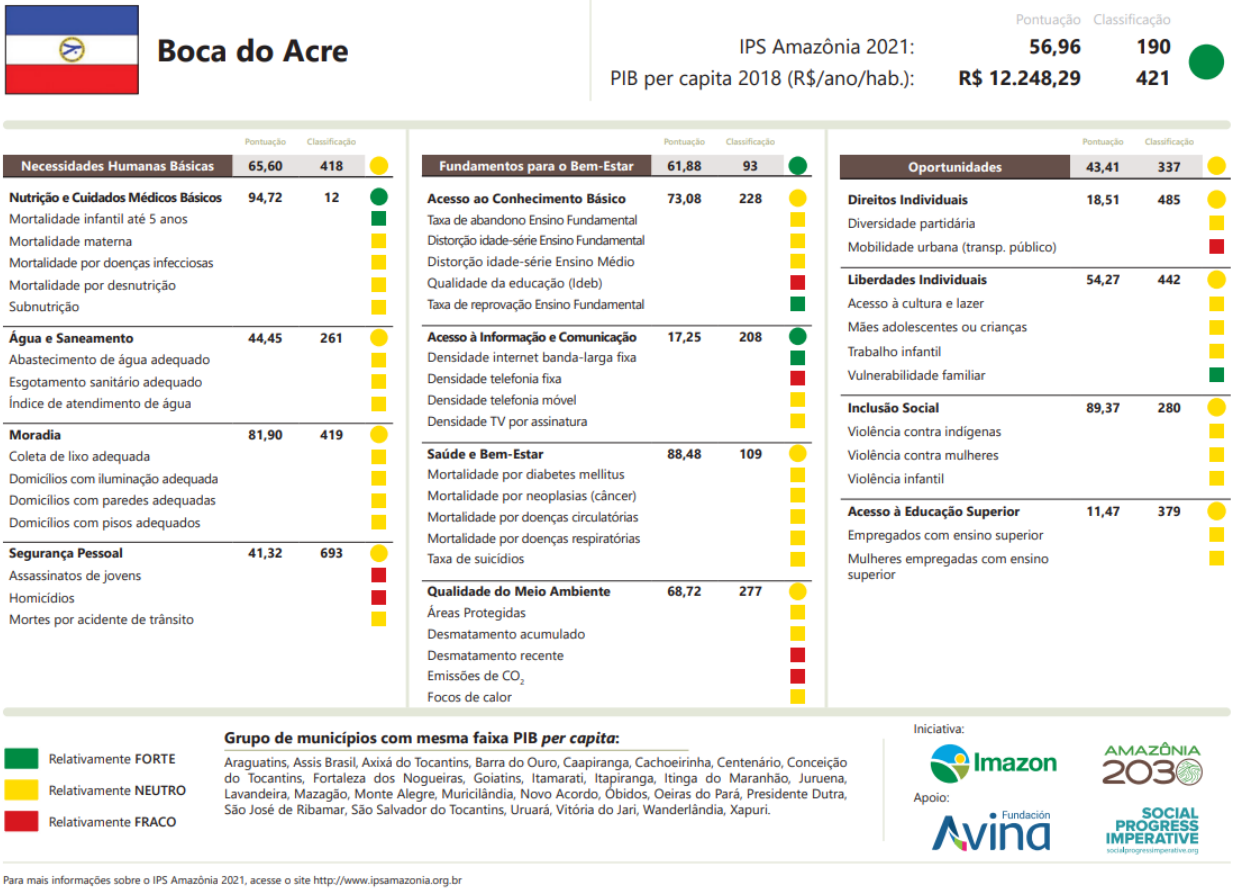

Figure 16. Scorecard of the municipality of Boca do Acre according to the dimensions of the IPS Amazônia 2021.

According to IPS 2021, in 2020, the total number of hotspots in Boca do Acre was the fourth largest in the state, totaling 37.16 hotspots per thousand inhabitants and CO_2 emissions were 112.58 tons per inhabitant, in comparison, the 4th largest in the state[100]. In addition to the fires that compromise ecosystems

[99] Mosaner, M.; Santos, D.; Seifer, P. Índice de Progresso Social na Amazônia Brasileira - IPS Amazônia 2021. Banco de dados exportados. Available at: <https://ipsamazonia.org.br/dashboard#aspects%5B%5D=1&aspects%5B%5D=2&aspects%5B%5D=3&aspects%5B%5D=4&map-view=city&map-type=performance&active-cat=1&page=1&tab=map>. Accessed on: 13/10/2022

[100] Mosaner, M.; Santos, D.; Seifer, P. Índice de Progresso Social na Amazônia Brasileira - IPS Amazônia 2021. Banco de dados exportados. Available at:

on which local populations depend for subsistence and income generation, the IBGE recorded 11,289 people who were in areas at risk of flooding, flash floods and landslides[101].

According to INPE, the state of Amazonas accounted for 14,848 hotspots in the year 2021[102]. In the year 2021, the month of August had the highest number of hotspots since 1998, totaling 8,588 hotspots[103]. In 2022, until the first half of October, there was an increase of 32% compared to the previous year, with 19,709 hotspots being accounted for[104]. According to INPE data, the number of fires in 2022 in the state of Amazonas was the highest since 1998[105]. These data on fires in the state of Amazonas reflect the advance of the arc of deforestation in the southern regions of the state that border the Acre, Rondônia and Mato Grosso following a tendency to pressure even the territory of the project area. Also according to INPE data, with reference to the year 2022, Boca do Acre occupies the 10th place among the municipalities with the highest number of fires with a number of 1,935 fires registered[106].

As explained above, the municipality of Boca do Acre is located in the South, on the border between the states of Amazonas and Acre. Currently, in the border region between the states of Amazonas, Acre and Rondônia, the project for the Sustainable Development Zone of Abunã-Madeira is being implemented. Initially entitled Amacro, the project was proposed by the Federation of Agriculture and Livestock of Acre with the intention of attracting new land investments in the state. Subsequently, based on cooperation between the Amazon Development Superintendence (Sudam), the Manaus Free Trade Zone Superintendence (Suframa), the Brazilian Agricultural Research Corporation (Embrapa) and the secretariats of the three states involved, an environmental sustainability project was proposed to the Amazon from the original Amacro model. This project, entitled ZDS Abunã-Madeira, is in progress and covers 32 municipalities in the states of eastern Acre, southern Amazonas and northwest Rondônia, and includes Boca do Acre.

<https://ipsamazonia.org.br/dashboard#aspects%5B%5D=1&aspects%5B%5D=2&aspects%5B%5D=3&aspects%5B%5D=4&map-view=city&map-type=performance&active-cat=1&page=1&tab=map>. Accessed on: 13/10/2022

[101] IBGE - Instituto Brasileiro de Geografia e Estatística. População exposta ao risco: População em Áreas de Risco no Brasil – 2010. Available at: <https://www.ibge.gov.br/geociencias/informacoes-ambientais/estudos-ambientais/21538-populacao-em-areas-de-risco-no-brasil.html?=&t=acesso-ao-produto> OR <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/panorama>. Accessed on: 13/10/2022.

[102] INPE - Instituto Nacional de Pesquisas Espaciais. Programa Queimadas, Monitoramento dos Focos Ativos por Estado. Available at: <https://queimadas.dgi.inpe.br/queimadas/portal-static/estatisticas_estados/>. Accessed on: 14/10/2022.

[103] INPE - Instituto Nacional de Pesquisas Espaciais. Programa Queimadas, Monitoramento dos Focos Ativos por Estado. Available at: <https://queimadas.dgi.inpe.br/queimadas/portal-static/estatisticas_estados/>. Accessed on: 14/10/2022.

[104] INPE - Instituto Nacional de Pesquisas Espaciais. Programa Queimadas, Monitoramento dos Focos Ativos por Estado. Available at: <https://queimadas.dgi.inpe.br/queimadas/portal-static/estatisticas_estados/>. Accessed on: 14/10/2022.

[105] INPE - Instituto Nacional de Pesquisas Espaciais. Programa Queimadas, Monitoramento dos Focos Ativos por Estado. Available at: <https://queimadas.dgi.inpe.br/queimadas/portal-static/estatisticas_estados/>. Accessed on: 14/10/2022.

[106] INPE - Instituto Nacional de Pesquisas Espaciais. Programa Queimadas. Situação Atual. Focos por município. Available at: <https://queimadas.dgi.inpe.br/queimadas/portal-static/situacao-atual/>. Accessed on: 14/10/2022.

However, the region bordering the states of Acre, Amazonas and Rondônia has become, as also explained, an agribusiness hub, especially beef cattle, with vertiginous growth in the volume of deforestation in the Amazon forest. In this sense, the region has become an epicenter of deforestation of non-designated public forests, private areas and agrarian reform settlements. Boca do Acre is inserted in this context, being among the municipalities of the ZDS Abunã-Madeira and located in the area affected by the arc of deforestation. Therefore, there is strong land pressure on the preserved forest areas in the municipality.

In the municipality of Boca do Acre, deforestation advances from the state border with Acre, with agricultural activities in the border area with neighboring municipalities as the main fronts for forest invasion. This advance of deforestation follows along the banks of the Purus and Acre rivers and northwards from Sena Madureira (AC) and Manoel Urbano (AC). There is also another front of intense deforestation from Rio Branco (AC) on the banks of the BR 317 highway and border with the municipality of Lábrea.

The local reality of Boca do Acre shows a stark contrast in the distribution of economic resources from the economic activities of the municipality and the distribution of economic resources and land among the inhabitants of the municipality. As explained, Boca do Acre is one of the main agricultural producers in the state of Amazonas. However, only a small portion of the population is employed, and about half of them earn half the minimum wage or less.

The distribution of land is also uneven, with traditional populations being disadvantaged. The advance of regional agribusiness through the Abunã-Madeira ZDS and the arc of deforestation puts strong pressure on the traditional populations that live in the forests of Boca do Acre. This pressure manifests itself in land grabbing, coercion and violence perpetrated against traditional populations, instilling in these populations the loss of their traditional territory, their material bases of extractive production and their way of life. Thus, both the traditional populations of the region and the forests are threatened by the advance of the deforestation arc and by the Abunã-Madeira ZDS.

According to IPS Amazônia criteria, the municipality of Boca do Acre ranks eighth in the state of Amazonas[107]. The municipality is in a general situation and in most dimensions and components above the average for this state (Figure 17). The “Opportunities” dimension is the one with the lowest performance, close to the lowest average in the state, which corroborates the emigration of young people discussed above. This indicates that the communities surrounding the Jatobá project are in a situation of socio-environmental vulnerability. The Jatobá project would be an important opportunity precisely in the dimension that the IPS points out as the greatest weakness for the communities that would be involved in this project.

[107] Mosaner, M.; Santos, D.; Seifer, P. Índice de Progresso Social na Amazônia Brasileira - IPS Amazônia 2021. Banco de dados exportados. Available at: <https://ipsamazonia.org.br/dashboard#aspects%5B%5D=1&aspects%5B%5D=2&aspects%5B%5D=3&aspects%5B%5D=4&map-view=city&map-type=performance&active-cat=1&page=1&tab=map>. Accessed on: 14/10/2022.

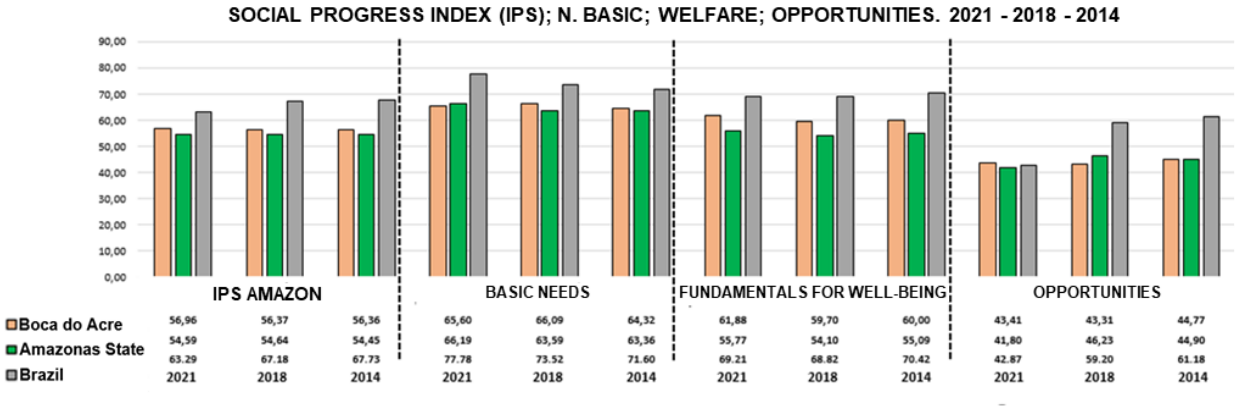

Figure 17. Municipality of Boca do Acre according to the dimensions of the IPS Amazônia 2021[108].

Cultural and Archaeological Heritage

In the scope of the Cultural Heritage, the municipality of Boca do Acre presents some cultural manifestations and practices of the intangible sphere recognized and registered by the National Institute of Historic and Artistic Heritage (IPHAN). As it is located in the northern region, Boca do Acre is in the cultural region stipulated by IPHAN for the occurrence of the Craft of Tacacazeira in the North Region. With a national scope and mainly being present in the interior of the Amazon and Brazil, the Knowledge and Practices of Traditional Midwives in Brazil are also recognized by IPHAN as Heritage. Both the Craft of Tacacazeira in the North Region, and Knowledge and Practices of Traditional Midwives in Brazil are in the process of being registered by the federal agency[109].

The Roda de Capoeira and the Capoeira Masters Craft are intangible cultural assets registered by IPHAN, inscribed in the Registration Book of Forms of Expression and the Registration Book of Knowledge, respectively, and distributed throughout the national territory, consequently being present in the municipality of Boca do Acre. It is also important to highlight that Roda de Capoeira is on the Representative list of Intangible Cultural Heritage in Brazil recognized by UNESCO[110].

The Craft of the Baianas de Acarajé, registered in the IPHAN's Registration Book of Knowledge, is also an intangible cultural asset that is distributed throughout the state of Amazonas. Due to the migration

[108] Mosaner, M.; Santos, D.; Seifer, P. Índice de Progresso Social na Amazônia Brasileira - IPS Amazônia 2021. Banco de dados exportados. Available at: <https://ipsamazonia.org.br/dashboard#aspects%5B%5D=1&aspects%5B%5D=2&aspects%5B%5D=3&aspects%5B%5D=4&map-view=city&map-type=performance&active-cat=1&page=1&tab=map>. Accessed on: 13/10/2022

[109] IPHAN – Instituto do Patrimônio Histórico Artístico Nacional. Patrimônio cultural imaterial em processo de registro. Available at: <http://portal.IPHAN.gov.br/>. Accessed on: 14/10/2022.

[110] IPHAN – Instituto do Patrimônio Histórico Artístico Nacional. Patrimônio cultural imaterial, Bens em processo de registro, Patrimônio Cultural Material e Imaterial do Brasil. Available at: <http://portal.IPHAN.gov.br/>. Accessed on: 14/10/2022.

of northeasterners to the northern region, this knowledge and practices, which was almost exclusively women's domain, spread to all the states in the northern region (IPHAN)[111].

According to IPHAN records of identification and location of archaeological sites consulted through the SICG (Integrated System of Knowledge and Management) platform, there are records of 17 archaeological sites in the municipality of Boca do Acre[112] (Figure 18). According to SICG records, among these archaeological sites, there is a historic site of indigenous occupation related to the processing of rubber in the 1940s. This archaeological site has trenches, in a circular structure of earth, chipped and polished lithic artifacts and ceramics. The site was identified through archaeological research for the environmental licensing of BR 317 between kilometers 416 and 526.

The other archaeological sites come from the pre-colonial context and are formed by large structures of ditches in the ground with geometric shapes. These structures are known as Geoglyphs and are present in the west and southwest of the Amazon, specifically in the states of Acre, Amazonas and Rondônia. Geoglyphs are archaeological structures identified in the last 20 years from the intensification of deforestation in the Amazon that exposes the soil and such structures. It is important to highlight that the arc of deforestation advanced precisely over the area where the Geoglyphs were present, which in a previous period were protected and preserved under the Amazon rainforest. However, as the Arc of Deforestation advances, Geoglyphs are suffering direct impacts through forest destruction and agropastoral activities. In Boca do Acre it is no different, all archaeological sites identified as Geoglyphs are impacted or partially destroyed with a low degree of integrity due to deforestation and implementation of pasture areas

Thus, one can draw a parallel and correlate the preservation of forests with the preservation and protection of archaeological sites. In this relationship, forests, besides performing the maintenance and conservation of its biodiversity, climate and traditional communities, they act in a similar way with the archeological vestiges and sites. In this perspective, once preserved, the forest protects the soil and consequently the archaeological remains and sites.

[111] IPHAN – Instituto do Patrimônio Histórico Artístico Nacional. Patrimônio cultural imaterial, Bens registrados Patrimônio Cultural Material e Imaterial do Brasil. Available at: <http://portal.IPHAN.gov.br/>. Accessed on: 14/10/2022.

[112] Plataforma SICG - Sistema Integrado de Conhecimento e Gestão. Sítios Arqueológicos. IPHAN – Instituto do Patrimônio Histórico Artístico Nacional. Available at: <https://sicg.IPHAN.gov.br/sicg/pesquisarBem>. Accessed on: 14/10/2022.

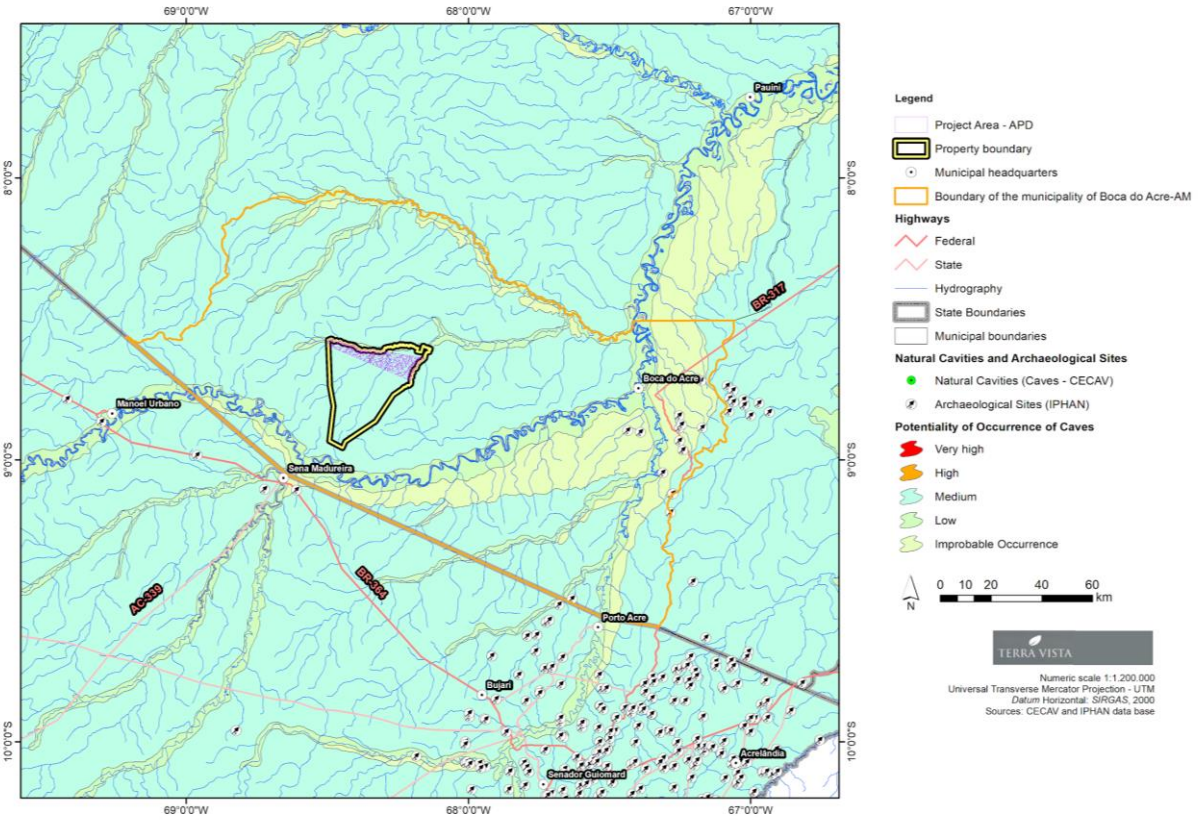

Figure 18. Archeological sites and natural cavities in the region where the Jatobá project is located.

Indigenous Lands

According to Funai data, Boca do Acre has five indigenous lands[113] (Figure 19). The indigenous population of Boca do Acre is mostly distributed among the indigenous lands: Igarapé Capanã and Camicuã, since the entire area of these indigenous lands is within municipal limits. The indigenous lands: Boca do Acre and Apurinã, despite having their areas divided between the municipalities of Boca do Acre and Lábrea, have villages in the municipality of Boca do Acre. The Inauini/Teuini Indigenous Land is mostly located in the municipality of Pauini, with only 2% of its area in Boca do Acre.

[113] Funai -Fundação Nacional do Índio. Ministério da Justiça e Segurança Pública. Atuação - Terras Indígenas - Geoprocessamento e Mapas. Available at: https://www.gov.br/funai/pt-br/atuacao/terras-indigenas/geoprocessamento-e-mapas. Accessed on: 21/12/2022.

The Apurinã and Boca do Acre ILs are inhabited by the Apurinã people, people of the Aruak-Maipure linguistic family[114]. The populations of these indigenous lands in 2002 totaled 209 people in the TI Apurinã and 248 people in the TI Boca do Acre[115]. In the same period, the Camicuã Indigenous Land was inhabited by 454 indigenous people of the Apurinã people[116]. In the current context, many Apurinã live outside these recognized areas, in riverside communities or in the headquarters of municipalities. Also, the lag of the last Census carried out must be taken into account. Thus, the population of Apurinã indigenous people must be greater than that mentioned.

[114] ISA – Instituto Socioambiental. Terras Indígenas no Brasil. Available at: https://terrasindigenas.org.br/. Accessed on: 21/12/2022.

[115] ISA – Instituto Socioambiental. Terras Indígenas no Brasil. Available at: https://terrasindigenas.org.br/. Accessed on: 21/12/2022.

[116] ISA – Instituto Socioambiental. Terras Indígenas no Brasil. Available at: https://terrasindigenas.org.br/. Accessed on: 21/12/2022.

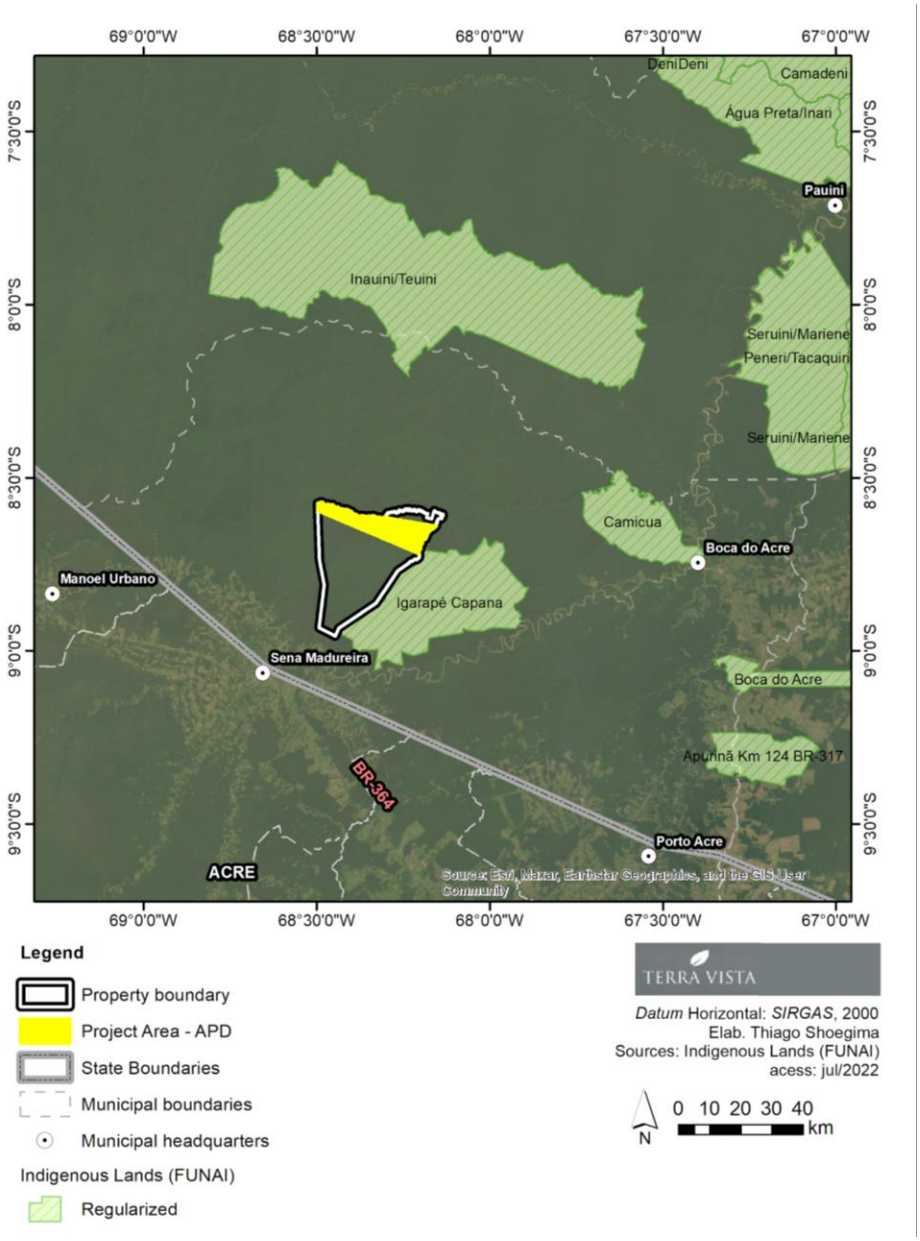

Figure 19. Distribution of indigenous lands in the region where the Jatobá project is located.

Located next to the Jatobá project area, the Igarapé Capanã Indigenous Land is inhabited by the Jamamadi, people of the Arawá linguistic family[117]. According to data from the 2010 Census, there were 85 people residing in the indigenous land at the time[118]. Considering the delay in this Census and the pace of

[117] ISA – Instituto Socioambiental. Terras Indígenas no Brasil. Available at: https://terrasindigenas.org.br/. Accessed on: 21/12/2022.

[118] ISA – Instituto Socioambiental. Terras Indígenas no Brasil. Available at: https://terrasindigenas.org.br/. Accessed on: 21/12/2022.

indigenous population growth, the population of the Jamamadi de Capanã, as well as that of other indigenous peoples, must have increased significantly. It is important to highlight that the Jamamadi are extractive and agricultural producers[119]. Among the extractive products collected, the Jamamadi currently work mainly with copaiba oil, collected from seasonal settlements[120].

The Jamamadi are part of the indigenous peoples of the region of the Juruá and Purus rivers, survivors of the rubber booms. They are known to inhabit upland forests as well as dense rainforests of the low plateaus. In addition to the municipality of Boca do Acre, the Jamamadi are present in four other indigenous lands in the Amazon: TI Caititu; IT Camadeni; TI Inauini/ Teuini and TI Jarawara/ Jamamadi/ Kanamanti. In 2002, a population of 800 people belonging to this ethnic group was estimated[121].

The Jamamadi language belongs to the Arawá family of the Western Amazon and most of them only speak the native language. In addition, the Jamamadi usually avoid contact with white people, whom they call jará. According to Instituto Socioambiental[122], no information was recorded on Jamamadi individuals living in urban areas.

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

The Jatobá project zone encompasses the geographic limit of the Amazon biome and the project area (initial instance) is located in the municipality of Boca do Acre (AM), specifically in Seringal São Miguel (Figure 20). The area of the property is 94,090.42 ha and extends from the northern banks of the Purus River in its southern portion to the São Francisco stream in the extreme north. To the east, it borders the Igarapé Capana Indigenous Land (TI), belonging to the Jamamadi indigenous people, and to the west, Incra's Gleba B37.

[119] Schröder, Peter, 2002. ISA – Instituto Socioambiental. Povos Indígenas no Amazonas. Povo Jamamadi. Available at: https://pib.socioambiental.org/pt/Povo:Jamamadi. Accessed on: 21/12/2022.

[120] Schröder, Peter, 2002. ISA – Instituto Socioambiental. Povos Indígenas no Amazonas. Povo Jamamadi. Available at: https://pib.socioambiental.org/pt/Povo:Jamamadi. Accessed on: 21/12/2022.

[121] ISA – Instituto Socioambiental, 2022. Terras Indígenas no Brasil. Available at: https://terrasindigenas.org.br/. Accessed on: 21/12/2022.

[122] ISA – Instituto Socioambiental, 2022. Terras Indígenas no Brasil. Available at: https://terrasindigenas.org.br/. Accessed on: 21/12/2022.

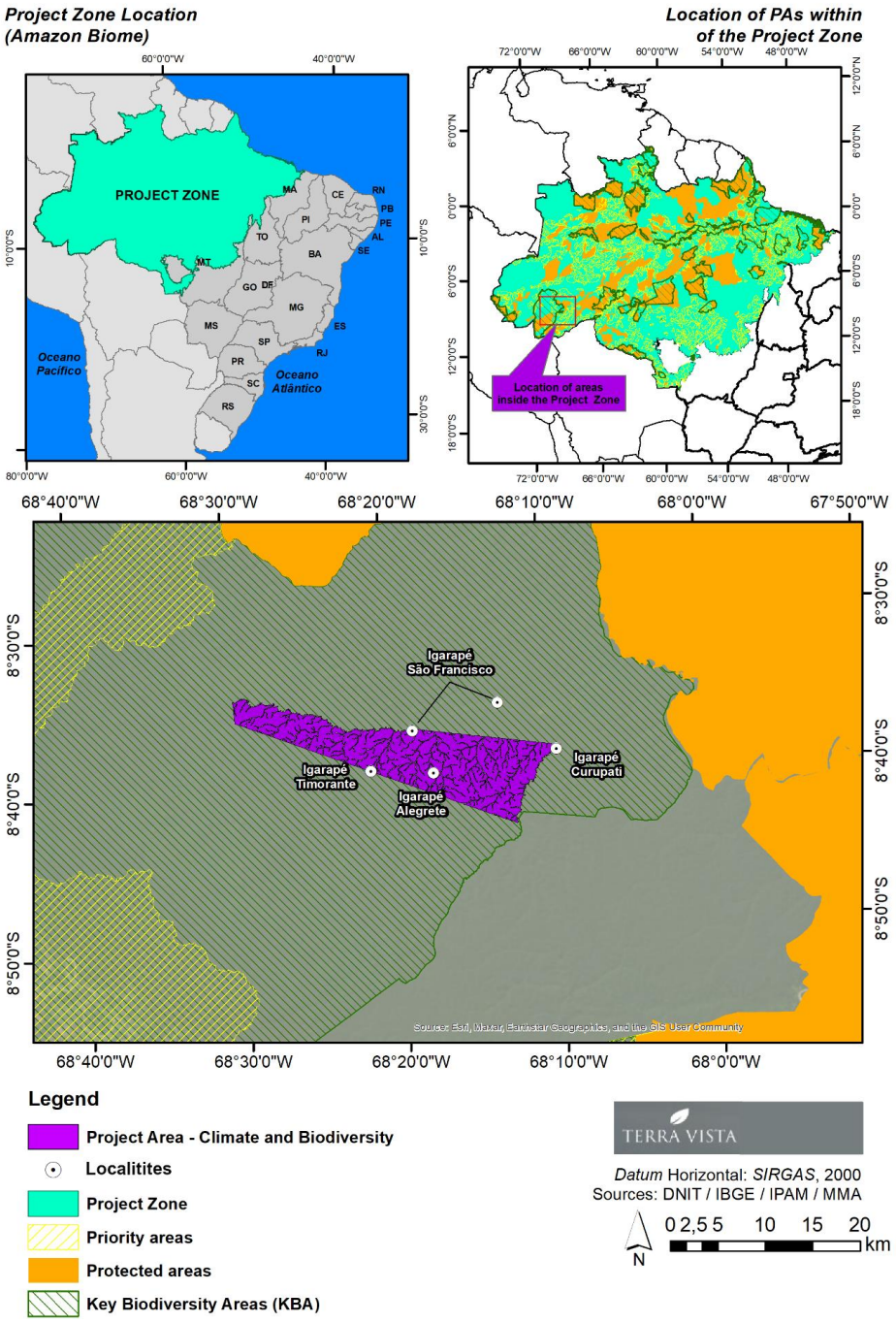

Figure 20. Jatobá project Zone, in the Municipality of Boca do Acre, Amazonas State, Brazil.

2.1.8 Stakeholder Identification (G1.5)

Corresponding to the first step in the development of carbon projects, the identification of stakeholders was done in two main steps[123]. The first step was conducted remotely, based on the reading of bibliographic references about the municipality and the region, internet searches, consultation with the landowner, and contact with local people. The second was a face-to-face step, conducted during the first field campaign, with the application of rapid-participatory diagnostic methods, questionnaires on sustainable livelihoods and semi-structured interviews.

The stakeholder identification process aimed to find actors who maintain a relationship with the territory, either directly or indirectly. In this way, we seek to detect organizations or actors that, even if they don't live on the property or close to the project area, can make use of it or help create a network aimed at favoring conservation actions and strengthening sustainable economic chains.

In the first step of the stakeholder identification process, an internet survey was conducted on August 3rd and 4th, 2022. On these occasions, search engines were consulted, especially Google, combining keywords such as the name of the municipality (e.g., "Boca do Acre") and the categories of organizations of interest (e.g., "NGO" or "company", "association"). This search was complemented by consulting more specific sites aimed at registering companies[124], official websites of public authorities[125][126], of transparency agencies[127], and NGOs[128]. The survey focused on stakeholders who work, whether in the public sector, business, or in the third sector, in activities related to conservation, agriculture and livestock, and mainly linked to the handling of timber and non-timber forest products. As a result, a list of 56 stakeholders from different sectors active in the municipality of Boca do Acre – AM and Sena Madureira – AC was generated. This list provided us with an overview of the organizations present in the municipality and served as a basis to guide the technical team's field work and the primary data analysis.

Concomitantly, satellite images were used to identify possible buildings within the property and in the surrounding area. In accordance with the AFOLU Non-Permanence Risk Tool v4.0, this sweep respected an area of 20 km of the property area. The objective was, through photointerpretation, to identify possible

[123] 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. Available at: https://verra.org/wp-content/uploads/social-and-biodiversity-impact-assessment-sbia-manual-for-redd-projects-part-1.pdf. Accessed on: 21/12/2022.

[124] Empresas do Brasil. Available at: <https://empresasdobrasil.com>. Accessed on: 01/09/22.

[125] City Hall of Boca do Acre - AM. Available at: <https://www.bocadoacre.am.gov.br>. Accessed on: 01/09/22.

[126] Government of the state of Amazonas. Available at: <https://www.amazonas.am.gov.br>. Accessed on: 01/09/22

[127] Portal of Access to Information and Transparency of the Municipalities of the state of Amazonas. Available at: <https://transparenciamunicipalaam.org.br>. Accessed on: 02/09/22.

[128] ONGS Brazil. Available at: <http://www.ongsbrasil.com.br>. Accessed on: 02/09/22.

residents in the vicinity of the project so that they can be integrated into the stages of identifying stakeholders.

The community technical team went to the field between March 3 and 9, 2023, with the aim of holding meetings with community leaders and carrying out a socioeconomic diagnosis of local communities. 60 families of extractivists were identified that inhabit the São Francisco, Curupati, Alegrete and Timorante streams, in the northern portion of the property, within the project area (Figure 21). dispersed without any concentration of dwellings in the form of villages or communities. This type of dispersed occupation was conceptualized in the diagnosis as locality.

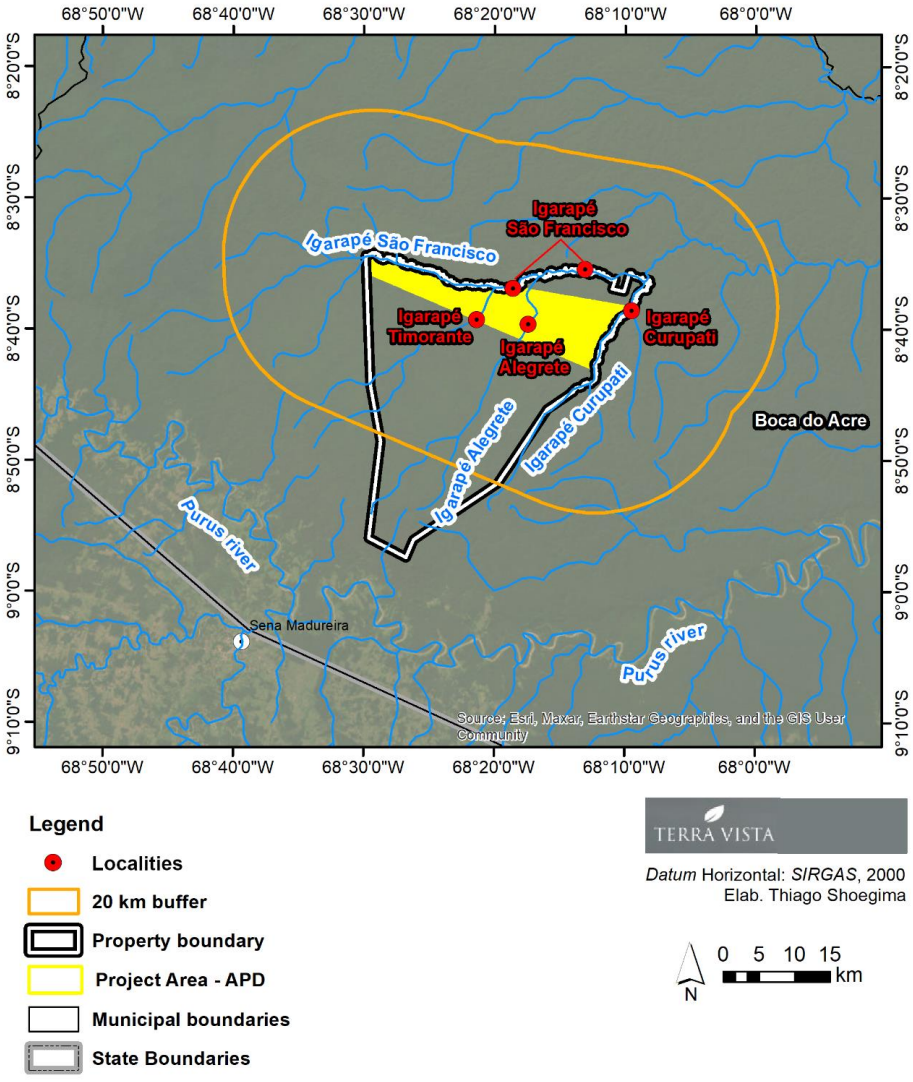

Figure 21. Location of streams (*igarapés*) to the north of the property where families are distributed close to the Jatobá project.

On the 4th the team met with the Secretary of the Environment of the municipality, presenting the project, the stages and activities that would be carried out in the territory. The Secretariat took a favorable position in supporting the activities and made itself available to participate in public hearings and eventual assistance in the municipality.

Between March 6th and 8th, the field team traveled to the project area and held conversations with the families that live there. Using informal language that is easy for traditional extractivists to understand, the project and its objective, the rights of squatters and the benefits it will bring to the region were explained. The activities were divided into individual interviews with riverside families and a meeting with a community group.

A total of 16 riverside families were consulted and interviewed. The individual public consultation was used in this case, instead of the collective one, due to the distance and the difficulty of locomotion of the families. In addition, the safety of the interviewees was considered, so that the exposition of ideas could be carried out without the coercion of leaders who exert financial influence on the community. At the end of each conversation with the community members in the project area, the interviewed families were asked if they supported the execution of the project, with a total of 16 acceptances recorded, duly recorded in audio and in a signed document.

A meeting was held with 8 families of extractivists at the home of one of the local leaders who acts as a middleman for chestnut trees and, for this reason, exercises power and influence over others. The meeting progressed extremely satisfactorily, in which those present understood the project, the proposals and actions to be carried out. However, as its main activity is livestock, this leadership was against the project's activities.

On March 8, 2023, a public hearing was held for chestnut trees to join the Project in the city of Boca do Acre. The meeting was attended by representatives of 7 chestnut extractive families and the participation of the local government in the presence of the Municipal Secretary for the Environment. After clarifying all doubts, the project was unanimously accepted by those present. Thus, the Free, Prior and Informed Consultation was carried out respecting all the rights of the participants.

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

Based on current data, stakeholders were grouped into the following classes: project proponent, public authorities, communities and third sector. The description of the stakeholders according to their right, interest and relevance in participating in the project is summarized in Appendix 1: Stakeholder Identification Table.

2.1.10 Sectoral Scope and Project Type

- Sectoral Scope: AFOLU (Scope 14): Agriculture, Forestry, and Other Land Uses;

- Project Category: REDD (Reducing Emissions from Deforestation and Forest Degradation);
- Project Activity: APD (Avoided Planned Deforestation);

The Jatobá REDD+ project is not a grouped project.

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

The main objective of the Jatobá project is to promote actions aimed at reducing greenhouse gasses (GHG) emissions from planned deforestation. In this way, some activities will be proposed, such as the improvement of heritage surveillance, remote monitoring of forest cover, monitoring and deepening of biodiversity studies, in addition to activities to intensify the engagement of communities with the preservation of the forest and forest resources.

Thus, to ensure positive benefits for the three main scopes: climate, community and biodiversity, the project activities were defined based on the reality and local context, always aiming at continuous improvement. The successful implementation of the project's activities guarantees the commercialization of carbon credits, which return as financial resources for the continuation of social development activities and natural resources conservation.

A brief description of the activities that make up the theory of change of the Jatobá project is presented below:

Maintenance of forest cover:

Maintenance of 18,017.19 ha of forest coverage and reduction of 5,440,804 GHG emissions (tCO_2e) by stopping deforestation. The project proposes, through remote sensing, the periodic monitoring of forest cover, allowing the monitoring of changes in land use/cover, and a better understanding of the agents and vectors of deforestation in the region, as well as serving as support for the heritage surveillance team, making operations more effective and assertive. In this sense, remote monitoring of forest cover is directly related to the containment of deforestation, conservation of natural resources and biodiversity and, consequently, the reduction of GHG emissions. In addition, the project proposes to promote the training of agents, and thus contributing to climate change adaptation and increasing communities' income.

Biodiversity conservation:

By providing for the maintenance of forest cover in the project area, Jatobá project also ensures the conservation and protection of the local habitats and species, thus generating expected positive net benefits to biodiversity, in a scenario with the Project.

The activities related to biodiversity for this project include the monitoring of sensitive species, that is, species that are under some degree of threat, and the performance and encouragement of scientific

research in the project area, generating information and knowledge about the ecosystem dynamics. In addition, constant monitoring is planned in areas with recognized high conservation value.

Strategies for improving quality of life and technology transfer:

Based on the socioeconomic diagnosis, the result of interviews and meetings held with the participating communities, with the objective of learning about the local reality and the expectations of the target audience, the project identified the main social demands and mitigating actions capable of promoting improvement in the local infrastructure and quality of community life.

With regard to community infrastructure, the project will facilitate the transfer of social technologies, through: a) Acquisition and implementation of a community photovoltaic system; b) Implementation of a water collection and distribution system; c) Logistical alternatives to ensure the flow of non-timber forest products; d) Acquisition of equipment for processing non-timber forest products; e) Implementation of an internet access system.

The communities involved will also benefit from training and courses aimed at: a) Strengthening the nut production chain, adding value to the product and community management capacity; b) Increase in the income of extractive families, strengthening associations; c) Encouraging the training and engagement of young people and women in economic activities; d) Training for sustainable forest management of Brazil nuts. As a result, the project activity will have a positive impact by strengthening the families' autonomy, providing decent conditions for community infrastructure and ensuring better conditions for permanence in the territory.

2.1.12 Sustainable Development

One of the goals of the Jatobá project is to promote sustainable development in the region, with the joint actions of all stakeholders being the drivers of net benefits for the local communities, climate and biodiversity, under the facilitation and encouragement of Terra Vista Gestora de Recursos Ltd. Based on this support and according to the expected impacts, the project will contribute to the United Nations Sustainable Development Goals (SDGs) described below:

	Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture The project brings together the socio-economic demands of the communities with local opportunities for more resilient economic activities, through the promotion and fostering of sustainable practices. To this end, the project makes environmental education and community training actions possible, in association with different partners and extensionists, in order to promote knowledge about the importance of reconciling good productive practices with the preservation and maintenance of natural resources. In addition to fostering perceptions about the relevance and advantages of sustainable production systems, the project also works to raise awareness among families about the

	value of sustainable exploitation of non-timber forest resources for their survival, income generation, well-being and, consequently, the maintenance of the standing forest.

	Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all The project enables and encourages access to education through technical courses and training focused on the environmental and socioeconomic areas, especially on resilient agricultural and livestock production practices, sustainable extraction of non-timber forest products, education on hunting, fishing, and preservation of threatened species. To do this, it relies on the support and collaboration of specialized partners and the articulation with the related public bodies, in order to guarantee effectiveness and stakeholder engagement. These capacity-building activities promoted by the project allow for the strengthening of local governance, the consolidation of a sense of belonging, access to information, better employment conditions, and income diversification; especially for extractivists and small rural producers, consequently leading to the maintenance of the forest and its resources.

	Goal 12. Ensure sustainable consumption and production patterns The project includes the "Fostering sustainable practices" with actions aimed at identifying potential activities related to resilient subsistence agriculture, sustainable livestock farming, and low-impact extractivism and forest management; according to the demand and profile of local communities. In this sense, the project works on the dissemination of knowledge, instructions, and experiences focused on the efficient use of natural resources and environmental preservation; focusing on sustainable business chains through greater integration among the stakeholders; thus generating income, well-being, and cultural identity for the fostered communities.

	Goal 13. Take urgent action to combat climate change and its impacts All activities developed by the project aim to take action to combat climate change and its impacts and, consequently, to reduce environmental degradation in the project area. In addition to stakeholder engagement and governance strengthening, the project also promotes satellite and field monitoring of deforestation. The heritage surveillance within Seringal São Miguel, supplied with geospatial information, is effective and assertive in actions to prevent and stop the conversion of forest lands. The project has the potential to reduce 5,440,804 tCO_2e of GHG emissions in 30 years, collaborating directly with the Brazilian goal of reducing emissions.

	Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss Seringal São Miguel is located close to protected areas that are part of a mosaic of fundamental importance for the preservation of significant samples of the region's ecosystems, which are under strong pressure from the advance of the agricultural

	frontier, land grabbing and predatory logging. Thus, the project focuses efforts on long-term monitoring of ecological indicators associated with practices arising from conservation activities on populations and ecosystems both one and off the property. Consequently, the project aims to minimize habitat loss, changes in landscape, and climate change. To this end, it seeks to engage, involve, and sensitize all stakeholders about the importance of biodiversity (flora and fauna) in providing ecosystem services, maintaining landscape connectivity, controlling environmental degradation, and limiting the overuse of natural resources. Environmental education lectures on hunting and fishing, sustainable livelihood training, and workshops and activities on local ecological aspects are aimed primarily at the surrounding community groups, who eventually pass through the property and use forest resources. This participatory involvement and knowledge of good production practices promote the strengthening of local governance and awareness of the value and socio-environmental importance of the forest, ensuring positive impacts on biodiversity in the project area.

Some national policies for the inclusion of the riverside population that extracts products from standing forests, such as the development of family farming (National Support Program for Family Farming - PRONAF - Federal Law nº 11,326/2006) and the Sharing of Benefits (Biodiversity Law - Federal Law nº 13,123/2015), among others, were initiatives adapted in the Amazon to promote the sustainable development of riverside populations. These policies on the side of strengthening the more environmental, economic and productive dimensions should be analyzed together with others related to social strengthening, such as the Unified Health System (SUS - Federal Law nº 8080 of 1990) and policies to achieve education quality goals, accompanied by the national education evaluation system (PNE - Law nº. 13,005/2014 and updates).

These policies depend essentially on the states and municipalities for their application throughout the national territory. As we have seen that the municipality of Boca do Acre ranks in several very low positions in various indicators of the application of these public policies and of its own management, the Jatobá project can provide complementary capillarity in all these dimensions of the livelihoods of communities directly related to the project. Environmental preservation, as well as access to energy, internet, drinking water and improvements in the production system will precisely allow the resource bases to improve and provide better quality of life for the target population.

2.1.13 Implementation Schedule (G1.9)

The summary schedule of activities related to the development and implementation of the Jatobá project is presented in Table 10 below.

Table 10. Detailed implementation schedule of the main activities related to the Jatobá project.

Date	Milestone(s) in the project's development and implementation
November 2019	Start date.
July 2022	Signing of a contract between developer Terra Vista and owner José Carlos Kalil
August 2022	First field visit by the Communities team: identification of residents and validation of the socio-environmental characterization. Meeting with stakeholders, mapping priority demands to communities and prior presentation of the scope and activities of the project.
January 2023	Second field visit by the Communities team: Feedback on the social baseline diagnosis to the communities. Public consultation. Survey of land conflicts and way of life of local communities.
February 2023	Third field visit by the Communities team: Deepening the study on the way of life, socioeconomic data and land issues in the territory.
March 2023	Fourth field visit by the Communities team: Public stakeholder consultation. Free, prior and informed consent. Acceptance of the project by extractivists from the northern portion of the territory.
April 2023	Biomass forest inventory in the project area with floristic survey and phytosociological analysis.
	Fauna survey
	Listing of the project description document (PDD) in Verra's system.
May 2023	Request to change project status to "under validation" and submit documents to Verra Registry
	Verra performs project documentation review
	Correction of the "findings" of the project. Beginning of the "Public Comments" period.
June 2023	Monitoring Report submission to Verra's system.
	Start of project audit
July 2023	Completion of validation/verification of the project by the contracted validating body.
February 2023 to December 2049 2024	Implementation of socio-environmental and governance programs.
April 2023 to April 2050	Verification: Production of monitoring reports for verification; Site visit (Field audit) follow-up.

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2.1.14 Project Start Date

On November 9, 2019, the landowner José Carlos Kalil requested georeferencing for the land and environmental regularization of the property, with a view to developing a forest preservation project for the origination of carbon credits. Land regularization is the first investment for project development. Therefore, considering the methodology criteria, the project start date was April 26, 2020.

2.1.15 Benefits Assessment and Crediting Period (G1.9)

The crediting period of the Jatobá project will be from April 26, 2020 (start date) to April 26, 2050, contemplating a 30-year period.

There will be ongoing monitoring of the benefits to climate, communities and biodiversity, and reports will be submitted to the CCB for verification throughout the project's lifetime.

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

The crediting period for the Jatobá project is marked by the formalization of the land regularization proposal, as mentioned in Section 2.1.14. After formalizing the budget for the georeferencing of the land, the project begins and, consequently, the first major investments are made.

The development of activities related to the climate, community, and biodiversity scope, along with the monitoring of parameters related to these scopes, occurs through a second major investment of the project. This investment is made by charging the first credits, which come from the first verification of the project through the VCS certification. In this way, the assessment of changes related to climate, community and biodiversity benefits starts soon after the start of the project's crediting period.

2.1.17 Estimated GHG Emission Reductions or Removals

The annual estimates of GHG emission reductions or removals over the duration of the Jatobá project are presented in Table 11 below.

Table 11. Estimated reductions or removals of GHG emissions for the Jatobá project.

Year	APD Reductions (tCO_2)
2020	970,064.87
2021	970,064.87

2022	970,064.87
2023	970,064.87
2024	970,064.87
2025	590,480.07
2026	0.00
2027	0.00
2028	0.00
2029	0.00
2030	0.00
2031	0.00
2032	0.00
2033	0.00
2034	0.00
2035	0.00
2036	0.00
2037	0.00
2038	0.00
2039	0.00
2040	0.00
2041	0.00

2042	0.00
2043	0.00
2044	0.00
2045	0.00
2046	0.00
2047	0.00
2048	0.00
2049	0.00
Total estimated ERs	5,440,804
Total number of crediting years	30
Average annual ERs	181,360

2.1.18 Risks to the Project (G1.10)

The "AFOLU Non-Permanence Risk Tool, v4.0", September 19, 2019, version 4.0, establishes the procedures for conducting non-permanence risk analysis and determining the credit buffer for projects developed under the AFOLU sectoral scope. The score achieved by the project in each of the risk categories (internal, external, and natural) is presented in Table 12. Detailed information on the evaluation of each of the risk factors in each category and subcategory can be found in Appendix 3. All data, rationales, assumptions, and justifications were provided to the validation/verification bodies.

Table 12. Summary of the Non-Permanence Risk Analysis for the Jatobá project.

Category	Score
Intern Risk	12

Extern Risk	0
Natural Risk	0
Overall score	12

Other likely risks to the expected climate, community, and biodiversity benefits during the life of the project, as well as their mitigation measures, are described in Table 13.

Table 13. Potential risks to the benefits of climate, community and biodiversity and their mitigation measures.

Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
Lack of engagement of the communities involved in the project activities	Loss of forest cover and degradation of biodiversity in the project area	Use of participatory methods, ensuring that people are included in decision-making processes
Illegal deforestation in the project area caused by an external agent	Deforestation within the project area	Ground patrols and remote sensing monitoring of the project area in order to identify illegal deforestation as quickly as possible and take action.

■

2.1.19 Benefit Permanence (G1.11)

In order to maintain and enhance the climatic, social and biodiversity benefits in the scenario with the project, a set of actions organized in basic social and environmental programs will be carried out. Terra Vista and its investors have the necessary financial resources to maintain the project activities until the first verification. After that, the project's resources will come from the revenues obtained from the sale of carbon credits.

Climate

The project activities focused on climate benefits aim to decrease deforestation and, consequently, GHG emissions. To this end, systematic monitoring will be implemented in the project area, including river and land patrols as well as satellite surveillance with up-to-date images of the project area. As an

exceptional benefit, the maintenance of forest cover protects the watershed network of the project area and contributes to water regulation in the watershed of the project area.

Communities

The residents of the communities included in the project will be protagonists in the process of defining the actions developed. Socio-environmental programs will be developed to reduce the impacts caused by climate change, enabling the improvement of the quality of life of the community. Structured actions will be implemented to provide water security, basic sanitation, electricity, and internet access. Continuous communication and consultation will be maintained throughout the life of the project to ensure that the activities are causing the expected positive impacts.

Biodiversity

For biodiversity activities and benefits, a fauna diagnosis and forest inventory will be carried out. The areas will be monitored systematically with permanent plots to evaluate the dynamics of the vegetation and fauna survey campaigns to evaluate the conservation of biodiversity.

2.1.20 Financial Sustainability (G1.12)

Financing of the project activities is guaranteed by funds from the project proponents from the start date until the first verification. Thereafter, revenues from GHG emissions reductions will be used to implement programs that will leverage the project's climate, community, and biodiversity benefits. Evidence of the proponents' funds will be made available to the validation and verification body.

2.1.21 Grouped Projects

This is not a grouped project.

1) Eligibility Criteria for Grouped Projects (G1.14)

Not applicable.

2) Scalability Limits for the Grouped Projects (G1.15)

Not applicable.

3) Risk Mitigation Approach for Grouped Projects (G1.15)

Not applicable.

2.2 Without-project Land Use Scenario and Additionality

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

To determine the land use scenario in the absence of the project, the tool for Demonstration and Assessment of Additionality in VCS - Agriculture, Forestry and Other Land Uses (AFOLU) - VT0001 (v3.0) was used. Based on economic and political trends and usual regional activity, three credible alternative land use scenarios were identified for the project area within this GDP (Output of VT0001 v3.0 sub-stage 1a):

SCENARIO 1: Maintenance of the forest cover of 20% of the property, where land use conversion is allowed by law[129]: it is the maintenance of the area as it is, without any activities and conservation measures, but still being responsible for the costs of the necessary taxes to maintain ownership of the land. Although no economic activity is carried out in the pre-project scenario, the area is exposed to invasions and illegal deforestation, antecedents to livestock, a common practice in the region.

SCENARIO 2: Legal deforestation of 20% of the property (deforestation with allowances), where land use conversion is allowed by law i.e.: forest suppression for pasture (livestock).

SCENARIO 3: Illegal deforestation of 20% of the property (deforestation without a grant), where the conversion of land use is permitted by law, that is: forest suppression for pasture (livestock) and agricultural purposes or simply for real estate speculation.

The analysis regarding deforestation agents and the probable land use scenarios in the absence of the project were carried out using the baseline scenario as a basis. Considering that the baseline scenario is similar to the conditions existing before the start of the project, this analysis is presented and detailed in section **3.1.4** - Baseline Scenario.

2.2.2 Most-Likely Scenario Justification (G2.1)

The most likely scenario observed in the Jatobá project is the conversion of land use and land cover from forest to livestock areas, legally (APD).

Legal deforestation of 20% of the property (deforestation with grant) is considered the most plausible baseline scenario because the land is expected to be converted to non-forest land and the conversion is legally authorized and documented, following VM0007 v1.6. Furthermore, the identified deforestation agent has a history of agricultural activity on other lands owned by him for economic purposes, which makes “SCENARIO 2” realistic and credible.

[129] According to Law 12,651 of May 25, 2012, landowners can convert up to 20% of the forest within their rural property in the Amazon biome for economic purposes. Available at: < https://www.planalto.gov.br/ccivil_03/_ato2011-2014/2012/lei/l12651.htm>. Accessed on 13/03/2023.

2.2.3 Community and Biodiversity Additionality (G2.2)

The Jatobá project has as its main objective the conservation of the native Amazon Forest in a region where the pressure for deforestation is mainly due to the activities of conversion of land use from forests to pastures aimed at raising cattle. In the absence of the project, the expected scenario would be the advance of deforestation and the degradation of the area. The scenario with the presence of the Jatobá project will guarantee the allocation of necessary resources for the conservation and protection of the area destined for the project, guaranteeing several benefits for the community and biodiversity in the region.

Regarding the community, we highlight the implementation of strategies aimed at improving the quality of life of residents of local communities, which would not have occurred in the absence of the project, such as the implementation of a family photovoltaic system, systems for capturing and distributing treated water, toilets with dry pits, internet access, improvement in educational, productive and health infrastructure. In addition, the communities will benefit from training and courses aimed at strengthening the production chain, with training in management diversifying the economy, adding value to the products sold, providing more job opportunities and improving the income of families, all with an inclusive awareness of socially vulnerable groups.

For biodiversity, the main benefits of the project that would not occur in its absence refer to the conservation of vegetation. The maintenance of continuous forest environments guarantees the maintenance of the gene flow of species and ecosystem services in the region, promoting the conservation of fauna and flora. Also, the project will allow for greater knowledge of the local biodiversity, encouraging scientific research in the region through the environmental monitoring planned during its life cycle.

By preserving the forest area used in extractivism and for subsistence and which presents an imminent risk of deforestation, the project tends to strengthen the ways of life of local traditional communities and their economic production.

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

The Jatobá project does not intend to use any benefits to communities or biodiversity as offsets.

2.3 Stakeholder Engagement

2.3.1 Stakeholder Access to Project Documents (G3.1)

The installation of a private carbon credit project, which has the potential to generate positive impacts and socio-environmental solutions and is thus offered to the market, is associated with a detailed process of accreditation and control of variables and indicators that should measure and demonstrate its deliverables, accomplishments and concrete achievements for forest conservation and the improvement of the living conditions of the populations associated with it.

In view of the feasibility and the establishment of an efficient and assertive communication with the different stakeholders, the project will focus, over time, on the training of local multipliers, through the dissemination of knowledge and information about the project in all its phases. This will demonstrate a maturing of society itself as it takes ownership of the consequences of the presence of local and territorial commitment to the carbon credit, reversing the logic of deforestation as the only alternative.

The project information will be available in an adequate and public language for the broad knowledge of all stakeholders. The documentation will be freely accessible through meetings between the community and the project's technical staff, in written form through printed versions of the project description, monitoring report, validation and verification report, and virtual, through the VERRA and Terra Vista Gestora de Recursos Ltd.

In order to establish such efficient and assertive communication channels, enhancing the capacity for positive feedback between the Jatobá project, the government, the community of which it will be a part, society in general, and the market, communication will be in accordance with the following premises:

- Adopt ways and channels of communication that encourage dialogue;
- Adopt communication languages that consider the different education levels;
- Adopt means of communication that are easy to update, considering the conditions of logistical access and local infrastructure;
- Recognize and value the specificities of the local/regional culture, which will guide the proposed initiatives and activities;
- Establish directed communication, transmitting information in a guided and frequent way to specific segments of the population, according to the definitions of publics of relationship of this Plan, not prioritizing only mass media and the digital media of low access due to the precarious situation of the digital infrastructure;
- Always seek to take a stance that takes into consideration the perspectives and points of view of each public relationship, seeking to facilitate, on the proponents' side, the understanding and comprehension about the territory's issues and those related to forest conservation and biodiversity as a means of generating carbon credits.

2.3.2 Dissemination of Summary Project Documents (G3.1

The project description information will be presented to the communities involved in the form of meetings after the audits performed in the project area in order to disseminate the monitoring results and actively disseminate the information in the communities in a participatory manner. Summary information of the monitoring results will be available on the Verra and Terra Vista Gestora de Recursos Ltd.

2.3.3 Informational Meetings with Stakeholders (G3.1)

As mentioned in section 2.1.9 (Identification of Stakeholders), between March 6th and 8th, the field team traveled to the project area and held conversations with the families that live there. Using informal language that is easy for traditional extractivists to understand, the project and its objective, the rights of squatters and the benefits it will bring to the region were explained. The activities were divided into individual interviews with riverside families and a meeting with a community group.

A total of 16 riverside families were consulted and interviewed. The individual public consultation was used in this case, instead of the collective one, due to the distance and the difficulty of locomotion of the families. In addition, the safety of the interviewees was considered, so that the exposition of ideas could be carried out without the coercion of leaders who exert financial influence on the community. At the end of each conversation with community members in the project area, the interviewed families were asked if they supported the execution of the project, with a total of 16 acceptances recorded, duly recorded in audio and in a signed document.

A meeting was held with 8 families of extractivists at the home of one of the local leaders who acts as a middleman for chestnut trees and, for this reason, exercises power and influence over others. The meeting progressed extremely satisfactorily, in which those present understood the project, the proposals and actions to be carried out. However, as its main activity is livestock, this leadership was against the project's activities.

On March 8, 2023, a public hearing was held for chestnut trees to join the Project in the city of Boca do Acre. The meeting was attended by representatives of seven chestnut extractive families and the participation of the local government in the presence of the Municipal Secretary for the Environment. After clarifying all doubts, the project was unanimously accepted by those present. Thus, the Free, Prior and Informed Consultation was carried out respecting all the rights of the participants.

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

During meetings held with riverside communities and extractivists in the project region, information on costs, risks and benefits was collected, making use of the methodologies of the Rapid Participatory Diagnosis. The diagnosis aimed to analyze the level of understanding and the current situation in which they find themselves in order to better understand the implementation process of this project. During the meetings, the concepts of costs, risks and benefits were transmitted to the community, which was encouraged to raise the possible impacts generated by the implementation of the carbon credit project. The consultation was carried out by specialist professionals, who communicated in a way that everyone present could understand. Thus, from the participatory dialogue, the technical staff and the community listed the following issues:

Costs:

- Negotiate and recognize the land borders of possessions and properties;
- Have free time to participate in formal and informal meetings, giving up the application in productive, spiritual or leisure time.

Risks:

- Be threatened by invaders (external agents), when they take a position to protect the project's forest fragments;
- Suffer internal reprisals by leaders opposed to the project due to the interest in developing their livestock activity.

Benefits:

- Improvement of home infrastructure with the implementation of a family photovoltaic system, systems for capturing and distributing treated water, bathrooms with dry pits and internet access;
- Improvement of educational, productive and health infrastructure;
- Financial resource from the Forest Guardians Program;
- New learning that adds value to the products sold and generates new income alternatives, providing more job opportunities and improving families' incomes;
- Strengthening of associations and community management capacity;
- Strengthening the inclusion of socially vulnerable groups in productive activities.

During the community consultations, information about the benefits of the project was provided to community members. No financial costs will be passed on to the communities, as all project activities will be borne by the project proponents. Activities are planned to improve quality of life and have a positive impact. Furthermore, the project will not bring direct or indirect risks to the communities.

An annual monitoring plan will be implemented to quantify and document changes in social and economic well-being resulting from project activities.

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

To inform stakeholders about the validation and verification process, meetings are held with communities to present the project, with the application of questionnaires with directed questions that result in indicators to assess the impact of the project on people’s quality of life. The participants were informed about the entire process of origination of carbon credits, validation and registration, while it was pointed out that an external auditor (validation and verification body) will visit the project area, interact with stakeholders, evaluate project information and activities, and issue evaluation reports.

Annual communication campaigns are the most explicit way to share content comprehensively and are able to mobilize both internal and external audiences on a large scale, and will be carried out before

the new verifications. Other institutional stakeholders were communicated about the project by email, where informative material about the project was made available.

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

The date of the auditor's site visit will be communicated in advance to allow stakeholders to plan ahead and be available during the project site visit. Open access by communities and institutional stakeholders to the validation and verification body auditor will be provided.

The proponent will be responsible for all necessary expenses with transportation, food and accommodation to ensure compliance with the audit plan.

2.3.7 Stakeholder Consultations (G3.4)

The articulation between the stakeholders began in August 2022 with meetings with the riverside communities, as described in item 2.1.9 (Identification of stakeholders - G1.5). Between March 6th and 8th, the technical team traveled to the project area and held talks with local extractivists. Using informal and easy-to-understand language, the project and its objective, the rights of the squatters and the benefits it will bring to the region were explained. The following benefits were agreed with them: a) Creation of a lending agreement with the squatters in the area who use it for chestnut extraction; b) Participation of the guardian of the forest, referring to the payment of a minimum wage per family that owns a nut grove; c) The execution of social technology programs, such as the installation of solar panels, systems for capturing, treating and distributing water in homes, internet in strategic locations, in addition to training courses and supply of equipment to improve the extraction and sale of chestnuts. In addition, several local demands were collected that are found as programs to be carried out, respecting the free, prior and informed consultation, and the self-determination of the riverside people.

A total of 16 riverside families were consulted and interviewed. The individual public consultation was used in this case, instead of the collective one, due to the distance and the difficulty of locomotion of the families. In addition, the safety of the interviewees was considered, so that the exposition of ideas could be carried out without the coercion of leaders who exert financial influence on the community. At the end of each conversation with the community members in the project area, the interviewed families were asked if they supported the execution of the project, with a total of 16 acceptances recorded, duly recorded in audio and in a signed document.

A meeting was held with 8 families of extractivists at the home of one of the local leaders who acts as a middleman for chestnut trees and, for this reason, exercises power and influence over others. The meeting progressed extremely satisfactorily, in which those present understood the project, the proposals and actions to be carried out. However, as its main activity is livestock, this leadership was against the project's activities.

On March 8, 2023, a public hearing was held for chestnut trees to join the project in the city of Boca do Acre. The meeting was attended by representatives of seven chestnut extractive families and the

participation of the local government in the presence of the Municipal Secretary for the Environment. After clarifying all doubts, the project was unanimously accepted by those present. Thus, the Free, Prior and Informed Consultation was carried out respecting all the rights of the participants.

2.3.8 Continued Consultation and Adaptive Management (G3.4)

The project has a permanent channel of communication and consultation between project proponents and communities and other stakeholders. Communication happens instantly via email. Prior to each verification, communities and other stakeholders will be contacted and consulted for updates on project activities and results.

The following are considered success factors in the communication of this project:

- Strategic Factor: it must provide the exchange of knowledge and essential information for achieving and maintaining carbon accreditation, strategically, in accordance with the guidelines and standards of the control bodies;

- Integration Factor: encouraging constant dialogue creates an environment of trust favorable to stable and lasting relationships, through the exchange of experiences and knowledge with the main stakeholders in order to support all lessons learned and corrections in the course of the project, when necessary.

- Motivation and Satisfaction Factor: when the proponent's direct and indirect employees have access to information and opportunities to present their opinions with freedom of internal and external participation, raising the levels of co-responsibility among the stakeholders for the best performance of the project.

Establishing the guidelines so that communication and inter-institutional and informal relationships take place in a profitable way, both for the project and for society, is important since communication will be the access route for sharing the knowledge produced. Knowledge is shared based on this experience of contact, promoting structured dialogue between Terra Vista Gestora de Recursos Ltd. and extractive riverside communities that, despite not residing in the project area, use the project area for their subsistence.

The activities proposed by the project can be redirected as the results are being evaluated, according to the dynamics of the perception of the stakeholders on the impact of the actions developed.

2.3.9 Stakeholder Consultation Channels (G3.5)

Consultations are held directly with communities, institutions or their legitimate representatives in face-to-face meetings. The project summary was presented by the email address jatoba@terravista.eco.br, establishing a communication channel open to dialogue.

The project activities were built in a collective and participatory way during workshops and meetings between the technical team and communities. Through the methodological approaches of DRP and MVS, the local needs and specificities of each community were raised in order to shape community aspects of the project.

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

The project values activities that favor meaningful learning for all parties involved, especially those that help employees, project representatives, to make assertive decisions and the communities involved to participate effectively. It is expected that society will be positively impacted, get to know the project well and have the opportunity to express their opinions.

The public meeting and its ritual is the legal and normative tool of this collective participation for communities to decide on their willingness to get involved, at what level this will take place and what are the expectations in terms of benefits. From the mapping of stakeholders, contacts made, people records and questionnaires applied, a specific mobilization was carried out through telephone contact with the community, in order to participate in the public hearing, in which the current status of the project was presented. For the hearings, there was also mobilization via a personal invitation through the visit of technicians from Terra Vista Gestora de Recursos Ltd. in the homes of communities participating in the project.

The articulation of the public hearing provided the presence of extractivists from the São Francisco, Curupati, Alegrete and Timorante streams. In addition, the technical team of Terra Vista Gestora de Recursos Ltd. carried out individual consultations in the project areas, due to the difficulty of mobilization on- site and possible harassment to be suffered by livestock leaders in the region. In the meetings, the communities were informed about the project and its current stage of development. The possible impacts of the project were also addressed in a participatory manner. Such results were used for the elaboration and consolidation of the socio-environmental programs that will be developed by the project.

2.3.11 Anti-Discrimination Assurance (G3.7)

Terra Vista Gestora de Recursos Ltd. has a Code of Ethics and Conduct in common with the other companies that make up the Economic Group (section **2.1.3**). The document governs some guidelines on the behavior of the Group's employees, among them, the contribution to the "development of a workplace free of discrimination based on origin, race, color, gender, age, religion, marital status, physical condition or any other personal characteristic, as well as any form of intimidation or harassment, whether moral, sexual, religious, political or organizational".

Communities are instructed to report potentially unethical and/or illegal conduct, or inappropriate and abusive behavior that generate discomfort and humiliation, as well as any suspicion of sexual and/or moral harassment, attacks on physical integrity and threats to their superior and/or reporting channel (e-mail and telephone), which may or may not be anonymous.

Terra Vista Gestora de Recursos Ltd. is proud to act with ethics, integrity, transparency and respect for people and requires that these values also be exercised by its employees, customers, service providers, suppliers and partners. The company has a reporting channel that was implemented with the aim of helping to report possible violations of its Code of Conduct, applicable laws or company policies and standards. Collaborators and third parties can make a report, anonymous or not, at their convenience, directly through the website https://my.safe.space/company/terravista.

2.3.12 Feedback and Grievance Redress Procedure (G3.8)

The project proponent understands that stakeholders want and need to be involved in project design, implementation, monitoring and evaluation throughout project lifetime. Therefore, a formal channel was established to receive complaints, compliments or suggestions from the community in general.

This channel also guarantees the option of confidentiality for those who access it, and serves for stakeholders to continuously express their concerns and solve any problems during the planning, implementation and monitoring of the project. Communication can be made via the project email (project email), which is managed by the Terra Vista Gestora de Recursos Ltd. team, or via the reporting channel https://my.safe.space/company/terravista.

The records will be registered for the control of the manifestations until the availability of answers when the manifestation so requires, respecting the normative deadline of ombudsmen of 20 days plus 20 days for complex subjects such as maximum response time. The responses will be prepared, forwarded, tracked and controlled to ensure the effectiveness of the service.

The procedures for returning and repairing complaints will have as their main objective a consensus between the parties. If there is no agreement between the parties, claims and claims will be formally recorded in the minutes of the meeting for later verification of new negotiation possibilities. Finally, if there is no understanding between the actors, the conflict will be directed to the judicial instances.

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

The manifestations presented by the communities will be carried out by email or through the complaint channel (reporting channel) with the completion of a digital form. Manifestations will be forwarded for discussion and feedback, under the responsibility of the Terra Vista Gestora de Recursos Ltd. The history of the manifestations will be stored in a database suitable for internal consultation whenever necessary, which will allow the production of knowledge about the main issues raised by the stakeholders, as well as the traceability of the internal conduct of these processes.

2.3.14 Worker Training (G3.9)

Technical training and local development are fundamental for the consolidation of a carbon credit generation project. Mainly when the place of origin is used traditionally through extractivism. The realization of extractivism as a management of non-timber products depends on keeping the forest standing. In this

cycle, in which the maintenance of the forest is made possible by the exploration of the flora by the extractivists in a sustainable way, and from another point of view, it allows the carrying out of traditional activities of non-timber forest products, the training and strengthening of the technical training associated with the valuing traditional knowledge will result in the continuity of the project and an improvement in the quality of life in local communities.

In general, the technical training proposed by the Jatobá project intends to integrate social technologies in the communities of the São Francisco, Curupati, Alegrete and Timorante streams and share the knowledge produced with the community families. The training proposal also intends to address the strengthening of the extractive productive chain and institutionally strengthen the local association. The training proposal can be seen in the Activities and Theory of Change table (see Appendix 2). Below is a summary of activities.

Training in social technologies:

- Training for maintenance of water collection and distribution systems;
- Training for maintenance of the photovoltaic system;
- Training for maintenance of the communication system;

Strengthening the extractive production chain:

- Training and courses aimed at valuing the product; Working capital; Encourage the participation of young people and women;
- Training aimed at diversifying the production chain and processing non-timber forest products; Encourage the participation of young people and women;
- Establishment of rules for use and responsibility for the maintenance of equipment received by projects.

Service to the community:

- Community training for emergency health care.

2.3.15 Community Employment Opportunities (G3.10)

The job opportunities offered by the Project to the communities that use the project area cover all positions, including management positions, provided that the requirements for the vacancy are fulfilled. The employee hiring process must follow the parameters and guidelines of a selection process that allows transparency and effectiveness for all involved.

For hiring, the following criteria will not be adopted: race, gender, sexual orientation, color, religion, age, ethnicity, physical or mental disability or social class. The hiring of the employee will be based on requirements and criteria established by the job description, with a minimum qualification being desirable.

As a way to encourage professional qualification and promote an improvement in family income, the Jatobá project intends to carry out training for community members without any distinction by race, gender, sexual orientation, color, religion, age, ethnicity, physical or mental disability or social class.

Initially, the project intends to create job openings in a telecommuting regime (home office) for the function of administrative assistant. The work contracts will be signed between the Terra Vista Gestora de Recursos LTDA e contratado conforme legislação trabalhista brasileira.

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

Employees of the Jatobá project will be guaranteed employment in accordance with Brazilian labor legislation. In addition, the international agreements ratified by Brazil and issues related to the well-being and safety of workers will be respected.

Hired employees will receive training and qualifications on procedures and technical qualification, promotion of qualification, and safety at work. In addition, hired employees are advised to join the respective unions in the work area responsible for their rights.

The laws and regulations governing the protection of labor law in Brazil are listed below:

- Decree Law No. 5.452, of May 1, 1943;
- Law No. 6,514, of December 22, 1977;
- Convention OIT 012 – Compensation for accidents at work (agriculture);
- Convention OIT 026 – Methods for setting minimum wages;
- Convention OIT 029 – Forced or compulsory labor;
- Convention OIT 042 – On Compensation for Occupational Illnesses;
- Convention OIT 095 – Wage Protection;
- Convention OIT 098 - Application of the principles of organization and collective bargaining right;
- Convention OIT 099 – Methods for setting the minimum wage in agriculture;
- Convention OIT 100 – Equal remuneration for male and female workers for work of equal value;
- Convention OIT 103 – Maternity Support;
- Convention OIT 105 – Abolition of Forced Labor;
- Convention OIT 106 – Weekly rest in commerce and offices;
- Convention OIT 111 – Discrimination in respect of employment and occupation;
- Convention OIT 113 – Medical examination of fishermen;
- Convention OIT 119 – Protection of machinery;
- Convention OIT 125 – Fishermen's Capability Certificates;

- Convention OIT 127 – Regarding the maximum weight of loads that can be carried by a single worker;
- Convention OIT 131 – Fixing of minimum wages;
- Convention OIT 132 – Paid annual leave;
- Convention OIT 135 – Protection of Workers' Representatives;
- Convention OIT 138 – Minimum Age for Admission to Employment;
- Convention OIT 140 – Paid study leave;
- Convention OIT 141 – Organization of rural workers;
- Convention OIT 144 – Tripartite consultations to promote the application of international labor standards;
- Convention OIT 154 – Incentive to Collective Bargaining;
- Convention OIT 155 – On the safety and health of workers and the working environment;
- Convention OIT 159 – Vocational Rehabilitation and Employment of Disabled Persons;
- Convention OIT 160 – Labor Statistics;
- Convention OIT 161 – On Occupational Health Services;
- Convention OIT 167 – Safety and health in construction;
- Convention OIT 168 – Promotion of employment and protection against unemployment;
- Convention OIT 169 – Indigenous and tribal peoples;
- Convention OIT 182 – Worst forms of child labor;
- Convention OIT 011 - Agricultural Workers' Rights of Association and Union;
- Convention OIT 019 – Equal Treatment of Foreign and National Workers with regard to Compensation for Accidents at Work;
- Convention OIT 080 – Revision of the Final Articles and Constitution of the International Labor Organization;
- Convention OIT 088 – Organization of the Employment Service;
- Convention OIT 097 – Migrant Workers;
- Convention OIT 116 – Revision of the final articles and constitution of the OIT;
- Convention OIT 117 – Objectives and Basic Rules of Social Policy;
- Convention OIT 118 – Equal treatment of nationals and nationals in matters of social security;
- Convention OIT 122 – Employment Policy.

2.3.17 Occupational Safety Assessment (G3.12)

To promote occupational safety among employees, the Jatobá project will follow all official norms instituted by the federal and state governments. In addition to respecting the labor legislation and the conventions of the International Labor Organization, the project intends to be guided by the following measures to maintain the occupational safety of its employees:

- Map the risks of the work environment and make all employees aware of it;
- Conduct regular training to ensure that project employees have a safe working environment. Training must address the dangers of the work environment such as venomous animals and insects;
- Standardize processes to more quickly and accurately identify errors and what should be done to resolve them;
- The use of Personal Protective Equipment (PPEs) is essential to protect employees from any danger to their health. Mandatory use of PPE (helmets, boots, leggings, ear plugs, gloves, among others) when necessary;
- Record the accidents that have occurred so that it is known which failures cannot happen again;
- Promote a culture of safety among employees of the Jatobá project.

  ○

2.4 Management Capacity

2.4.1 Project Governance Structures (G4.1)

■ The project is managed by the proponent Terra Vista Gestora de Recursos Ltd. Among its responsibilities are the coordination and execution of the socioeconomic and environmental diagnostics; baseline and carbon stock studies; elaboration of the project design document (PD); monitoring and implementation of the proposed activities; assistance in conducting field audits for validation and future verifications; and commercialization of the credits generated.

■ Terra Vista Gestora de Recursos Ltd. has ten departments that are jointly responsible for project management (Figure 22). The "Carbon Project Origination" department is responsible for project development and implementation, its technical team is subdivided into seven interconnected teams (Figure 23) and counts mainly on the support of the legal, technological and financial departments.

■

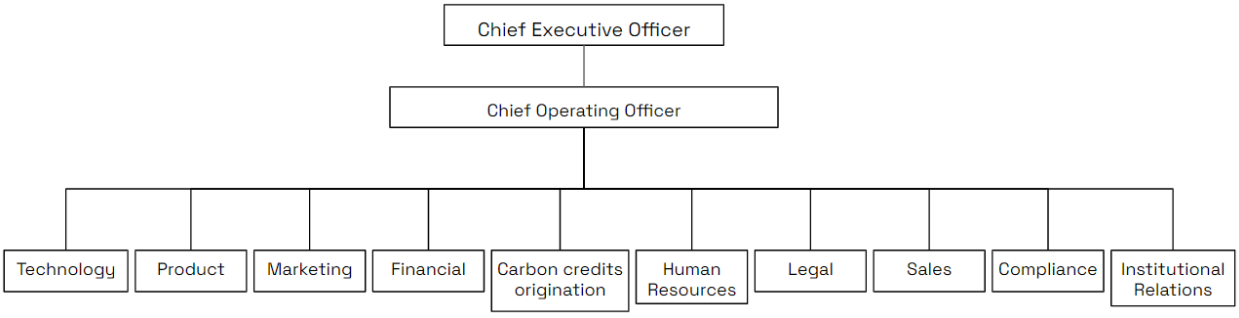


Figure 22. Executive Governance Structure of Terra Vista Gestora de Recursos Ltd.

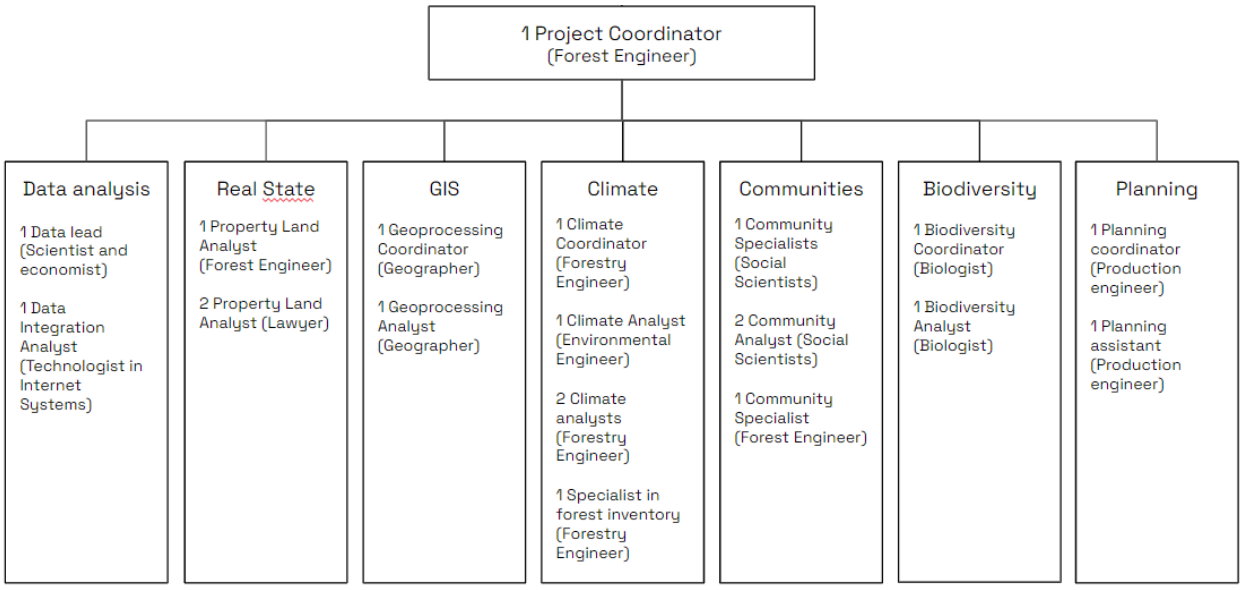


Figure 23. Technical governance structure of the "Carbon Project Origination" department.

The responsibilities of each team part of the Carbon Project Origination department are described below:

i. Real Estate: Team responsible for the environmental and land analysis of the properties, essential to analyze the viability of the project. It works mainly in synchrony with the legal department.

ii. Climate: Team responsible for conducting the project's general and climate chapters following the CCB+VCS standard and for project risk analysis. Acts in the collection of forest biomass data from the literature and in loco through forest inventories.

iii. Communities: Team responsible for socioeconomic diagnosis and engagement and articulation with communities and other stakeholders. It also operates in the development and monitoring of social indicators.

iv. Biodiversity: Team responsible for carrying out the biodiversity diagnosis and conducting the project's biodiversity chapter following the CCB+VCS standard. Acquires data from third parties, performs bibliographic research and validates field data.

v. GIS (Geographic Information System): Team responsible for collecting all the project's geospatial data and executing all the maps necessary for its development. Acts by supporting all other areas of the project.

vii. Planning: Team responsible for administrative and financial management of the generation projects, involving cash control and financial projections, as well as support in planning field logistics for the communities.

vii. Data analysis: responsible for prospecting new areas for project execution. Integrate databases for preliminary analysis. Contribute to monitoring.

2.4.2 Required Technical Skills (G4.2)

In order to implement the Jatobá project knowledge on development and management of projects related to the conservation of the Amazon biome is required. In addition, carbon measurement and monitoring expertise, development of activities in conjunction with the community and monitoring and evaluation of biodiversity are needed.

The project proponents have the necessary technical skills for its implementation. section **2.4.3** demonstrates the competencies of the specialized team of Terra Vista Gestora de Recursos Ltd. allocated in the project.

2.4.3 Management Team Experience (G4.2)

The management team is made up of qualified professionals (Table 14) who have the necessary technical skills for the implementation and execution of the project.

Table 14. Members of Terra Vista Gestora de Recursos Ltd. who are part of the Jatobá project management team, their respective positions and qualifications.

Name	Position and Role in the Project	Technical Qualification and Professional Experience
Ana Karoline Brasil Soares	Environmental and land property Analyst	Forest Engineer by Universidade Federal University do Amazonas (UFAM). Postgraduate in Socio-Environmental Business by ESCAS IPÊ. More than 3 years of market experience in Timber Forest Management projects, Forest Inventories, Degraded Areas Recovery Projects and CAR Rural Environmental Registry in the States of Amazonas, Roraima, Rondônia and Pará.
Karoline Pantoja do Nascimento	Environmental and land property Analyst	Bachelor of Laws from the Universidade da Amazônia - UNAMA. Post graduate in Environmental Law from Estácio de Sá. Post graduate in Agri-Environmental Law from CESUPA. Specialist in triple environmental responsibility. Experience in environmental and land regularization of rural properties. Vice President of the Rural Properties Commission of the Environmental Law Institute -IDAM.

Felipe Mendes Godoy	Legal Coordinator	Responsible for the legal coordination of the demands related to carbon credit projects, including drafting contracts after technical approval from the area and managing the day-to-day legal demands of the projects. Lawyer graduated from Mackenzie University (2011), Post graduate in land law from FGV (2015), MBA in Environmental Technology Management (2019). Over 12 years of experience in environmental and land law consulting.
Alan de Brito	Project Coordinator	Forest Engineer and Master Degree in Management of Production Forests by Universidade Federal de Lavras (UFLA). Ph.D in Earth System Science by Instituto Nacional de Pesquisas Espaciais (INPE) e Humboldt-Universität zu Berlin - HU. Experience in monitoring native vegetation and deforestation projects, as well as accounting for Greenhouse Gas (GHG) emissions. Member of the Technical Working Group on Reduction of Greenhouse Gas Emissions from Deforestation and Forest Degradation (GTT REDD+) of Ministério do Meio Ambiente (MMA). Currently working in the technical coordination of REDD+ and Forest Restoration projects.
Rafaela Martins	Climate Coordinator	Forest Engineer and Master in Environmental and Forestry Sciences with emphasis in Silviculture and Forest Management (UFRRJ), and Ph.D. student in Forest Sciences with emphasis in Silviculture at Universidade Federal de Viçosa (UFV).
Leandro Silva Rodrigues	Climate Specialist	Forest Engineer by Universidade Federal de Lavras (UFLA) with 15 years of experience in environmental and land tenure consulting for rural properties, georeferencing, forest management and forest inventory of native forests.
Ana Carla Netto da Silva	Climate Specialist	Environmental Engineer, Master degree in Environmental Technology and Water Resources. One year of professional experience as a Climate Change consultant.

Luciane Cristina Lazzarin	Climate Specialist	Forest Engineer by Universidade do Contestado (UnC). Master degree in Forest Science by the Universidade do Estado de Santa Catarina (UDESC). Ph.D. in Forestry Sciences by Universidade Estadual Paulista (UNESP). Ph.D. Sandwich in Kansas State University - USA. Experience in the preparation of environmental licensing projects. Over 15 years of experience teaching undergraduate and graduate courses (Forest Engineering, Environmental Engineering, Civil Engineering, Agronomy, Biology, Architecture); Guidelines for project of course conclusion and environmental sustainability in partnership with Community. Currently working as a Climate Change Specialist on REDD+ and Forest Restoration projects.
Maria de Fátima Sandoval Nery	Climate Specialist	Forest Engineer by the Federal University of Amazonas, Post-graduate student in Management, Auditing and. Over 2 years of experience in environmental project analysis, Technical Reports, Maps, Geoprocessing, inspection surveys, Fauna and Flora inventories, environmental licensing.
Gustavo Fernandes Moura	Community Specialist	Bachelor in Social Sciences and graduate student in Data Science at the Universidade de São Paulo.Over 9 years of experience in research and development of socioeconomics, culture, cultural heritage, and archeological heritage projects with traditional communities.
Vivian Fernanda Carneiro Martins	Community Specialist	Forest Engineer, postgraduate in Sustainable Regional Development and in Quality, Environment and Safety Management. Over 15 years of experience in the elaboration and coordination of socio-environmental projects in the Amazon.
Arthur Augusto Santos	Community Specialist	Bachelor of Social Sciences by Universidade Federal do Espírito Santo (UFES). Master's student in Social Sciences with a focus on Socio-environmental Studies, Cultures and Identities - PGCSO/UFES. Experience planning and evaluating actions to repair socio-environmental damages, focusing on indigenous peoples, quilombolas and other peoples and traditional communities, and experience in environmental licensing with a focus on the socio-

		economic area, mainly with regard to the way of life of rural populations, fishermen and traditional.
Henrique Hugbert de Oliveira Reis	Community Specialist	Social Scientist graduated by Universidade Federal do Pará. Experience in REDD+ projects with traditional communities, reports and project documents in VCS and CCB methodology, monitoring audits in REDD+ projects, production and execution of participatory rural diagnosis and socioeconomic surveys.
Gabriela Magalhães	Biodiversity Coordinator	Biologist, specialist in Environment by COPPE/UFRJ, Master in Botany and MBA in Business Management by USP. Over 8 years of experience in the development and coordination of socio-environmental projects, biodiversity analysis and environmental licensing.
Nathália Vieira Hissa Safar	Biodiversity Specialist	Biologist, Master in Botany and PhD student in Botany with emphasis in Forest Ecology at Universidade Federal de Viçosa, over 7 years of experience in forest dynamics studies, assessing the resilience of tropical forests and their role in biodiversity conservation and carbon mitigation.
Thiago França Shoegima	Geoprocessing Coordinator	Geographer graduated by USP, specialist in Environmental Management by SENAC/SP and Graphic Design by Anhembi Morumbi. Master Degree in Physical Geography by USP, Ph.D. student in Environmental and Territorial Analysis at UNICAMP. Over 15 years of experience in Spatial Analysis, Licensing and Environmental Impact Assessment projects.
Henrique Lemes Bezerra	Geoprocessing Specialist	Bachelor degree in Geography by the Federal University of Mato Grosso (2019). Master degree in Physical Geography by Universidade de São Paulo (USP). Experience in soil erosion control, pedology and clay mineralogy. Experience in geoprocessing and remote sensing techniques using ArcGIS and QGIS software. Experience in analysis and description of the physical environment: geomorphology, geology, land use, pedology and climate variables (ADA, AID and AII). Experience teaching at the university level

		(undergraduate and graduate). Experience in Rural Environmental Cadastre as Environmental Analyst at SEMA-MT (2022 - 2023). Theoretical and practical experience in carbon credit (REDD+) projects of Verra certification (VCS & CCB), in delimiting reference regions (RRL, RRD), leakage belt, deforestation rate and baseline (of AFOLU scope AUD).
Luíza Pagel Classen	Planning Coordinator	Production Engineer graduated by UFRGS, with a sandwich degree at ESB Business School, in Germany, and specialization in Strategy and Marketing at the University of La Verne, USA. Several complementary management courses, such as Project Management and Management by OKR. Over 8 years of experience in company and project management, with emphasis on structuring and optimizing processes and workflows. She has worked in the financial market in a VC and PE fund manager, in the tourism market as Planning and Expansion Coordinator (CVC Viagens) and also with international experience at BMW, in Germany. Currently she is the Planning Coordinator of the company, also accumulating the role of PMO of the carbon credit origination projects.
Tiago Fronza Machado	Planning Assistant	Production Engineering by Universidade Federal do Rio Grande do Sul, with international experience at Hult International Business School (USA) and Universidad de Valladolid (Spain). He has experience with management consulting and controlling, economic feasibility analysis processes, and project management.
Thiago de Assis Massara	Data lead	He contributes to the project with the development of a tool that helps prospect areas with potential/viability to implement carbon projects and monitors the areas. Graduated in Economics from PUC Minas and in General Sciences with emphasis in Statistics from the University of Manitoba (CA), specialized in programming and data engineering, has over 7 years of experience working in the technology field in algorithm development and statistical and predictive modeling in companies like IdWall, Telefonica and Google. Data Lead, responsible for implementing and automating prospecting processes and statistical analysis on big data.
Ana Pris	Data Integration Analyst	I contribute to the project by consolidating and automating data from public sources, inspection and control agencies, and georeferenced files for our area prospection and monitoring tool. Internet Systems Technologist, has been

		working for 5 years with systems and data integration. Building, managing and maintaining data pipelines

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

GUAXINIM Soluções Ambientais Ltd. collaborates on the project with the preparation and execution of the forest inventory and fauna diagnosis.

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

Terra Vista Gestora de Recursos Ltd. is a Brazilian company with proven experience in the environmental carbon credit market and has investors who support the company's business plan for the coming years.

The company has a financial department responsible for cash flow management. The project budget is defined and revised monthly, based on the analysis of the balance between the 'actual vs. budgeted' expenditure related to the foreseen activities. Terra Vista Gestora de Recursos Ltd. raised enough funds from investors to guarantee the execution and maintenance of the project.

The documents that prove the financial health of the structure created to develop the project and of the company Terra Vista Gestora de Recursos Ltd. are classified as Commercially Sensitive Information and will be shared with the audit team on a confidential basis.

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

Terra Vista Gestora de Recursos Ltd. Gestora de Recursos has a common Code of Ethics and Conduct used by the entire Economic Group to which it belongs. The document provides guidelines for its employees to fight and denounce all forms of corruption, especially when its objective is the control of information, and also provides, as prohibited acts in the corporate environment, the maintenance of any involvement in irregular or corrupt practices.

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

Some documents are considered commercially sensitive, for this reason, they are confidential and cannot be published by the project proponents. These documents can be accessed by the third party audit team during the validation process, however they were not included in the public version. Below is a list of commercially sensitive documents:

- Contract between the bidders;
- Documents referring to property rights;
- Registers of community residents;

- Documents proving financial health:
    - Financial statement;
    - Bank statements;
    - Management financial statements.

2.5 Legal Status and Property Rights

2.5.1 Statutory and Customary Property Rights (G5.1)

The project area is the private property of Seringal São Miguel SPE Ltd., holder of all ownership, access and use rights.

The project area comprises the rural property called Jatobá Preservação Agroflorestal Ambiental, located on the left bank of the Purus River, Francisco Sevalho State Farm, Rural Area, located in the municipality of Boca do Acre in the State of Amazonas, with a total area of 94,192.61 ha and perimeter of 197,239.83 m.

The property was certified by the National Institute of Colonization and Agrarian Reform (INCRA), the Brazilian federal agency whose objective is to maintain the national registry of rural properties. The property is registered under separate registrations with INCRA (CCIR) and the Brazilian Federal Revenue Service (NIRF/CIB). The land documents that prove the rights of use and ownership of the property were made available for audit.

2.5.2 Recognition of Property Rights (G5.1)

The project area is privately owned by Seringal São Miguel SPE Ltd. and his property rights are recognized, respected, and supported by Brazilian law (Table 15). The land documentation of the property will be made available to the validation and verification body at the time of the audit.

Table 15. Proof of land regularization of the benefited property.

Property	Property Area	Project Area	Landowner	INCRA
Jatobá Preservação Agroflorestal Ambiental	94,192.61	18,017.19	Seringal São Miguel SPE Ltd.	9999030848675

■ An expedition to the project area was carried out during the feasibility analysis phase to identify the existence of family nuclei. On this expedition there were no signs of land conflicts, as reported in the field surveys. The existence of family groups that acquired lots of land illegally was identified. The rightful owner of the land is the one who holds the title he paid for, who has paid all taxes due over the years, and who has the property registration. However, the project proponents protect the way of life of the community members and there will be no eviction or any change in the way of life of these people. Proponents are committed to drawing up free lease agreements to ensure the permanence of these community centers on the rural property where the Jatobá project is located.

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

The necessary consent for the development of the project was obtained from the partner-owner of the project area, a fully capable agent, willing to voluntarily execute the project, free of vices of consent. The contract was widely and freely negotiated, being accepted and signed by those who had the legal right to do so, as demonstrated by the signed partnership contract.

The riverside communities that use the project area for the extraction of non-timber forest products expressed their consent to be part of the project in public consultations that were conducted after prior disclosure of the project and clarification of all the community's doubts. In order to carry out the public consultations, the project was concerned with meeting the four stages established with the aim of making the consultation process more participatory and open to the communities.

Pre-mobilization

Initially, after the first contact and identification of the communities was carried out through prior contact with the community members, informing in advance the date of the meeting and the purpose of the public consultation.

Mobilization

Based on contacts via the internet and telephone, the field team visited the communities, articulating with the residents the ideal date for carrying out the consultation. It was established in common agreement with the project's development team, that in order to better serve the communities, local individual meetings and a public meeting would be held in the host city of Boca do Acre.

Execution

Between March 6th and 8th, the field team traveled to the project area and held conversations with the families that live there. Using informal language that is easy for traditional extractivists to understand, the project and its objective, the rights of squatters and the benefits it will bring to the region were explained. The activities were divided into individual interviews with riverside families and a meeting with a community group.

A total of 16 riverside families were consulted and interviewed. The individual public consultation was used in this case, instead of the collective one, due to the distance and the difficulty of locomotion of the families. In addition, the safety of the interviewees was considered, so that the exposition of ideas could be carried out without the coercion of leaders who exert financial influence on the community. At the end of each conversation with the community members in the project area, the interviewed families were asked if they supported the execution of the project, with a total of 16 acceptances recorded, duly recorded in audio and in a signed document.

A meeting was held with 8 families of extractivists at the home of one of the local leaders who acts as a middleman for chestnut trees and, for this reason, exercises power and influence over others. The meeting progressed extremely satisfactorily, in which those present understood the Project, the proposals and actions to be carried out. However, as its main activity is livestock, this leadership was against the project's activities.

On March 8, 2023, a public hearing was held for chestnut trees to join the project in the city of Boca do Acre. The meeting was attended by representatives of 7 chestnut extractive families and the participation of the local government in the presence of the Municipal Secretary for the Environment. After clarifying all doubts, the project was unanimously accepted by those present. The Free, Prior and Informed Consultation was carried out respecting all the rights of the participants.

Figure 24. Community member of Igarapé Curupati signing document supporting the project.

Figure 25. Community members approving the project at a Public Hearing in Boca do Acre.

For disclosure and transparency of the consultation process, minutes were drawn up containing the matters discussed, attendance lists and photos of the meeting. The minutes were signed by community members and technicians from Terra Vista Gestora de Recursos Ltda. and made available digitally to people with internet access and a smartphone. The minutes, the attendance list and the individual signature of acceptance to the project will be made available for consultation by the validation and verification body.

2.5.4 Property Rights Protection (G5.3)

Under Brazilian law, it is possible to state that the owner has the full right to use, enjoy and dispose of the assets that make up his property, having the legitimacy to allow the development of the project. With regard to public entities, whether state, federal or municipal, directly or indirectly administered, the certificates analyzed indicate the legitimacy of the title and ownership of the property.

The project does not lead to the involuntary removal or relocation of property rights holders from their lands or territories, nor will it displace traditional livelihood activities. In addition, the proponents maintain constant communication with the stakeholders through the communication channel established to protect the property rights of the owner and the maintenance of the traditional ways of life of riverside communities in the project area.

2.5.5 Illegal Activity Identification (G5.4)

Deforestation affects areas close to the riverside of *igarapé* São Francisco. In these areas, there are reports of deforestation for the implantation of pastures and cybernetic land grabbing. In addition, during field activities in the project area, many community members reported that into the area, crossing the *igarapé* São Francisco, there are already invasions and are starting to cut down the forest.

To combat the illegal activities identified, it is necessary to implement socio-educational actions with the aim of engaging the community and other regional actors, land inspection and property surveillance in the project area. The planned actions to prevent illegal activities in the Jatobá project area are described in Table 16.

Table 16. Actions and methods of operation for measures against illegal activities in the Jatobá project area.

Actions and methods of operation for measures against illegal activities	
Actions	Construction of a logistical support headquarters within the project area
	Carry out surveillance and monitoring of the project area
	Promote the prevention of illegal deforestation and fires, land grabbing and illegal mining in the project area and its surroundings
	Promote awareness and engagement in the environmental and climate issue of local actors and other stakeholders
	Disseminate socio-educational actions among regional actors and stakeholders
	Maintain a good relationship with communities that use the area for subsistence extractivism
	Support to State police and inspection authorities
	Surveillance via river patrol along rivers and streams (*igarapés*)
	Surveillance by remote monitoring with satellite images
Operation Methods	Sending a security team to the place of occurrence to investigate the fact
	Activation of the legal sector
	Registration of incident report at the police station
	Activate IBAMA and the Environmental Police when there is an environmental crime

2.5.6 Ongoing Disputes (G5.5)

The right to rural land is governed by the Constitution, the Land Statute and the Civil Code of 2002 (Law No. 10,406), which deals with family, inheritance, possession and property rights. In Brazil, land can be acquired through purchase, transfer of ownership (for example, through inheritance) and government allocations. The right to acquire land by prolonged occupation (usucapion) has existed in Brazil since 1916. It is relevant to mention the various Brazilian laws on the rights of squatters – adverse possession – which can be categorized as:

- Ordinary, governed by Law No. 10,406;
- Extraordinary, covered by article 1238 of the Civil Code;
- Rural special, described in article 191 of the Federal Constitution and;
- Extrajudicial measures, which may be carried out in a notary's office, and whose framework is provided for in art. 1.071 of the Code of Civil Procedure (Law No. 13.105/15).

The clauses of these laws establish that if a person owns an area, in some cases limited to 50 hectares, as if it were his own, for an uninterrupted period of five to 15 years, depending on the context, he is entitled to acquire the property document.

This is the main legal framework within which legitimate property rights claims can be made in the context of this project. However, no lawsuits relating to ownership or tenure of the properties have been identified.

The documents Plan and Descriptive Memorial of the property, issued by INCRA, whose code is 96ed5bc8-5b28-4605-b3c6-2cc80eeaf54f, certify that the traverse of the property Jatobá Preservação Agroflorestal Ambiental does not overlap with any other traverse contained in the georeferenced register of INCRA , which is one of the documents that proves the non-existence of conflict.

2.5.7 National and Local Laws (G5.6)

Proponents of the Jatobá project are committed to complying with applicable and relevant national, state and local laws, including statutes and regulatory frameworks.

International agreements:

- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1975;
- Convention on Biological Diversity (CBD), 1992;
- United Nations Framework Convention on Climate Change (UNFCCC), 1992;
- International Tropical Timber Agreement (ITTA), 1994;
- Kyoto Protocol, 1997;
- Cartagena Protocol on Biosafety to the Convention on Biological Diversity, 2000;
- United Nations Declaration on the Rights of Indigenous Peoples, 2007;
- Paris Agreement, 2015.
- UN IPCC report - report on climate change, 2023.

National laws:

- Brazilian Federal Constitution of 1988, under Title VIII, of the social order, in its Chapter VI, on the environment, article 225 "*Everyone has the right to an ecologically balanced environment, a good for common use by the people and essential to a healthy quality of life, imposing on the Public Power and the community the duty to defend and preserve it for present and future generations" and in its 1st paragraph, section III, provides "to define, in all units of the Federation, territorial spaces and their components to be specially protected, alteration and*

deletion being permitted only by law, any use that compromises the integrity of the attributes that justify their protection is prohibited";

Still in the aforementioned article, the Law provides in its § 4th "*The Brazilian Amazon Forest, the Atlantic Forest, the Serra do Mar, the Mato-Grossense Pantanal and the Coastal Zone are national heritage, and their use will be made, in law, under conditions that ensure the preservation of the environment, including the use of natural resources*".

Art. 68. Permanent ownership is recognized for the remnants of the quilombo communities that are occupying their lands, and the State must issue them the respective titles.

Art. 215. The State will guarantee to all the full exercise of cultural rights and access to sources of national culture, and will support and encourage the appreciation and dissemination of cultural manifestations.

§ 1º The State will protect the manifestations of popular, indigenous and Afro-Brazilian cultures, and those of other groups participating in the national civilizing process.

In its chapter II, which deals with social rights, in its articles n° 7, 8, 9, 10 and 11 there are labor laws.

- National Environmental Policy, provided for in Law 6,938 of 1981. The aforementioned Law determines in its Art. 6 "The bodies and entities of the Union, the States, the Federal District, the Territories and the Municipalities, as well as the foundations instituted by the Public Power, responsible for the protection and improvement of the environmental quality, will constitute the National Environment System - SISNAMA, structured like this:

"IV - executing agencies: the Brazilian Institute for the Environment and Renewable Natural Resources - IBAMA and the Chico Mendes Institute for Biodiversity Conservation - Chico Mendes Institute, with the purpose of executing and enforcing the governmental policy and guidelines established for the environment, according to their respective competences"; "

Furthermore, the Law provides in its Art. 9 that "The following are instruments of the National Environmental Policy:

VI - the creation of territorial spaces specially protected by the federal, state and municipal government, such as areas of environmental protection, of relevant ecological interest and extractive reserves".

- Forest Code, Law 12,651 of 2012. Provides for the protection of native vegetation; In your Art. 12 that:

"Every rural property must maintain an area with native vegetation cover, as a Legal Reserve, without prejudice to the application of the rules on Permanent Preservation Areas, observing the following minimum percentages in relation to the area of the property, except for the cases provided for in art. 68 of this Law:

I - located in the Legal Amazon:

a) 80% (eighty percent), in the property located in a forested area;

b) 35% (thirty-five percent), in the property located in a cerrado area;

c) 20% (twenty percent), in the property located in an area of general fields;

Also, its article 4 provides that "A Permanent Preservation Area is considered, in rural or urban areas, for the purposes of this Law:

I - the marginal strips of any perennial and intermittent natural watercourse, excluding ephemeral ones, from the edge of the channel of the regular bed, with a minimum width of:

a) 30 (thirty) meters, for water courses less than 10 (ten) meters wide;

b) 50 (fifty) meters, for water courses that are from 10 (ten) to 50 (fifty) meters wide;

c) 100 (one hundred) meters, for water courses that are 50 (fifty) to 200 (two hundred) meters wide;

d) 200 (two hundred) meters, for water courses that are from 200 (two hundred) to 600 (six hundred) meters wide;

e) 500 (five hundred) meters, for water courses that are more than 600 (six hundred) meters wide;

II - the areas surrounding natural lakes and ponds, in a strip with a minimum width of:

a) 100 (one hundred) meters, in rural areas, except for water bodies with up to 20 (twenty) hectares of surface, whose marginal range will be 50 (fifty) meters;"

- National Policy on Climate Change, provided for in Law 12,187 of December 29, 2009.

- National Payment Policy for Environmental Services, provided for in Law 14,119 of January 13, 2021. This Law establishes the National Payment Registry for Environmental Services (CNPSA) and the Federal Payment for Environmental Services Program (PFPSA).
- Civil Code, instituted by Law 10.406 of January 10, 2002. Article 1245 “Transfers between living persons to propertyCivil Code, instituted by Law 10,406 of January 10, 2002.”.

> *Art. 1.238. Whoever, for fifteen years, without interruption or opposition, owns a property as his own, acquires the property, regardless of title and good faith; being able to request the judge to declare it so by sentence, which will serve as a title for the registration in the Real Estate Registry Office.*

> *Art. 1.242. The person who, continuously and undisputedly, with just title and in good faith, owns it for ten years also acquires the property of the property.*

- Code of Civil Procedure, Law 13.105 of March 16, 2015.
- Statute of the Indigenous, Law 6001 of December 19, 1973.
- National Policy for Sustainable Development of Traditional Peoples and Communities, instituted by Decree 6040, of February 7, 2007. Art. 3. “I - Traditional Peoples and Communities: culturally differentiated groups that are recognized as such, that have their own forms of social organization, that occupy and use territories and natural resources as a condition for their cultural, social, religious, ancestral and economic reproduction, using knowledge, innovations and practices generated and transmitted by tradition;”

> *III - Sustainable Development: the balanced use of natural resources, aimed at improving the quality of life of the present generation, guaranteeing the same possibilities for future generations.*

- Consolidation of Labor Laws (CLT), Decree-Law No. 5,452, May 1, 1943.
- Regulatory Norms for Rural Work, established by Law 5,889 of June 8, 1973.

Amazon State Laws

- State Law No. 3,785, July 24, 2012, provides for environmental licensing in the state of Amazonas.
- Law No. 3,789, July 27, 2012, provides for forest replacement in the state of Amazonas..
- State Decree No. 32,986, November 30, 2012. Regulates Law No. 3,789/2012, which provides for forest replacement in the state of Amazonas.

2.5.8 Approvals (G5.7)

Currently, Brazil does not have a specific authority for the management and approval of projects that generate voluntary carbon credits, so there was no need for such approval.

The project Proponents gained recognition and approval of project implementation through meetings, community consultations, as well as consultations with other project stakeholders

Although there is no specific need for approval by any administrative body, the project was designed and will be conducted in accordance with the rules and principles of administrative bodies in Brazil, such as IBAMA, FUNAI, INCRA and ICMBIO. Proponents declare to follow all laws applicable to the country and the state of Amazonas.

2.5.9 Project Ownership (G5.8)

As previously informed, the project area consists of a rural property called Jatobá Preservação Agroflorestal Ambiental belonging to Seringal São Miguel SPE Ltd., the documentation that proves the property was made available for the audit.

2.5.10 Management of Double Counting Risk (G5.9)

The project does not intend to generate or receive any form of environmental or social credit, including certificates related to GHG emissions reductions or renewable energy. Emissions reductions resulting from the implementation of these project activities will not be used to meet emissions reduction targets of any other REDD program or mechanism.

2.5.11 Emissions Trading Programs and Other Binding Limits

Not applicable. This is the first time that a carbon credit project is developed in this area, with no overlapping of the area with any other program for issuing credits.

2.5.12 Other Forms of Environmental Credit

Not applicable. The project is not registered nor is it seeking registration in any other GHG program besides the VCS and CCB.

2.5.13 Participation under Other GHG Programs

Not applicable. The project is not registered nor is it seeking registration in any other GHG program besides the VCS and CCB.

2.5.14 Projects Rejected by Other GHG Programs

Not applicable. The project is not registered nor is it seeking registration in any other GHG program besides the VCS and CCB.

2.5.15 Double Counting (G5.9)

Not applicable.

3 CLIMATE

3.1 Application of Methodology

3.1.1 Title and Reference of Methodology

This REDD project is applying the Climate, Communities and Biodiversity (CCB) and Verified Carbon Standard (VCS) with the intention of reducing CO_2 emissions from planned (APD) deforestation compared to baseline levels. As required by VM0007[130], the project area consists of contiguous, discrete areas covered by forest that meet the definition of eligible forest, which would be an area that has been forest for at least 10 years prior to the project start date.

The list below refers to the methodologies, modules, and tools used within the project:

Approved VCS Methodology:

- VM0007 "REDD+ Methodological Framework (REDD+FM)", v1.6.

Carbon Reservoir Modules:

- VMD0001 "Estimation of carbon stocks in the above and below ground biomass of the live and non-tree tree pool" (CP AB), v1.1".
- VMD0005 "Estimation of carbon stocks in the long-term timber product pool (CP W), v1.1".

Baseline Module:

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

Leakage Module:

- VMD0009 "Estimated emissions from activity change to avoid planned deforestation/forest degradation and avoid planned wetland degradation (LK ASP), v1.3".
- VMD0011 "Estimation of emissions from market effects (LK ME), v1.1".

[130] VM0007 "REDD+ Methodological Framework (REDD+ MF)," v1.6. Available at: https://verra.org/methodologies/vm0007-redd-methodology-framework-redd-mf-v1-6/ . Accessed on: 14/12/2022.

Various Modules:

- VMD0013 "Estimation of Greenhouse Gas Emissions from Biomass and Peat Burning (E BPB), v1.2".
- VMD0016 "Methods for project area Stratification (X STR), v1.2".
- VMD0017 "Estimation of Uncertainty of REDD Project Activities (X UNC), v2.2".

Tools:

- "Combined tool to identify baseline scenario and demonstrate additionality in F/R CDM project activities (T ADD), v01".
- CDM "Executive Board. Tool to test the significance of GHG emissions in F/R CDM project activities (v01)" EB 31.
- AFOLU "Non-Permanence Risk Tool. Procedural Document, VCS, v4.0.[131]

3.1.2 Applicability of Methodology

The applicability conditions of the VM0007 methodology and its associated modules are detailed in Table 17 below.

Table 17. Applicability criteria for the Jatobá project.

Applicability Criteria	Description
All project activities	
All areas of land registered under the CDM or any other GHG program (either voluntary or compliance oriented) should be transparently reported and excluded from the project area. The exclusion of land in the project area from any other GHG program should be monitored over time and reported in monitoring reports.	The Jatobá project is not registered in any carbon trading system or program.
All types of REDD activity	

[131] AFOLU "Non-Residency Risk Tool" VCS Version 4, Procedural Document. Available at: http://www.vcs.org/programdocuments. Accessed on: 19/04/2022.

This REDD+ activity is applicable due to the following conditions: ● Land in the project area has been qualified as forest for at least 10 years prior to the project start date; ● Baseline deforestation in the project area falls under the categories of unplanned deforestation (VCS AUD category) and planned deforestation/degradation (VCS APD category); ● Leakage prevention activities do not include: i) Agricultural land that is flooded to increase production (e.g. rice paddies); ii) Intensification of livestock production through the use of feedlots and/or manure lagoons.	Land in the Jatobá project area has qualified as forest (following the definition used by the VCS and the Brazilian National Agency definition of forest - SNIF, 2018) for at least the 10 years prior to the project start date. Baseline deforestation in the project area falls into the activity categories: unplanned deforestation (VCS AUD category) and planned deforestation/degradation (VCS APD category). Activities to prevent leakage do not include: (i) agricultural land that is flooded to increase production (e.g. paddy rice); ii) Intensifying livestock production through the use of feedlots and/or manure ponds.
VMD0001 "Estimation of carbon stocks in above- and below-ground biomass in live tree and non-tree pools" (CP-AB), v1.1	
The module allows for the *ex-ante* estimation of carbon stocks in tree and non- tree above and below ground biomass in the baseline scenario (for both pre- and post-deforestation stocks) and in the project case and for the ex-post estimation of the change in carbon stocks in tree above and below ground biomass in the project case.	This module is applicable to all forest phytophysiognomies and age classes. The inclusion of the above ground tree biomass pool as part of the project boundary is mandatory according to the REDD-MF module.
VMD0005 "Estimation of Carbon Stocks in the Long-Term Wood Products Pool" (CP-W), v1.1	
This module allows for the *ex-ante* estimation of carbon stocks in the long-term wood products pool in the baseline scenario. The carbon stocks addressed here are those remaining in wood products after 100 years; most of the emissions associated with harvesting, processing and waste of wood and eventual removal of products occur within this timeframe, and this module employs the simplifying assumption that the proportion remaining after 100 years is effectively 'permanent'.	This module is applicable to all cases where timber is harvested for conversion into timber products for commercial markets, for all forest phytophysiognomies and age classes. This module is applicable in the baseline, as the wood products pool is included as part of the project boundary, as per applicability criteria in the REDD-MF framework module, specifically: ● Timber harvesting occurs before or during the deforestation process, and the timber is destined for commercial markets;

	• The wood product pool is determined to be significant (using T GIS).
VMD0006 "Estimating Baseline Carbon Stock Changes and Greenhouse Gas Emissions from Planned Deforestation/Forest Degradation and Planned Wetland Degradation" (BL-PL), v1.3	
The module allows you to estimate changes in carbon stock and GHG emissions related to planned deforestation, planned forest degradation, and planned wetland degradation in the baseline scenario.	The module is applicable for estimating baseline emissions on forest lands (usually privately or government owned) that are legally permitted and documented to be converted to non-forested lands. Where, pre-project, unsustainable fuelwood collection is occurring within project boundaries, the BL-DFW and LK-DFW modules should be used to determine potential leakage.
VMD0009 "Estimated Emissions from Activity Change to Avoid Planned Deforestation/Forest Degradation and Avoid Planned Wetland Degradation" (LK-ASP), v1.3	
The module allows estimation of GHG emissions caused by activity change leakage from planned deforestation carbon projects. The module is applicable for estimating leakage emissions due to activity change from legally permitted and documented forest lands to be converted to non-forest lands, including activity change to forested wetlands drained or degraded due to project implementation. The module is also applicable for estimating leakage emissions due to activity displacement from legally authorized and documented non-forested wetlands to be converted and degraded. In these situations, the displacement of baseline activities can be controlled and measured directly by monitoring baseline deforestation or wetland degradation agents or class of agents. This tool should be used for projects in areas where planned deforestation occurs in forested wetlands, regardless of the absence of wetland within the project boundary.	The module is mandatory if the BL- PL Module is used to define the baseline, and the applicability conditions in the BL-PL Module must be met in full.
VMD0011 "Estimation of Market Effects Emissions" (LK-ME), v1.1	
The module allows estimating GHG emissions caused by leakage from market effects related to timber extraction for wood, fuelwood or charcoal in the baseline for carbon projects. It is applicable for calculating market effects leakage from REDD projects that are expected to reduce timber harvest levels substantially and permanently. Where REDD project activities result in reductions in timber harvest, it is likely that production can be shifted to other areas of the country to compensate for the reduction. As referenced in the Framework (REDD-MF), the module is mandatory where:	The module is mandatory when the deforestation process involves the extraction of timber for commercial markets.

● The deforestation process involves harvesting timber for commercial markets. ● Baseline is calculated using BL-DFW AND firewood or charcoal is harvested for commercial markets. In all other circumstances, the module should not be used.	
VMD0013 "Estimation of Greenhouse Gas Emissions from Biomass Burning" (E-BB), v1.2	
This module provides a step-by-step approach to estimating greenhouse emissions from biomass and peat burning. This module is applicable to REDD project activities with emissions from biomass burning and REDD-WRC project activities with emissions from biomass and/or peat burning. This module is also applicable to RWE and ARR-RWE project activities with emissions from peat burning.	In the baseline scenario, fire is used to clear land, resulting in emissions of CO_2, N_2O and CH_4. When used in the baseline, accounting must occur both under the baseline and in the project scenario and both in the project area and in the leakage belt. Where fires occur ex-post in areas that coincide with deforested or degraded areas in the baseline, the module should be used to account for greenhouse gas emissions.
VMD0016 "Methods for Stratification of project area" (X-STR), v1.2	
This module provides guidance on how to stratify the project area into discrete, relatively homogeneous units to improve the accuracy and precision of carbon stock and carbon stock change estimates.	Strata are only used for forest classes under deforestation pressure and are the same in the case of the baseline and project scenario. The post-deforestation (conversion) scenario is not stratified, instead the average of the carbon stock values for post-deforestation land uses is applied observing the guidelines of Modules BL-UP and BL-PL.
VMD0017 "Estimation of Uncertainty for REDD Project Activities" (X-UNC), v2.2	
The module allows you to estimate uncertainty in baseline estimates and in project estimates of sequestration, emissions, and leakage. The module focuses on the following sources of uncertainty: ● Determination of deforestation and degradation rates ● Uncertainty associated with estimating carbon stocks and changes in carbon pools ● Uncertainty associated with estimating peat emissions ● Uncertainty in assessing project emissions When an uncertainty value is not known or cannot be simply calculated, the project must justify that it is using an arguably	This module is mandatory when using the REDD+ MF methodology.

conservative number and an uncertainty of 0% can be used for this component.	
VT0001 "Tool for Demonstrating and Assessing Additionality in Agriculture, Forestry and Other Land Use (AFOLU) Project Activities" (T-ADD), v3.0	
• AFOLU activities the same or similar to the proposed project activity on the land within the proposed project boundary, performed with or without registration as a VCS AFOLU project, will not lead to a violation of any applicable law, even if the law is not enforced. • The use of this tool to determine additionality requires that the baseline methodology provide a stepwise approach that justifies the determination of the most plausible baseline scenario. Project proponents proposing new baseline methodologies should ensure consistency between the determination of a baseline scenario and the determination of the additionality of a project activity.	• As stated in section 2.3.16, the project is in compliance with all relevant laws, statutes and regulatory frameworks. • The approach to define the baseline scenario using this tool was described in section 3.1.4.

■

3.1.3 Project Boundary

The project area is located in the municipality of Boca do Acre (AM), specifically in Seringal São Miguel (Figure 2, section **2.1.5**). The area of the property is 94,090.42 ha and extends from the northern banks of the Purus River in its southern portion to the São Francisco stream at the northern end. To the east it borders the Igarapé Capana Indigenous Land (IT), of the Jamamadi indigenous people, and to the west with Incra's Gleba B37.

GHG Emission Sources

Methodology VM0007 includes the six carbon pools listed in the table below, indicating whether they were included or excluded within the proposed APD project activity, as well as their respective justifications.

Table 18. GHG sources included or excluded within the boundaries of the Jatoba project area.

Source		Gas	Included	Justification/Explanation
Baseline	Biomass burning	CO_2	Excluded	Excluded by recommendation of the methodology applied. Counted as change in carbon stock.
		CH_4	Included	Included as non-CO_2 emissions from biomass burning in the baseline scenario, according to the methodology.

Source		Gas	Included	Justification/Explanation
		N_2O	Included	Included as non-CO_2 emissions from biomass burning in the baseline scenario, according to the methodology.
		Other	Excluded	No other GHGs were considered in this project activity
	Emissions from livestock	CO_2	Excluded	Not a significant source
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
		Other	Excluded	No other GHG gasses were considered in this baseline activity.
Project	Biomass burning	CO_2	Excluded	No increase in biomass burning is predicted to occur in the project scenario compared to the baseline case. Therefore, it is considered insignificant.
		CH_4	Included	Included as non-CO_2 emissions from biomass burning in the project scenario, according to the methodology.
		N_2O	Included	Included as non-CO_2 emissions from biomass burning in the project scenario, according to the methodology.
		Other	Excluded	No other GHGs were considered in this project activity.
	Emissions from livestock	CO_2	Excluded	It is not a significant source.
		CH_4	Excluded	No expansion of livestock is planned to occur in the project scenario compared to the baseline case. Therefore, it is considered insignificant.
		N_2O	Excluded	No expansion of livestock is planned to occur in the project scenario compared to the baseline case. Therefore, it is considered insignificant.
		Other	Excluded	No other GHGs were considered in this project activity.

Carbon Stocks

The carbon stocks included in the project, as well as their justification, are presented in Table 19 below, considering the proposed scope of the PDPA activity.

Table 19. Carbon storage compartments included or not in the Jatobá project.

Carbon stocks	Included/Excluded	Justification

Aboveground Biomass	Tree: included	The carbon stock change in this stock is always significant and mandatory according to VM0007.
	Non-tree: included	Stock included in the forest class in the baseline scenario.
Belowground Biomass	Tree: included	Significant carbon stock.
	Non-tree: included	Significant carbon stock.
Dead wood	Included	Not required by the methodology. Included in the project because it represents more than 5% of the trees' woody biomass, therefore significant as indicated by the T-SIG tool.
Litterfall	Excluded	Stock considered insignificant in REDD projects, its inclusion is optional.
Soil organic carbon	Excluded	Recommended when forests are converted to agricultural crop areas. Should not be measured in conversion to pasture and crops.
Long-term wood products	Excluded	The project activities do not include commercial logging.

Temporal Boundaries

A historical reference period from 2010 to 2020 was used to define project eligibility, and deforestation and forest degradation rates for *ex-ante* estimates of GHG emissions under the project scenario, following criteria VM0007 v1.6, section 5.2.1 and VMD0015 v2.2, section 2. The start and end dates of the crediting period for the Jatobá project are defined in sections **2.1.14** and **2.1.15**, respectively. The re-evaluation of the baseline will be performed considering the period of 10 years after the project start date.

3.1.4 Baseline Scenario

For the Jatobá project, the conversion of forest land to non-forest land in the baseline scenario is considered to be given from the perspective in the component: Avoided Planned Deforestation (APD). The ability of the landowner to bear the efforts and costs to maintain long-term surveillance of the project boundary to avoid planned deforestation is not real.

The Jatobá project assumes the conversion of forest cover limited to 20% of the property area, based on the legal permissibility of the Forest Code - Law 12.651/2012[132] . In this scenario the area equivalent to the 20% of the property would be subject to clear cutting, followed by conversion to pasture.

Thus, the project falls into the category of AFOLU REDD projects for Planned Avoided Deforestation (PPA).

Selecting the most likely baseline scenario for the project - APD

The APD component of the Jatobá project avoids deforestation of 18,017.19 ha of planned deforestation between 2020 and 2029.

This component relates to forest land that can legally receive authorization to be converted to non-forest land by project proponents, which will not occur as a result of the Jatobá project activity. According to the Brazilian Forest Code, proponents can suppress up to the prescribed legal limit of 20% of the property. The deforestation agent class in the APD component is the owner of land suitable for livestock and timber extraction.

Deforestation area

According to the methodology, the deforestation area (Planned) is defined as an immediate threat of deforestation specific to the site, which can be demonstrated by the legal permission for deforestation, since every rural property must maintain an area of native vegetation as the Legal Reserve (RL), in addition to the Permanent Preservation Area (APP), observing the minimum required according to the biome. For properties located in the Legal Amazon, the percentage is 80%. Thus, deforestation in the Legal Amazon of a maximum of 20% of the area of the property is legally permitted. The authorizations for alternative land use present a series of conditions that must be met in accordance with the state's environmental legislation. Among the conditions of the license, the prohibition of logging in Permanent Preservation Areas (APP) stands out. Besides the legal permissibility for deforestation, the suitability of the project area for forest conversion into another alternative land use was evaluated considering factors such as soil, climate (see section 2.1.5) and, finally, access to relevant markets and the main economic activity of the region. The municipality of Boca do Acre is economically based on livestock, being among the ten largest livestock in the state of Amazonas[133], and has, to a lesser extent, extractivism and family agriculture. About 86.2% of the municipality's territory is composed of natural forest formations and 12.8% of areas dedicated to

[132] New Brazilian Forest Code. Available at: https://www.planalto.gov.br/ccivil_03/_ato2011-2014/2012/lei/l12651.htm. Accessed on 13/01/2023.

[133] IBGE. Brazilian Institute of Geography and Statistics. Livestock 2022. Available at: <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/pesquisa/18/16459>. Accessed on: 22/09/2022.

agriculture and pasture[134]. Therefore, it is assumed that the project area is inserted in an economic matrix dominated by livestock activity, being the main economic activity in the region.

Deforestation rate

The deforestation rate (D%planned,ei) is defined according to the analysis of proxy areas presented in Table 20. In the case of the project under study, there is no management plan defined for the project areas (PA) and we sought to identify proxy areas among the municipalities adjacent to the municipality where the project areas are located, located in the state of Amazonas, such as, Boca do Acre, Eirunepé, Envira, Ipixuna, Itamarati, Lábrea and Pauini, and in the state of Acre, such as Acrelândia, Assis Brasil, Brasiléia, Bujari, Capixaba, Epitaciolândia, Feijó, Jordão, Manoel Urbano, Plácido de Castro, Porto Acre, Rio Branco, Santa Rosa do Purus, Sena Madureira, Senador Guiomard, Tarauacá and Xapuri.

The region presents the same pattern in the advance of deforestation, and the proxy areas can be considered adequate for the quantification of the rate of planned deforestation estimated for the baseline, according to the tool "VCS VMD0006 - Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation/forest degradation and planned wetland degradation". For the determination of the proxy areas, the land use and land cover class chosen for the project baseline was pasture. For the analysis of the Risk of Abandonment (Risk of Abandonmet, section 1.5, VMD0006, Version 1.3), properties were selected with land use classified as "Pasture" according to the MapBiomas 7.0 collection updated for the year 2021, considering that none of the selected areas had restoration or revegetation by specific activities or abandonment, remaining the land use chosen for the baseline comparison due to the recent update date of the MapBiomas base.

We selected only areas of private properties that are registered in the Rural Environmental Cadastre (CAR), with a duly registered legal reserve. The base registries were accessed in the month of April 2023.

After initial filtering by baseline land use, by property registration in official government databases, each proxy area was selected based on the following criteria, according to the cited tool:

- Land conversion practices must be the same as those used by the baseline agent or agent class.
- Land conversion practices are the same as those used by the baseline agent and are similar in large-scale clearings in the same region, usually involving mechanized clearing and burning;
- Post-deforestation land use should be the same in the proxy areas as expected in the project area under business as usual.

[134] MapBiomas. MapBiomas Brasil collections. Available at: <https://mapbiomas.org/>. Accessed on: 22/09/2022.

- As detailed above, the areas were chosen according to the post-deforestation land use type, classified as "Pasture" by MapBiomas for the year 2021 according MapBiomas.

The proxy areas should have the same type of management and land use rights as the proposed project area in business as usual. And all the chosen proxy areas are privately owned, just like the project areas.

If suitable sites exist, they should be in the immediate project area; if an insufficient number of sites exist in the immediate project area, sites should be identified elsewhere in the same country as the project; if an insufficient number of sites exist in the country, sites should be identified in neighboring countries.The source consulted was the CAR[135] base (SICAR, 2023).

Deforestation agents in proxy areas must have deforested their lands under the same criteria that project lands must follow (legally permitted and suitable for conversion).

Only legally deforested areas were considered, with proportions within the legal limits. The proxy areas were analyzed for Legal Reserve (LR) and Permanent Protection Area (PPA) areas registered in the CAR, and only deforestation in areas outside of legally protected areas was accounted for.

Deforestation in the proxy area must have occurred in the 10 years prior to the baseline period.

The areas were deforested between 2012 and 2021, in the 10 years prior to the project start date, December 2021. The source consulted was PRODES[136] (INPE, 2022).

The following conditions were met:

Forest types around the proxy area or in the proxy area prior to deforestation must be in the same proportion as in the project area (±20%). The reference source was the BDIA[137] portal (IBGE, 2022), which contains the most detailed official vegetation delineations currently available.

Soil types suitable for the land use practice used by the deforestation agent must be present in the proxy area in the same proportion as the project (±20%). The reference source was the BDIA portal (IBGE, 2022), which contains the most detailed official pedology delimitations currently available.

The ratio of "gentle" (slope <15%) to "steep" (slope ≥15%) slope classes in proxy areas should be ±20% in the same ratio in the project area. Slope was calculated using the SRTM Digital Elevation Model provided by the Brazilian Agricultural Research Corporation[138] (EMBRAPA, 2023).

[135] Platform for public access to environmental cadastre data of Brazilian rural properties. Available at: <https://www.car.gov.br/publico/imoveis/index>. Accessed on: 20/04/2023.

[136] PRODES is a mapping of accumulated deforestation in the Amazon, carried out by the National Institute for Space Research available on the Terrabrasilis platform. Available at: <http://terrabrasilis.dpi.inpe.br/downloads/>. Accessed on: 20/04/2023.

[137] BDIA (Environmental Information Database) is the environmental database made available by the Brazilian Institute of Geography and Statistics. Available at: <https://bdiaweb.ibge.gov.br/>. Accessed on: 20/04/2023

[138] EMBRAPA, 2023. "Brazil in relief." Available at: <https://www.cnpm.embrapa.br/projetos/relevobr/>. Accessed on: 20/04/2023.

The elevation classes (500m classes) in the proxy areas should be in the same proportion as in the project area (±20%). The hypsometry was calculated using the SRTM Digital Elevation Model provided by Embrapa. Initially numerous proxy areas were selected and after filtering based on the VMD0006 tool, only those that best met legal deforestation conditions were maintained. With this, we defined 6 proxy areas that meet the legal proportions of deforestation, area size and all the conditions related to the methodological criteria (Table 20).

Table 20. Selected proxy areas, deforestation, deforestation rate, and legal reserve (LR).

Proxy	Property Code (Rural Environmental Cadastre - CAR)	Area (ha)	Deforestation (ha)	Useful Area	Deforestation x Useful Area (%)
1	AM-1300706-0083FC780F964D519D98493CC3BD9896	348.50	74.28	76.65	96.90
2	AM-1300706-FA99CA533C834FC4A16634D828D6A695	392.60	63.38	69.16	92.64
3	AM-1300706-A289AB3F10044F8487ABF7918F66B9A6	2,500.80	197.21	197.20	100
4	AM-1300706-D4086E1A925E4FE396EE57D73C004596	460.40	21.71	21.71	100
5	AM-1300706-E5C6F216A96C40C3ABD1E6BA61BE75D1	34.20	10.82	10.82	100
6	AM-1300706-CEF5A817AF634EFDB71CA7DE310F0EDD	3,584.30	213.87	213.87	100
1	AM-1300706-0083FC780F964D519D98493CC3BD9896	348.50	74.28	76.65	96.90
2	AM-1300706-FA99CA533C834FC4A16634D828D6A695	392.60	63.38	69.16	92.64

The vegetation and land cover types (Table 21), slope and elevation classes (Table 22), and soil classes (Table 23) found in the project area and selected proxy areas are presented in the tables below.

Table 21. Forest classes in the project area and proxy areas.

	Area (%)						
Area	Shrub Campinarana	Grassy-Woody Campinarana	Alluvial Open Ombrophylous Forest	Lowland Open Ombrophylous Forest	Submontane Open Ombrophylous Forest	Lowland Dense Ombrophylous Forest	Livestock (pasture)
Project	0	0	15	83	0	2	0
Proxy							
9	0	0	7	92	0	0	0
18	13	6	0	0	0	81	0
19	0	0	0	0	0	100	0
21	0	0	0	87	0	0	13
29	0	0	5	41	0	54	0
32	0	0	0	74	26	0	0
34	0	0	0	100	0	0	0
52	0	0	13	85	0	0	0

Table 22. Slope classes and elevations in the project area and proxy areas.

Area	Slope		Elevation			
	< 15%	> 15%	Mean	Minimum	Maximum	Amplitude
Project	97	3	178	125	250	125
Proxy						
9	94	6	205	146	249	103
18	100	0	149	125	160	35
19	100	0	137	118	145	27
21	97	3	173	145	214	69
29	91	9	237	164	300	135

Area	Slope		Elevation			
	< 15%	> 15%	Mean	Minimum	Maximum	Amplitude
32	100	0	150	118	188	70
34	96	4	160	124	185	61
52	99	1	179	142	201	59

Table 23. Soil classes in the project area and proxy areas.

	Area (%)						
Area	Red-Yellow Argisol	Haplic Gleysol	Yellow Latosol	Red-Yellow Latosol	Chromic Luvisol	Haplic Luvisol	Argiluvic Plinthosol
Project	90	2	0	3	6	0	0
Proxy							
9	92	8	0	0	0	0	0
18	0	0	93	0	0	0	7
19	50	0	50	0	0	0	0
21	47	0	0	0	0	53	0
29	90	5	0	0	0	5	0
32	80	0	0	20	0	0	0
34	0	0	0	100	0	0	0
52	85	12	0	0	0	0	0

Analyzing the above results it is possible to consider that the project area is suitable for conversion to pasture, since it presents vegetation classes, slope, altitude and soils similar to the proxy areas, just as the proxy areas are likely to be used to calculate the average deforestation rate for the project.

The deforestation rate for each proxy area was calculated from data obtained from PRODES (INPE, 2022). The PRODES data are official and accepted by official crediting bodies for voluntary carbon markets.

The annual deforestation rate was calculated using the equation described in VMD0006:

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

where:

D%planned, i, t = Projected annual proportion of land that will be deforested in stratum i during year t. If the actual annual proportion is known and documented (e.g. 25% per year for 4 years), defined as proportion; %

D%pn Percentage of deforestation in pn land parcel of a proxy area as a result of planned deforestation as defined in this module; %.

Yrspn Number of years when deforestation occurred on the land parcel pn in the proxy area; years

N Total number of land parcels examined

Pn 1, 2, 3, ...n* plots examined in the proxy area

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

The individual annual deforestation rates as well as the proportions of deforested areas and years of deforestation activities are presented in Table 24. The average of the annual deforestation rates for the proxy areas was calculated to be 1.32%. The map in Figure 26 presents the geographic location of the project area and the 8 selected proxy areas

Table 24. Selected proxy areas and deforestation rate.

Year	Proxy Area					
	P1	P2	P3	P4	P5	P6
1	0	0	118.31	1.04	33.3	0
2	0	0	28.66	2.09	9.89	0
3	0	0	31.03	1.85	15.51	0
4	7.28	6.57	0	0	57.58	0

5	25.3	25.89	8.4	0,18	8.95	2.97
6	16.59	16.92	4.66	-0.15	15.22	0.91
7	13.64	22.25	5.78	-0.13	33.9	0.09
8	0.82	1.53	0.39	0.25	6.98	1.3
9	-0.33	0.69	0	4.52	0.88	0.09
10	0.08	0.43	0	1.17	31.66	16.35
Total	63.38	74.28	197.23	10.82	213.87	21.71
Average	11.52364	13.50545	35.86	1.967273	38.88545	3.947273
D(%)pn	17	18	18	18	18	18
D%planned,i,t(%)	*17,83*					

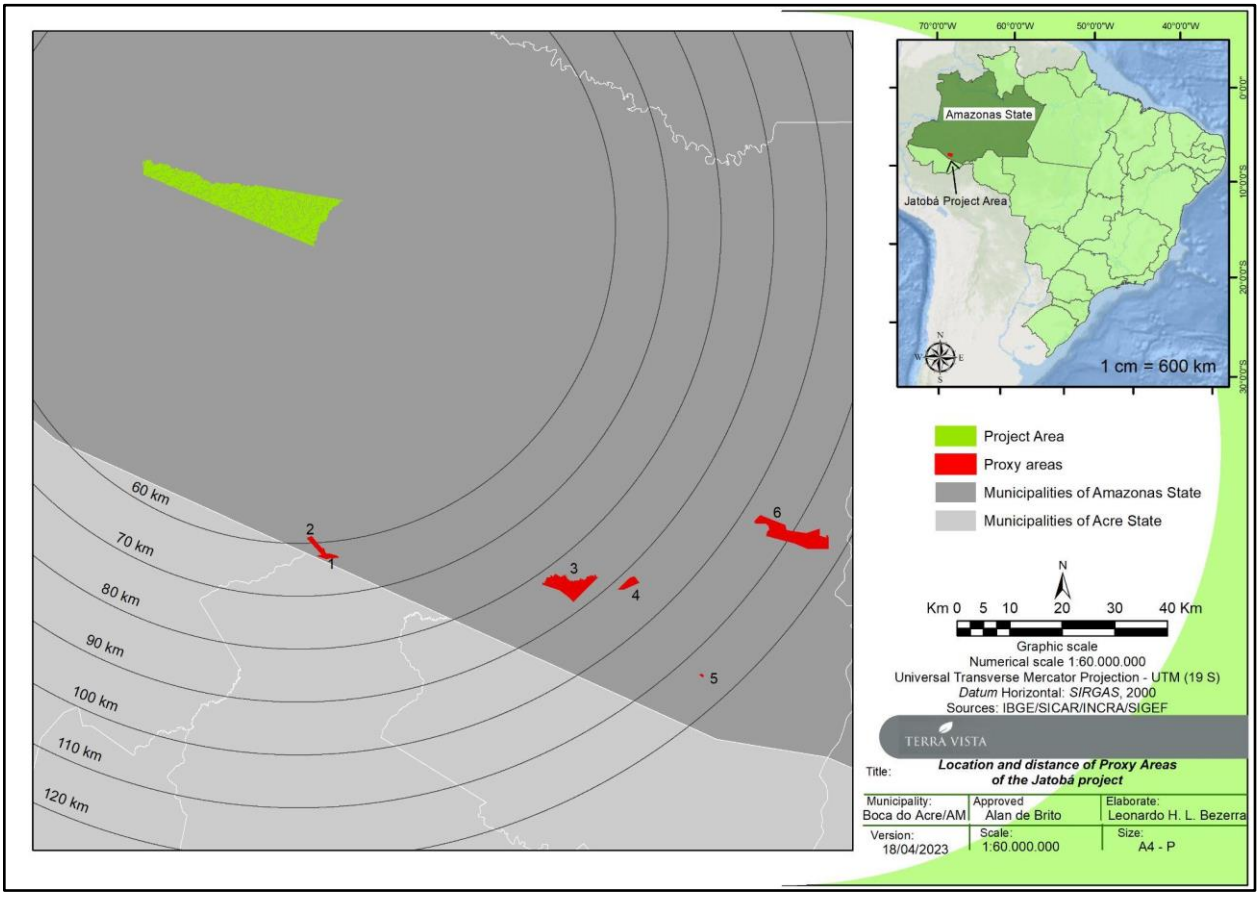


Figure 26. Distribution of the 8 selected proxy areas close to the property where the Jatobá project is located.

Deforestation Probability

The deforestation probability (L-Di) is set to 100% according to VMD0006 criteria, section 1.4.

Risk of Abandonment

The risk of abandonment is considered based on proxy areas that have the same class of deforestation agents over a 10-year interval. Properties near the project area were analyzed based on the same deforestation classes and agents, climate, soil, and topography. Proxy areas are areas with similar spatial characteristics to the project area, as well as similarities in terms of activities and land use conditions. These areas were selected according to VMD0006 criteria based on geographic data analysis and the project proponent's knowledge of existing properties in the vicinity of the project area. Thus, with the land use conversion history analysis, if any of the representative areas have been abandoned for forest regeneration, then the planned deforestation activities are not eligible and this module should not be used.

3.1.5 Additionality

According to the procedure defined in methodology VM0007, the most recent version of the tool referenced in the T-ADD was used to identify credible alternative land use scenarios and evaluate the proposed project alternatives and scenarios, and to demonstrate project additionality: "Combined tool to identify baseline scenario and demonstrate additionality in F/R CDM project activities (T-ADD) (v.01)" [139].

The additionality analysis, applying the T-ADD tool (v.1) is presented below for the APD activity.

Identification of Alternative Land Use Scenarios for the Proposed AFOLU Project Activity

Based on economic and political trends and usual regional activity, three credible alternative land use scenarios were identified for the project areas within each property under this GDP (result of VT0001 v3.0 sub-stage 1a):

SCENARIO 1: Maintenance of forest cover of 20% of the property, where land use conversion is allowed by law [140]: maintaining the area as it is, without any conservation activities and measures, but still

[139] Combined tool to identify the baseline scenario and demonstrate additionality in the CDM A/R project. Available at: <https://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-02-v1.pdf>. Accessed on: 13/03/2023.

[140] According to Law 12,651 of May 25, 2012, landowners can convert up to 20% of the forest within their rural property in the Amazon biome for economic purposes. Available at: < https://www.planalto.gov.br/ccivil_03/_ato2011-2014/2012/lei/l12651.htm>. Accessed on 13/03/2023.

being responsible for the costs of the taxes necessary to maintain land tenure. Although no economic activity is carried out in the pre-project scenario, the area is exposed to illegal invasions and deforestation, prior to livestock, a common practice in the region.

SCENARIO 2: Legal deforestation of 20% of the property (deforestation with permission), where land use conversion is allowed by law, i.e.: forest clearing for pasture (livestock).

SCENARIO 3: Illegal deforestation of 20% of the property (deforestation without authorization), where land use conversion is allowed by law, that is: forest suppression for pasture (livestock) and agricultural purposes or simply for real estate speculation.

The maintenance of forest cover without financial incentives (Scenario 1) is possible, but unlikely, due to the direct costs of surveillance, forest fires, and the opportunity cost associated with the economic use of the property where the law allows forest suppression.

The deforestation agent identified has a history of agricultural and ranching activity on other lands on his property for economic purposes, which makes the Scenario 2 realistic and credible. Illegal deforestation is a common practice throughout the Jatobá project area (Legal Amazon), which makes Scenario 3 realistic and credible.

The Scenarios 1 and 2 are in compliance with applicable laws and regulations in the country. The scenario 3 presents illegal activities, resulting from the systematic lack of enforcement of applicable laws and regulations (result of VT0001 v3.0 sub-step 1b).

Recent studies published by different institutions support the thesis that most of the deforestation observed in Brazil today is illegal[141].

The Scenario 2 is considered the most plausible baseline scenario because the land is expected to be converted to non-forest land in the baseline case and the conversion is legally authorized and documented, following VM0007 v1.6, Table 01 decision tree criteria for the activity type project. VMD0006 v2.2, in turn, presents a step-by-step approach for the justification and determination of scenario "b" (see section 3.1.4) (result of VT0001 v3.0 sub-step 1c). The alternative baseline land use scenario for the Jatobá project refers to the area that would be legally cleared for livestock in the absence of the APD REDD project activity.

Barrier Analysis

The list below shows the most relevant barriers that would prevent the implementation of the type of project activity proposed without the revenue from the sale of VCUs (result of VT0001 v3.0 sub-stage 3a):

[141] Azevedo, T., Rosa, M. R., Shimbo, J. Z., Oliveira, M. G. 2020. Annual Report on Deforestation in Brazil 2020, São Paulo, Brasil MapBiomas, 2021, 93 pages.

- Investment barriers: financial flows to private area conservation are insignificant in Brazil;
- Institutional barriers: lack of enforcement of forest or land use related legislation is typical in the Jatobá project area;
- Barriers related to local tradition: local customs and market conditions favor livestock as a means of livelihood for local communities;
- Barriers due to social conditions and land use practices: widespread illegal practices are well known in the Jatobá project area.

The barriers identified do not impede the implementation of "Scenario 3". On the contrary, the lack of financial resources for conservation, effective public policies to reduce deforestation and promote sustainable socioeconomic development, associated with the inherent difficulty of public power to curb illegal activities drives illegal deforestation in Brazil (Result of VT0001 v3.0 sub-phase 3b).

Analysis of common practice

In Brazil there are few legal, regulated and operational mechanisms or policies capable of effectively avoiding legal deforestation on private properties. We consider for this analysis the mechanism called Environmental Reserve Quota (CRA)[142].

Although provided for in the 2012 Brazilian Forest Code, the mechanism of CRAs was only regulated in December 2018. Environmental Reserve Quotas are titles that represent an area covered by native vegetation on a property with an "excess of Legal Reserve" that can be acquired by owners with a "deficit of Legal Reserve" in the same biome, to regularize the rural property. One title represents 1 hectare with preserved forest cover. As these titles can be traded, the mechanism can be indicated as a similar initiative to a REDD APD project, but essential differences between them can be observed. As CRAs can only be traded within the same biome and to specific stakeholders, the regulatory framework is different from the one relevant for carbon projects. In addition, since forest cover in the Amazon biome exceeds 80%, the demand for bonds becomes very low, implying a low supply. This effect can be evidenced by the amount of bonds available in the market. In a search carried out in the main CRA[143] transaction platform,

[142] Environmental Reserve Quotas (CRAs) are securities representing vegetation cover that can be used to compensate for the lack of Legal Reserve on other properties. Available at: <https://www.bvrio.org/pt-br/mercado-de-cotas-de-reserva-ambiental/>. Accessed on 13/03/2023.

[143] CRA transaction platform. Available at: https://past.bvrio.org/florestal/cra/plataforma/prepara.do. Accessed on:31/03/2023.

only 55 CRAs titles were offered for the entire State of Amazonas, and 110 for the entire Amazon biome, offering their remaining native vegetation surplus for "Legal Reserve compensation" in other properties.

However, the fact that they are offered in the market does not mean that a transaction (or payment for forest surplus) has taken place. As a result, it can be argued that the impacts of this mechanism are limited in the Amazon biome. In addition, the CRA mechanism does not consider forest carbon stocks, but only forest cover, thus not serving the purpose of offsetting GHG emissions. Thus, it is concluded that, although similar, the CRA mechanism presents essential distinctions in relation to carbon projects.

The practice of conserving private forest areas in the state of Acre as a whole is extremely rare. Conservation activities in larger areas are usually carried out in public areas, such as Conservation Units, federal and state conservation units. Although most of Brazil's agricultural production is deforestation free, it is observed that a fraction of the properties in the Amazon and Cerrado account for 62% of all potentially illegal deforestation and that about 20% of soybean exports and at least 17% of beef exports from both biomes to the EU may be contaminated with illegal deforestation [144].

In conclusion, there are no similar activities widespread in the same geographic area, or activities considered similar have essential distinctions for the project. Therefore, the Jatobá project activity is additional.

3.1.6 Methodology Deviations

The Jatobá project has no methodology deviations.

3.2 Quantification of GHG Emission Reductions and Removals

3.2.1 Baseline Emissions

In the Jatobá project area there are two strata, considering the DPA component. The stratification of the area was based on the VMD0016 module ("X-STR Methods for the Stratification of the project area, version 1.1"), as presented in Table 25.

Table 25. Strata of the Jatobá project.

Strata	Area (ha)
Lowland Open Ombrophylous Forest	10,066.17
Alluvial Open Ombrophylous Forest	7,951.02

[144] Questions and Answers about RPPN. Available at: https://www.gov.br/icmbio/pt-br/servicos/servicos-do-icmbio-no-gov.br/crie-sua-rppn/perguntas-e-respostas-sobre-rppn. Accessed on 14/03/2023.

Strata	Area (ha)
Total	18,017.19

Net carbon stock changes and GHG emissions from the project were calculated using two modules of the VM0007 methodology. To estimate baseline emissions related to APD areas, module VMD0006 "Estimating baseline changes in carbon stock and GHG emissions from planned forest clearing/degradation and planned wetland degradation (BL-PL)" was used. APD areas comprise forest land on which proponents can apply for permission to clear forest areas (20% of the property according to the legal limit prescribed in the Brazilian Forest Code). The baseline net GHG emissions for planned deforestation were determined as:

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

Where:

$\Delta C_{BSL,planned}$ = Net GHG emissions at baseline by planned deforestation in year t*; tCO_2e;

$\Delta C_{BSL,i,t}$ = Net carbon stock change in all stocks in strata i at baseline in year t; tCO_2e;

$GHG_{BSL-E,i,t}$ = GHG emissions as a result of deforestation activities in the project boundary in stratum i of the baseline in year t: $tCO_2e\ yr^{-1}$;

i1,2,3, ... strata M;

t1,2,3, ... t* years elapsed since the scheduled start of the project activity.

The total area of planned deforestation over the baseline period (Aplanned,i,t) in the project area (Table 26) is determined according to what is recognized as a site-specific immediate deforestation threat, which in turn is a function of the legal permissibility for deforestation, the suitability of the project area for conversion to alternative non-forest land use, government approval for deforestation and a management plan for the deforestation of the project area. For details on the determination Aplanned,i,t, see section **3.1.4**.

Table 26. Area of planned deforestation in the Jatobá project baseline scenario.

Year	Lowland Open Ombrophylous Forest		Alluvial Open Ombrophylous Forest	
	Planned area (ha)		Planned area (ha)	
	($D\%_{planned}$)	ha (accumulated)	($D\%_{planned}$)	ha (accumulated)
2020	1,795	1,795	1,418	1,418
2021	1,795	3,590	1,418	2,835
2022	1,795	5,384	1,418	4,253
2023	1,795	7,179	1,418	5,671
2024	1,795	8,974	1,418	7,088
2025	1,092	10,066	863	7,951
2026	-	10,066	-	7,951
2027	-	10,066	-	7,951
2028	-	10,066	-	7,951
2029	-	10,066	-	7,951
2030	-	10,066	-	7,951
2031	-	10,066	-	7,951
2032	-	10,066	-	7,951
2033	-	10,066	-	7,951
2034	-	10,066	-	7,951

2035	-	10,066	-	7,951
2036	-	10,066	-	7,951
2037	-	10,066	-	7,951
2038	-	10,066	-	7,951
2039	-	10,066	-	7,951
2040	-	10,066	-	7,951
2041	-	10,066	-	7,951
2042	-	10,066	-	7,951
2043	-	10,066	-	7,951
2044	-	10,066	-	7,951
2045	-	10,066	-	7,951
2046	-	10,066	-	7,951
2047	-	10,066	-	7,951
2048	-	10,066	-	7,951
2049	-	10,066	-	7,951

Change in Carbon Stock in the Baseline Scenario

This section presents the expected changes in carbon stocks per reservoir under the baseline scenario. Initial and post-deforestation stocks are taken from the peer-reviewed literature.

Two forest classes were identified in the project area: Lowland Open Ombrophylous Forest (covering 55.9% of the total area) and Alluvial Open Ombrophylous Forest (44.1%). Carbon stock values

for all forest types were obtained from the literature: Ministry of Science, Technology and Innovation (2020)[145] (Table 27). To calculate the carbon stocks (above and belowground) in each stratum, the carbon values (tC/ha, from the literature) were multiplied by the conversion factor 44/12 (conversion factor from tC to tCO_2).

Table 27. Aboveground (CAB_tree,bsl,i) and belowground (CBB_tree,bsl,i) carbon stocks in different strata in the project area.

Strata	CAB_tree,bsl,i	CBB_tree,bsl,i	Total (t CO_2e ha^{-1})
Lo - Lowland Open Ombrophylous Forest	490.97	49.13	539.12
Ao - Alluvial Open Ombrophylous Forest	430.10	42.90	473.00

Baseline emissions from planned deforestation - APD

To estimate the emissions from planned deforestation that would occur in the project area in the absence of the project, the estimated annual area of deforestation was multiplied by the sum of the above and below ground carbon stocks in the forest for each stratum. The results are presented in Table 28.

Table 28. Projected baseline gross emissions from planned deforestation by strata within the project area.

Year	Lowland Open Ombrophylous Forest (Ab)		Alluvial Open Ombrophylous Forest (Aa)	
	Planned area (ha)		Planned area (ha)	
	tCO_2eq/year	tCO_2eq (Accumulated)	tCO_2eq/year	tCO_2eq (Accumulated)
2020	890,004.13	890,004.13	615,820.54	615,820.54
2021	890,004.13	1,780,008.27	615,820.54	1,231,641.08
2022	890,004.13	2,670,012.40	615,820.54	1,847,461.63

[145] Fourth National Inventory of Greenhouse Gas Emissions and Removals. Available at: <https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/sirene/publicacoes/relatorios-de-referencia-setorial/pdf/invetario4/lulucf-jan21.zip>. Accessed on 14/03/2023.

2023	890,004.13	3,560,016.53	615,820.54	2,463,282.17
2024	890,004.13	4,450,020.67	615,820.54	3,079,102.71
2025	541,589.73	4,991,610.40	374,742.17	3,453,844.88
2026	-	4,991,610.40	-	3,453,844.88
2027	-	4,991,610.40	-	3,453,844.88
2028	-	4,991,610.40	-	3,453,844.88
2029	-	4,991,610.40	-	3,453,844.88
2030	-	4,991,610.40	-	3,453,844.88
2031	-	4,991,610.40	-	3,453,844.88
2032	-	4,991,610.40	-	3,453,844.88
2033	-	4,991,610.40	-	3,453,844.88
2034	-	4,991,610.40	-	3,453,844.88
2035	-	4,991,610.40	-	3,453,844.88
2036	-	4,991,610.40	-	3,453,844.88
2037	-	4,991,610.40	-	3,453,844.88
2038	-	4,991,610.40	-	3,453,844.88
2039	-	4,991,610.40	-	3,453,844.88

2040	-	4,991,610.40	-	3,453,844.88
2041	-	4,991,610.40	-	3,453,844.88
2042	-	4,991,610.40	-	3,453,844.88
2043	-	4,991,610.40	-	3,453,844.88
2044	-	4,991,610.40	-	3,453,844.88
2045	-	4,991,610.40	-	3,453,844.88
2046	-	4,991,610.40	-	3,453,844.88
2047	-	4,991,610.40	-	3,453,844.88
2048	-	4,991,610.40	-	3,453,844.88
2049	-	4,991,610.40	-	3,453,844.88

Emissions from biomass burning in the baseline

Greenhouse gas emissions from biomass burning were determined based on the 2006 IPCC Inventory Guidelines, project area as follows:

$$EBiomassBurn,i,t = \sum_{g=1}^{G} \square \left(\left(\left(A_{burn,i,t} * B_{i,t} * COMF_I * G_{G,I}\right) * 10^{-3}\right) * GWP_G\right)$$

Where:

$EBiomassBurn,i,t$ = GHG emissions due to biomass burning as part of deforestation activities in stratum i in year t; tCO_2e of each GHG CO_2, CH_4, N_2O);

$Aburn,i,t$ = Area burned for stratum i at time t; ha;

Bi,t = Mean aboveground biomass stock before burning of stratum i, time t; tons t; d.m. ha-1;

$COMFi$ = Combustion factor for stratum i; dimensionless (default value derived from Table 2.6 of IPCC, 2006);

Gg,i = emission factor of stratum i for gas g; kg t-1 of dry matter burned (default values derived from Table 2.5 of IPCC, 2006);

$GWPg$ = Global warming potential of gas g; tCO_2/t gas g (IPCC default values: CH_4 = 28; N_2O = 265);

g = 1, 2, 3 ... Greenhouse gases;

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

t = 1, 2, 3 ... t years have passed since the REDD project activity began;

The parameters used to calculate biomass burning for the APD component baseline scenario are presented in Table 29. The results of CH_4 and N_2O emissions generated as a result of the incomplete burning of non-commercial wood biomass after logging in PAD over a 30-years period are presented in Table 30.

Table 29. Biomass burning in the APD component baseline scenario.

Component	Value	Unit
COMF[146]	0.5045	dimensionless
G_{CH4}[147]	6.8	g/kg of dry matter burned
G_{N207}	0.2	g/kg of dry matter burned
GWP^{148}_{CH4}	28	dimensionless
GWP_{N2O}	265	dimensionless

146 https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_02_Ch2_Generic.pdf

147 https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_02_Ch2_Generic.pdf

148 WG1AR5_Chapter08_FINAL.pdf (ipcc.ch)

Table 30. Results of CH_4 and N_2O emissions generated as a consequence of incomplete burning of non-commercial wood biomass after logging.

Sum of the strata				
Year	ha/year	ha (accumulated)	tCO_2eq/year	tCO_2eq (accumulated)
2020	3,212	3,212	58,235.56	58,235.56
2021	3,212	6,425	58,235.56	116,471.12
2022	3,212	9,637	58,235.56	174,706.69
2023	3,212	12,850	58,235.56	232,942.25
2024	3,212	16,062	58,235.56	291,177.81
2025	1,955	18,017	35,437.79	326,615.60
2026	-	18,017	-	326,615.60
2027	-	18,017	-	326,615.60
2028	-	18,017	-	326,615.60
2029	-	18,017	-	326,615.60
2030	-	18,017	-	326,615.60
2031	-	18,017	-	326,615.60
2032	-	18,017	-	326,615.60

2033	-	18,017	-	326,615.60
2034	-	18,017	-	326,615.60
2035	-	18,017	-	326,615.60
2036	-	18,017	-	326,615.60
2037	-	18,017	-	326,615.60
2038	-	18,017	-	326,615.60
2039	-	18,017	-	326,615.60
2040	-	18,017	-	326,615.60
2041	-	18,017	-	326,615.60
2042	-	18,017	-	326,615.60
2043	-	18,017	-	326,615.60
2044	-	18,017	-	326,615.60
2045	-	18,017	-	326,615.60
2046	-	18,017	-	326,615.60
2047	-	18,017	-	326,615.60
2048	-	18,017	-	326,615.60
2049	-	18,017	-	326,615.60

Carbon stock of wood products at baseline

To estimate the biomass carbon from the commercial volume extracted in the deforestation process, the following equation was applied, applicable for the APD component of the Jatobá project, according to "Option 2: Commercial inventory estimation", as recommended in CP- C:

$$C_{XB},\ i = C_{ABtree} * (1/BCEF) * Pcomi$$

Where:

CXB,i = Average carbon stock of biomass extracted from stratum i; $tCO_2e\ ha^{-1}$;

$CABtrreee,i$ = Average carbon stock of the aboveground biomass in stratum i; $tCO_2e\ ha^{-1}$;

$BCEF$ = Biomass conversion and expansion factor (BCEF) for converting marketable volume to total aboveground tree biomass; dimensionless;

i 1,2,3, ... M-strata.

Conservatively, the proportion of carbon present in the biomass harvested in long-term (100-year) wood products, it is assumed that all harvested biomass not retained in long-term wood products after 100 years is emitted in the year of harvest, the equation was applied:

$$CWP,i = \sum ty=s,w,oir,p,o\ CXB,ty,i * (1 - WWty) * (1 - SLFty) * (1 - OFty)$$

Where:

CWP,i = Carbon stock in the long-term wood products pool (remaining stock in wood products after 100 years) of stratum i after deforestation; t $CO_2e\ ha^{-1}$;

CXB,ty,i = Average carbon stock of biomass extracted by timber product class ty of stratum i; t $CO_2e\ ha^{-1}$;

$WWty$ = Wood waste. The fraction immediately emitted due to mill inefficiency by wood product class ty; adimensional (0.24 for developing countries; Winjum et al. 1998 cited by CP-W);

$SLFty$ = Fraction of wood products that will be emitted to the atmosphere within 5 years after wood harvest, by wood product class ty; adimensional (0.2 for lumber; Winjum et al. 1998 cited by CP-W);

$OFty$ = Fraction of wood products that will be emitted to the atmosphere between 5 and 100 years of timber harvest by wood product class ty; dimensionless (0.80 for lumber in tropical forests; Winjum et al. 1998 cited by CP-W);

TyWood = product class - defined here as lumber(s).

The parameters used to calculate the carbon pool of wood products in the baseline, as well as the results of the estimates (sum of strata) for the entire project period are shown in the tables (Table 31 and 32) below.

Table 31. Parameters used in the calculation of the carbon pool of wood products in the baseline.

Strata	*CAB_tree* (tCO_2e/ha)	*BCEF*	*Pcom*	*CXB* (tCO_2e/ha)	*CWPi*(tCO_2e/ha)	*CWP*$_{100}$*i*(tCO_2e/ha)
Ab	490.97	1.32	0.08	36.27	19.22	16.15
Aa	430.10	1.32	0.08	36.27	19.22	16.15

Table 32. Carbon stock in wood products at baseline - APD.

Sum of the strata				
Baseline gross emissions from planned deforestation				
	ΔCWP,i		CWP100,i	
Year	tCO_2eq/year	tCO_2eq/accumulated	tCO_2eq/year	tCO_2eq/accumulated
2020	61,758.16	61,758.16	51,876.86	51,876.86
2021	61,758.16	123,516.33	51,876.86	103.753.71
2022	61,758.16	185,274.49	51,876.86	155,630.57
2023	61,758.16	247,032.65	51,876.86	207,507.43
2024	61,758.16	308,790.82	51,876.86	259,384.29

2025	37,581.38	346,372.20	31,568.36	290,952.65
2026	-	346,372.20	-	290,952.65
2027	-	346,372.20	-	290,952.65
2028	-	346,372.20	-	290,952.65
2029	-	346,372.20	-	290,952.65
2030	-	346,372.20	-	290,952.65
2031	-	346,372.20	-	290,952.65
2032	-	346,372.20	-	290,952.65
2033	-	346,372.20	-	290,952.65
2034	-	346,372.20	-	290,952.65
2035	-	346,372.20	-	290,952.65
2036	-	346,372.20	-	290,952.65
2037	-	346,372.20	-	290,952.65
2038	-	346,372.20	-	290,952.65
2039	-	346,372.20	-	290,952.65
2040	-	346,372.20	-	290,952.65
2041	-	346,372.20	-	290,952.65
2042	-	346,372.20	-	290,952.65
2043	-	346,372.20	-	290,952.65

2044	-	346,372.20	-	290,952.65
2045	-	346,372.20	-	290,952.65
2046	-	346,372.20	-	290,952.65
2047	-	346,372.20	-	290,952.65
2048	-	346,372.20	-	290,952.65
2049	-	346,372.20	-	290,952.65

Carbon stock in post-deforestation land use (pasture) in the baseline

To calculate the carbon stock remaining in the land after deforestation, we applied the conservative value of 27.50 $tCO_2eq.ha^{-1}$, adopted by the country in the Fourth National Communication to the United Nations Framework Convention on Climate Change - Reference Report: Land Use, Land Use Change and Forestry Sector, 2020[149]. The table below summarizes the results obtained for pasture carbon pools in the baseline scenario, for a 30-year project period.

Table 33. Post-deforestation carbon stock (grassland) at baseline - APD.

Sum of the strata				
Baseline gross emissions from planned deforestation				
Year	ha/year	ha (Accumulated)	tCO_2eq/year	tCO_2eq/Accumulated
2020	3.212	3.212	58.235,56	58.235,56
2021	3.212	6.425	58.235,56	116.471,12
2022	3.212	9.637	58.235,56	174.706,69

[149] Land Use Sector, Land Use Change and Forestry, 2020. Available at: <https://seeg-br.s3.amazonaws.com/Notas%20Metodologicas/SEEG_9%20%282021%29/Nota_Metodologica_SEEG_9_MUT_v3.docx.pdf>. Accessed on 19/04/2023.

2023	3.212	12.850	58.235,56	232.942,25
2024	3.212	16.062	58.235,56	291.177,81
2025	1.955	18.017	35.437,79	326.615,60
2026	-	18.017	-	326.615,60
2027	-	18.017	-	326.615,60
2028	-	18.017	-	326.615,60
2029	-	18.017	-	326.615,60
2030	-	18.017	-	326.615,60
2031	-	18.017	-	326.615,60
2032	-	18.017	-	326.615,60
2033	-	18.017	-	326.615,60
2034	-	18.017	-	326.615,60
2035	-	18.017	-	326.615,60
2036	-	18.017	-	326.615,60
2037	-	18.017	-	326.615,60
2038	-	18.017	-	326.615,60
2039	-	18.017	-	326.615,60
2040	-	18.017	-	326.615,60
2041	-	18.017	-	326.615,60
2042	-	18.017	-	326.615,60

2043	-	18.017	-	326.615,60
2044	-	18.017	-	326.615,60
2045	-	18.017	-	326.615,60
2046	-	18.017	-	326.615,60
2047	-	18.017	-	326.615,60
2048	-	18.017	-	326.615,60
2049	-	18.017	-	326.615,60

3.2.2 Project Emissions

The Jatobá project does not include activities within the APD project areas, so there are no project emissions to be accounted for on this occasion.

3.2.3 Leakage

Estimates of GHG emissions due to leakage from market effects through decreased timber harvesting is equal to the sum of emissions from timber harvesting in the potentially shifted baseline case plus a leakage factor, as per the equation:

$$LK_{MarketEffects,Timber} = \sum(LF_{Me} * AL_{T,i})$$

Where:

$LKMarketEffects,Timber$ = Total GHG emissions due to leakage from market effects through reduced timber harvesting; tCO_2e;

$LFMee$ = Leakage factor for market effects calculations; dimensionless;

ALT,i = Summed emissions from timber harvesting in stratum i in the baseline case potentially displaced by carbon project implementation; tCO_2e;

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

According to module VMD0011 (LK-ME), when the average biomass is more than 15% greater than the biomass within the project boundary, the LFMe should be considered 0.2, which is applicable for the case of this project.

The carbon emission due to displaced timber extraction has two components: the biomass carbon from the extracted timber and the biomass carbon in the forest damaged in the timber extraction process. The estimate of carbon displaced by timber extraction was accessed based on the equation:

$$CBSL,XBT,I,T = (VBSL,XE,I,t * Dmn * CF) + (VBSL,XE,I,t * LDF) + (VBSL,XE,I,t * LIF) * (44/12)$$

Where:

$CBSL,XBT,i,t$ = Carbon emissions due to displaced wood harvests in the baseline scenario in stratum i at time t; tCO_2e;

$VBSL,XE,I,t$ = Timber volume projected to be harvested within the project boundary during the baseline in stratum i at time t; m3;

Dmn = Average wood density of commercially harvested species; t dmm-3;

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

LDF = Log damage factor; tC.m-3 (default 0.53 t tC.m-3);

LIF = Logging infrastructure factor; t C m-3 (default 0.29 tC.m-3);

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

t 1, 2, 3, ... t years have passed since the planned start of the REDD project activity.

The results of the market leakage estimates for the Jatobá project are summarized in the table below.

Table 34. Market leakage of the Jatobá project.

Year	ha/Year	LKMarketEffects,timber	LKMarketEffects,FW/C	ΔCLK-ME
2020	3,212	93,819	1,714	95,533
2021	3,212	93,819	1,714	95,533
2022	3,212	93,819	1,714	95,533
2023	3,212	93,819	1,714	95,533
2024	3,212	93,819	1,714	95,533

2025	1,955	57,091	1,043	58,134
2026	-	-	-	-
2027	-	-	-	-
2028	-	-	-	-
2029	-	-	-	-
2030	-	-	-	-
2031	-	-	-	-
2032	-	-	-	-
2033	-	-	-	-
2034	-	-	-	-
2035	-	-	-	-
2036	-	-	-	-
2037	-	-	-	-
2038	-	-	-	-
2039	-	-	-	-
2040	-	-	-	-
2041	-	-	-	-
2042	-	-	-	-
2043	-	-	-	-
2044	-	-	-	-

2045	-	-	-	-
2046	-	-	-	-
2047	-	-	-	-
2048	-	-	-	-
2049	-	-	-	-
Total	18,017	526,186	9,612	535,798

■

3.2.4 Net GHG Emission Reductions and Removals

The estimated net GHG emissions reductions and removals for the Jatobá project, can be summarized as the "Estimated in-line emissions" minus the "Estimated project emissions" minus the "Estimated leakage emissions", presented in Table 35.

Table 35. *Ex-ante* estimates of GHG emission reductions and removals related to the Jatobá project.

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2020	1,065,597.74	-	95,532.87	970,064.87
2021	1,065,597.74	-	95,532.87	970,064.87
2022	1,065,597.74	-	95,532.87	970,064.87
2023	1,065,597.74	-	95,532.87	970,064.87
2024	1,065.597.74	-	95,532.87	970,064.87
2025	648,614.20	-	58,134.14	590,480.07
2026	-	-	-	-
2027	-	-	-	-
2028	-	-	-	-

2029	-	-	-	-
2030	-	-	-	-
2031	-	-	-	-
2032	-	-	-	-
2033	-	-	-	-
2034	-	-	-	-
2035	-	-	-	-
2036	-	-	-	-
2037	-	-	-	-
2038	-	-	-	-
2039	-	-	-	-
2040	-	-	-	-
2041	-	-	-	-
2042	-	-	-	-
2043	-	-	-	-
2044	-	-	-	-
2045	-	-	-	-
2046	-	-	-	-
2047	-	-	-	-
2048	-	-	-	-
2049	-	-	-	-
Total	5,976,602.91	-	535,798.49	5,440,804.42

3.3 Monitoring

3.3.1 Data and Parameters Available at Validation

Table 36. Data and parameters that are determined or available at validation and remain fixed throughout the project crediting period.

Data / Parameter	CF
Data Unit	tCt/td.m-1
Description	Fraction of carbon in dry matter in t Ct-1 dm
Data source	IPCC 2006 INV GLs AFOLU Chapter 4 Table 4.3)
Applied value	0.47
Justification for data choice or description of applied measurement methods and procedures	The default value was used for conservatism purposes.
Purpose of data	• Calculation of baseline emissions • Calculation of project emissions • Calculation of leakage
Comments	N/A

Data / Parameter	44/12
Data Unit	adimensional
Description	Mass of carbon to CO_2e mass conversion factor
Data source	2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 AFOLU
Applied value	44/12

Justification for data choice or description of applied measurement methods and procedures	Conversion from C to CO_2 based on molecular weights
Purpose of data	• Calculation of baseline emissions • Calculation of project emissions • Calculation of leakage
Comments	IPCC default value

Data / Parameter	R
Data Unit	t root dmt^{-1} shoot dm
Description	Root/shoot ratio or type of forest/biome suitable for the species; note that, as defined here, the root to shoot ratio is applied as belowground biomass per unit area: aboveground biomass per unit area (not per stem)
Data source	As per CP-AB - pg. 17; "Tropical forest"; “>125 t.ha-1”.
Applied value	0.37
Justification for data choice or description of applied measurement methods and procedures	Local values are not known, and the value proposed in CP-AB is conservative.
Purpose of data	• Calculation of baseline emissions • Calculation of project emissions • Calculation of leakage
Comments	N/A

Data / Parameter	WWty
Data Unit	adimensional
Description	Fraction of biomass effectively extracted and emitted to the atmosphere during production by wood product class ty

Data source	Standard value for developing countries: CP-W - page 14.
Applied value	0.24
Justification for data choice or description of applied measurement methods and procedures	As per CP-W.
Purpose of data	• Calculation of baseline emissions
Comments	Parameter values to be updated if new peer reviewed empirically based findings become available.

Data / Parameter	SLFty
Data Unit	adimensional
Description	Fraction of wood products that will be emitted into the atmosphere within 5 years of production by wood product class ty
Data source	As per CP-W: Lumber, page 13.
Applied value	0.20
Justification for data choice or description of applied measurement methods and procedures	Standard conservative value prescribed by CP-W.
Purpose of data	• Calculation of baseline emissions
Comments	N/A

Data / Parameter	OFty
Data Unit	adimensional
Description	Fraction of wood products that will be emitted into the atmosphere between 5 and 100 years of logging by wood product class ty

Data source	OFty is the complementary number of SLFty: the sum of both parameters must equal 1 (that is, 100%).
Applied value	0.80
Justification for data choice or description of applied measurement methods and procedures	According to CP-W.
Purpose of data	• Calculation of baseline emissions
Comments	Parameter values to be updated if new peer reviewed empirically based findings become available.

Data / Parameter	CWP,i
Data Unit	$tCO_2e\ ha^{-1}$
Description	Average carbon stock entering the stratum's wood products pool.
Data source	VCS Module VMD0005 REDD+ Methodology Module: Estimation of Carbon Stocks in the Long-term Wood Products Pool (CP-W)131. This parameter was calculated using default values prescribed in the CP-W.
Applied value	
Justification for data choice or description of applied measurement methods and procedures	According to CP-W.
Purpose of data	• Calculation of baseline emissions

Strata	CWP(tCO_2e/ha)
Ao	19.22
Lo	19.22

Comments	N/A

Data / Parameter	Cab_tree
Data Unit	$tCO_2e\ ha^{-1}$
Description	Average carbon stock of belowground biomass in stratum i
Data source	The value is the result of dividing the total carbon pool per stratum by area.
Applied value	

Strata	CAB_tree,bsl,i
Ao	490.97
Lo	430.10

Justification for data choice or description of applied measurement methods and procedures	As indicated in the CP-AB module.
Purpose of data	• Calculation of baseline emissions
Comments	N/A

Data / Parameter	Cbb_tree
Data Unit	$tCO_2e\ ha^{-1}$
Description	Average carbon stock of belowground biomass in stratum i
Data source	The value is the result of dividing the total area carbon pool by stratum by area, as indicated in Table 27.
Applied value	

	<table><tr><th>Strata</th><th>CBB_tree,bsl,i</th></tr><tr><td>Ao</td><td>49,13</td></tr><tr><td>Lo</td><td>42,90</td></tr></table>
Justification for data choice or description of applied measurement methods and procedures	As indicated in the CP-AB module.
Purpose of data	• Calculation of baseline emissions
Comments	N/A

Data / Parameter	CXB
Data Unit	$tCO_2e\ ha^{-1}$
Description	Average carbon stock of biomass extracted from stratum i
Data source	Featured in Section 3.1.4 Baseline Scenario, in the Wood Products Subsection
Applied value	<table><tr><th>Strata</th><th>CXB (tCO_2e/ha)</th></tr><tr><td>Ao</td><td>36,27</td></tr><tr><td>Lo</td><td>36,27</td></tr></table>
Justification for data choice or description of applied measurement methods and procedures	Calculated according to the CP-W Module
Purpose of data	• Calculation of baseline emissions

Comments	N/A

Data / Parameter	Pasture carbon pool
Data Unit	tCO_2e
Description	Grassland carbon pool in the baseline scenario
Data source	Fourth Brazilian Inventory of Anthropogenic Greenhouse Gas Emissions and Removals Reference Reports Sector Land Use, Land Use Change and Forestry . Ministry of Science, Technology and Innovation, 2015.
Applied value	27.5
Justification for data choice or description of applied measurement methods and procedures	The post-deforestation biomass (pasture) according to the National GHG Inventory was multiplied by the deforestation measured through MapBiomas data.
Purpose of data	• Calculation of baseline emissions
Comments	Calculation based on country-specific values.

Data / Parameter	BCEF
Data Unit	adimensional
Description	Biomass conversion and expansion factor for converting commercial wood volume per unit area to total trees aboveground biomass per unit area
Data source	As per CP-AB - page 14, being the average of the three proposed factors.
Applied value	1.32
Justification for data choice or description of applied measurement methods and procedures	The BCEF was applied to convert marketable volume into total aboveground tree biomass

Purpose of data	• Calculation of baseline emissions • Calculation of project emissions • Calculation of leakage
Comments	N/A

Data / Parameter	CabicI
Data Unit	tCO_2/ha
Description	Average carbon stock per hectare in aboveground biomass carbon pool of initial forest class *icl*
Data source	National Inventory Data: Ministry of Science, Technology and Innovation, 2020).
Applied value	

Strata	CAB_tree,bsl,i
Ao	490.97
Lo	430.10

Justification for data choice or description of applied measurement methods and procedures	The Biomass Expansion Factor (BCEF) was applied to convert the marketable volume into total tree biomass above round, according to CP-AB - page 14, being the average of the three factors presented in the module, for conservatism. A wood density of 0.589 t/m^3 was applied, according to Nogueira (2008).
Purpose of data	• Calculation of baseline emissions
Comments	N/A

Data / Parameter	CbbicI
Data Unit	tCO_2/ha

Description	Average carbon stock per hectare in belowground biomass carbon pool of initial forest class *icl*
Data source	National Inventory Data: Ministry of Science, Technology and Innovation, 2020).
Applied value	<table><tr><th>Strata</th><th>CBB_tree,bsl,i</th></tr><tr><td>Ao</td><td>49.13</td></tr><tr><td>Lo</td><td>42.90</td></tr></table>
Justification for data choice or description of applied measurement methods and procedures	A root-shoot ratio (R) of 0.37 was applied, according to "2006 IPCC Guidelines for National Greenhouse Gas Inventories", V. 4, chap. 4, AFOLU, pg. 4.49, Table 4-4.
Purpose of data	• Calculation of baseline emissions
Comments	Literature studies used for this assessment, as well as the respective calculations, are available for consultation by the audit team.

Data / Parameter	$CABnon-treepost$,i; $CBBnon-tree,post$,i
Data Unit	tCO_2/ ha
Description	Post-deforestation carbon stock in non-trees aboveground vegetation in stratum *i*; $tCO_2e\ ha^{-1}$; Post-deforestation carbon stock in non-tree belowground biomass in stratum *i*; $tCO_2e\ ha^{-1}$
Data source	Fourth Brazilian Inventory of Anthropogenic Emissions and Removals of Greenhouse Gases, Reference Reports Sector Land Use, Land Use Change and Forestry. Ministry of Science, Technology and Innovation, 2020.
Applied value	27.5 (sum of above and belowground biomass)
Justification for data choice or description of	Value used in the National GHG Inventory.

applied measurement methods and procedures	
Purpose of data	• Calculation of baseline emissions
Comments	Country-specific value provided for above and belowground pasture biomass.

Data / Parameter	Cabfcl
Data Unit	tCO_2/ ha
Description	Average carbon stock per hectare in aboveground biomass Final post-deforestation class carbon pool
Data source	Weighted average (by area taken from the Terra Class database): 2006 IPCC Guidelines for National Greenhouse Gas Inventories, V. 4, Chapter 6: Grassland, pg. 6.27, Table 6.4 (for Pasture: 76.1% of the area) 2006 IPCC Guidelines for National Greenhouse Gas Inventories, V. 4, Chapter 4: Forest Land, pg. 4.63, Table 12 (for Pasture with regeneration: 23.9% of the area) Value applied: 61.1
Applied value	27.5
Justification for data choice or description of applied measurement methods and procedures	IPCC conservative default value, for estimating carbon stock from land use after deforestation.
Purpose of data	• Calculation of baseline emissions • Calculation of project emissions • Calculation of leakage
Comments	Conservative average to be used in calculations, based on uncertainties in the source values.

Data / Parameter	COMF
Data Unit	adimensional

Description	Combustion factor for stratum *i* (type of vegetation)
Data source	E-BPB refers to Table 2.6 of the 2006 IPCC Guidelines for Greenhouse Gas Inventories, Volume 4 Agriculture, Forestry, and Other Land Uses, Chapter 2, "Primary Moist Tropical Forest" 134
Applied value	0.45
Justification for data choice or description of applied measurement methods and procedures	The value was applied in accordance with the E-BPB: Table 2.6 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4 Agriculture, Forestry and Other Land Uses, Chapter 2, "Primary Rainforest"
Purpose of data	• Calculation of baseline emissions • Calculation of project emissions
Comments	N/A

Data / Parameter	Ggi
Data Unit	g kg^{-1} burnt dry matter
Description	Emission factor for stratum *i* for gas *g*
Data source	The standards can be found in Volume 4, Chapter 2 of the IPCC 2006 Inventory Guidelines in table 2.5 (see Annex 2: Emission Factors for Various Types of Burns for CH_4 and N_2O).
Applied value	GCH_4= 6.8 GN_20 = 0.2
Justification for data choice or description of applied measurement methods and procedures	IPCC 2006 conservative default values.
Purpose of data	• Calculation of baseline emissions • Calculation of project emissions • Calculation of leakage
Comments	N/A

Data / Parameter	Deforestation
Data Unit	ha
Description	Maps of forest cover areas converted into non-forest areas
Data source	Measured using MapBiomas database
Applied value	Annual variable: deforestation values are presented for the Reference Region, Leakage Belt and Project Area (projections) in section 3.2.1
Justification for data choice or description of applied measurement methods and procedures	The MapBiomas project contributes to understanding the dynamics of land use in Brazil. The data generated by this program is used in this project. MapBiomas data are applicable for use in this project, according to the criteria listed below (Methodology VM0007): i) MapBiomas data cover the entire project area, leakage belt and reference region. ii) MapBiomas data cover the entire reference period (beginning, middle and end) of the fixed baseline period. iii) MapBiomas monitors the conversion of forest areas into non-forest areas. iv) Monitoring took place throughout the fixed baseline period. In case of unavailability of MapBiomas data for the monitoring period, other sources will be consulted such as PRODES, or an image classification will be performed (Landsat 8) to measure the deforested area. The mapping of land use and land cover is evaluated using images with a spatial resolution greater than 30 meters. The acquisition of images is carried out during the period of low incidence of clouds and rain in the region, in the months of July and September. The images undergo geometric correction through georeferencing, using topographic maps as a reference or orthorectified images from the USG-NASA. For analysis of areas with cloud cover, the visual interpretation of the radar image would be performed. The assessment of the classification accuracy is performed by analyzing the overall accuracy and the kappa index obtained from a confusion matrix. The minimum classification mapping accuracy should be greater than 90%, which is considered very high.

Purpose of data	• Calculation of baseline emissions
Comments	N/A

Data / Parameter	LIF
Data Unit	t C m^{-3}
Description	Calculation factor for emissions arising from the creation of logging infrastructure during logging operations per cubic meter
Data source	LK-ME, page 8
Applied value	0.29
Justification for data choice or description of applied measurement methods and procedures	Conservative default value of 0.29 t CO_2e m^{-3} calculated from 1,839 hectares of logging concessions analyzed by Winrock International in the Republic of Congo and Brazil can be used for tropical forests.
Purpose of data	• Calculation of project emissions • Calculation of leakage
Comments	N/A

Data / Parameter	LFme
Data Unit	adimensional
Description	Leakage factor for market effects calculations
Data source	VMD0011 (LK-ME)
Applied value	0.2
Justification for data choice or description of	When the average biomass is more than 15% greater than the biomass within the project boundary, the LFME will be considered 0.2.

applied measurement methods and procedures	
Purpose of data	• Calculation of leakage
Comments	N/A

Data / Parameter	Dmm
Data Unit	t dmm^{-3}
Description	Average wood density of commercially harvested species
Data source	Source: Brown, S., AJR Gillespie and AE Lugo, 1989. Biomass estimation methods for tropical forests with applications to forest inventory data. Forest Science, 35:881-902. See pg. 890,
Applied value	0.59
Justification for data choice or description of applied measurement methods and procedures	Country-specific data obtained in the same biome.
Purpose of data	• Calculation of baseline emissions • Calculation of project emissions • Calculation of leakage
Comments	N/A

3.3.2 Data and Parameters Monitored

Table 37. Data and parameters to be monitored during the crediting period of the Jatobá project.

Data / Parameter	Aburn,i,t
Data unit	hectare
Description	Burned area in stratum *i* at time *t*

Source of data	Remote sensing data
Description of measurement methods and procedures to be applied	Burning is considered a common practice in the region, and that every deforested area suffers burning at some point.
Frequency of monitoring/recording	Burned areas will be monitored annually, the examination will take place before any verification event.
Value applied	This value varies annually, depending on the area deforested.
Monitoring equipment	Remote sensing
QA/QC procedures to be applied	• Good practices in remote sensing; • Land use change map for the monitoring period; • Land use change map superimposed with location data from fire alerts from INPE-BDQUEIMADAS (http://www.inpe.br/queimadas/abasFogo.php) in the period; Quantify pixels of deforested areas on fire alerts. • Monitor areas of burned forest
Purpose of data	N/A
Calculation method	As burning biomass is a common practice in the region, it was considered that all deforested areas were burned – the deforestation cycle includes burning.
Comments	Remote Sensing

Data / Parameter	UMADefLB,i,t
Data unit	ha
Description	Area of deforestation recorded in the leakage belt in the project case in stratum i in year t
Source of data	According to the M-REDD Module. Satellite image.
Description of measurement methods and procedures to be applied	According to the M-REDD Module. Satellite image analysis.
Frequency of monitoring/recording	Annually
Value applied	*Ex- post*

Monitoring equipment	N/A
QA/QC procedures to be applied	According to section 9.3 of the REDD+ MF or other VCS methodology that uses this module.
Purpose of data	• Calculation of leakage
Calculation method	N/A
Comments	N/A

Data / Parameter	UMADefPA,I,u,t
Data unit	ha
Description	Registered deforestation area in the project area in stratum i converted to land use u in year t
Source of data	According to the M-REDD Module. Satellite image.
Description of measurement methods and procedures to be applied	According to the M-REDD Module. Satellite image analysis.
Frequency of monitoring/recording	Annually
Value applied	To measure ex- post.
Monitoring equipment	N/A
QA/QC procedures to be applied	According to section 9.3 of the REDD+ MF or other VCS methodology that uses this module.
Purpose of data	• Calculation of leakage
Calculation method	N/A

Comments	N/A

Dados / Parâmetro	RFt
Unidade de dados	%
Descrição	Risk factor used to calculate VCS buffer credits
Fonte de dados	Non-Permanence Risk Report (v3.1), Remote sensing and GIS data, Literature data
Descrição dos métodos e procedimentos de medição a serem aplicados	All VCS Non-Permanence Risk Report data sources will be used to measure the various risk factors.
Frequência de monitoramento/ registro	Annually
Valor aplicado	10
Equipamento de monitoramento	VCS Approved AFOLU Non-Permanence Risk Tool
Procedimentos de QA/QC a serem aplicados	Literature data from renowned sources will be used and critically checked. When possible, the average of two or more sources will be used.
Finalidade dos dados	• Calculation of project emissions
Método de cálculo	All risk factors described in the VCS Risk Report have been assessed.
Comentários	N/A

Data / Parameter	ADefLB,eu,u,t
Data unit	hectare
Description	Deforested area recorded in the leakage belt in stratum *i* converted to land use *i* in year *t*

Source of data	According to Module M-REDD v2 .two. Remote sensing images.
Description of measurement methods and procedures to be applied	According to the M-REDD Module. Analysis of satellite images.
Frequency of monitoring/recording	Annually
Value applied	Ex- post
Monitoring equipment	N/A
QA/QC procedures to be applied	As per REDD+ MoF section 9.3 or other VCS methodology using this module.
Purpose of data	• Calculation of leakage
Comments	N/A
QA/QC procedures to be applied	As per REDD+ MoF section 9.3 or other VCS methodology using this module.

Data / Parameter	Leakage Belt Forest Cover Monitoring Map
Data unit	hectare
Description	Map showing the location of the forest area within the leakage belt area at the beginning of each monitoring period. Applicable only when leakage must be monitored on a leakage belt.
Source of data	Remote sensing in combination with GPS data collected during soil verification
Description of measurement methods and procedures to be applied	Minimum map accuracy should be 90% for forest/non-forest classification on remote sensing images. If classification accuracy is less than 90%, the map is not acceptable for further analysis. More remote sensing data and ground verification data will be needed to produce a product that achieves the minimum 90% mapping accuracy.
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs at a frequency less than every 5 years, examination must occur prior to any verification event.

Value applied	Ex-post
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	MapBiomas data are applicable for use in this project, according to the criteria listed below (Methodology VM0007): i) MapBiomas data cover the entire project area, leakage belt and reference region. ii) MapBiomas data cover the entire reference period (beginning, middle and end) of the fixed baseline period. iii) MapBiomas monitors the conversion of forest areas into non-forest areas. iv) Monitoring took place throughout the fixed baseline period. In case of unavailability of MapBiomas data for the monitoring period, other sources will be consulted such as PRODES or an image classification (Landsat 8) will be carried out to measure the deforested area. Land use and land cover mapping is evaluated using images with a spatial resolution greater than 30 meters. The assessment of the classification accuracy is performed by analyzing the overall accuracy and the kappa index obtained from a confusion matrix. The minimum classification mapping accuracy should be greater than 90%, which is considered very good.
Purpose of data	• Calculation of leakage
Calculation method	Remote sensing and GIS
Comments	N/A

Data / Parameter	Forest Coverage Monitoring Map
Data unit	hectare
Description	Map showing the location of the forest area within the leakage belt area at the beginning of each monitoring period. Applicable only when leakage must be monitored on a leakage belt.
Source of data	Remote sensing in combination with GPS data collected during the soil verification.

Description of measurement methods and procedures to be applied	Minimum map accuracy should be 90% for forest/non-forest classification on remote sensing images. If classification accuracy is less than 90%, the map is not acceptable for further analysis. More remote sensing data and ground verification data will be needed to produce a product that achieves the minimum 90% mapping accuracy.
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs at a frequency less than every 5 years, examination must occur prior to any verification event.
Value applied	Ex-post
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	MapBiomas data are applicable for use in this project, according to the criteria listed below (Methodology VM0007): i) MapBiomas data cover the entire project area, leakage belt and reference region. ii) MapBiomas data cover the entire reference period (beginning, middle and end) of the fixed baseline period. iii) MapBiomas monitors the conversion of forest areas into non-forest areas. iv) Monitoring took place throughout the fixed baseline period. In case of unavailability of MapBiomas data for the monitoring period, other sources will be consulted such as PRODES or an image classification (Landsat 8) will be carried out to measure the deforested area. Land use and land cover mapping is evaluated using images with a spatial resolution greater than 30 meters. The assessment of the classification accuracy is performed by analyzing the overall accuracy and the kappa index obtained from a confusion matrix. The minimum classification mapping accuracy should be greater than 90%, which is considered very good.
Purpose of data	Calculation of project emissions
Calculation method	Remote sensing and GIS
Comments	N/A

3.3.3 Monitoring Plan

The Monitoring Plan was developed based on the guidelines of the "VM0007 REDD+ Methodology Framework (REDD+ MF), v1.6". According to the methodology, the Monitoring Plan demands the inclusion of the following tasks:

- Monitoring of project implementation;
- Monitoring the change in the current carbon stock and greenhouse gas emissions;
- Monitoring leakage in the carbon stock change and greenhouse gas emission;
- Estimation of net ex-post carbon stock change and greenhouse gas emission.

Monitoring Project Implementation

The project implementation will be monitored considering the project activity defined earlier. Table 38 presents information relevant to this task, following the criteria in section 9.3.1 of VM0007. Terra Vista Gestora de Recursos Ltd. will be responsible for the implementation of the project activity and its monitoring. The implementation of specific project activities can be performed by external consultants operating under the supervision of Terra Vista Gestora de Recursos Ltd. Digital files will be stored in the Terra Vista database and hard copies will be archived at their headquarters.

Table 38. Standardized Benefit Category, Project Activities, and Technical Description of the Monitoring Task.

Standardized Benefit Category	Project Activities	Technical Description of the Monitoring Task
Forest cover / GHG emissions reduction	Improving asset surveillance	Deforestation, forest degradation and fire scars will be monitored annually by means of satellite images and field verifications. Land use change maps will be collected from PRODES and DETER/INPE[150], MapBiomas[151] and orbital images from the European Space Agency[152].
Reduction of GHG emissions	Remote Biomass Monitoring	Land use change maps from scientifically recognized data sources such as MapBiomas will be used. There will also be annual remote monitoring of the area through satellite imagery and drone and radar overflights in order to assess the conservation status of the area

[150] Available at: http://terrabrasilis.dpi.inpe.br/ . Accessed on: 12/12/2022.

[151] Available at: https://mapbiomas.org/ . Accessed on: 12/12/2022.

[152] Available at: <https://sentinels.copernicus.eu/web/sentinel/home>. Accessed on: 12/12/2022.

		and project zone, more specifically, to assess whether there have been changes in forest cover during the monitoring period.
Reduction of GHG emissions	Prevention and Fighting of Forest Fires	Training on good management and firefighting practices will be offered to the communities living in the project area to prevent the spread of forest fires. The training in good management practices will focus on risk control and mitigation measures. There will be firefighting training for the formation of volunteer brigades. The execution of the training will be registered through activity reports. The number of training sessions will be reported in each monitoring report. Forest fires should also be prevented by establishing firebreaks. The number and extension of the firebreaks will be monitored and reported in each monitoring report.

Project implementation will be monitored through schedules, activity reports, meeting minutes, attendance lists, financial statements, forest cover maps. From the monitoring of the implementation of the Jatobá project, it is possible to monitor the processes, enabling learning and continuous improvements, guaranteeing the quality and efficiency of the project.

Terra Vista Resource Management Ltd. has digital data storage on the Google Drive[153] platform, which will be managed throughout the duration of the project (30 years). All required documents will be made available to Validation and Verification Teams (VVBs) in each verification process.

Monitoring of changes in current carbon stock, GHG emissions and leakage

This monitoring task will follow the criteria established in module VMD00015 v2, which provides methods to monitor *ex- post* GHG emissions and removals due to deforestation, forest degradation, natural disturbances and carbon stock enhancement in the project area and leakage belt. The monitoring of changes in current carbon stock and GHG emissions is carried out in three steps, presented in the next sections.

Selection and analysis of land use and land cover change data sources

This project uses different data sources to monitor land use and land cover change in the project area and the Leakage Belt. Classified orbital images from the PRODES project of the National Institute for Space Research (INPE) are used to assess deforestation. The PRODES project uses images compatible with those generated by the Landsat series satellites, termed "Landsat-class". These images are characterized by their spatial resolution of 30 meters and at least 3 spectral bands. Currently, images from

[153] Available at: https://www.google.com/intl/pt-BR/drive/ . Accessed on:1/12/2022

the Landsat-8, SENTINEL-2 (European Union) or CBERS-4 INPE/CRESDA (Brazil/China) satellites are also used. Precision evaluations are done with the European Space Agency (ESA) SENTINEL satellite series, with 10x10m spatial resolution. Classified orbital images from INPE's DETER service are used to assess deforestation and forest degradation alerts. The DETER service uses WFI sensor images from the Sino-Brazilian Earth Resources Satellite (CBERS-4) and AWiFS images from the Indian Remote Sensing Satellite (IRS), with 64 and 56 meters spatial resolution, respectively.

Land use and land cover change data processing

Landsat-8, SENTINEL-2 and CBERS-4 images are provided by their suppliers already orthorectified, with a refined system of geometric correction through control points and digital terrain elevation models. This corresponds to the highest level of geometric correction and means that the images are ready to be used in conjunction with existing maps and field measurements without the need for further processing, in accordance with the cartographic standards in force. The PRODES project performs image compositing for multiple satellites (and dates) to reduce cloud cover in a scene and assess the increase in deforested area. The DETER system has high temporal resolution. Visual analysis of each scene is performed by INPE technicians to evaluate image quality, selecting images that are not excessively contaminated with clouds.

Post-processing and accuracy evaluation

Data from the PRODES[154] project will be used annually to monitor land use change on all lands managed by the identified deforestation agent (including the project area and lands outside the project boundaries). Reference maps of forest cover will be generated and updated as soon as the data are released by INPE.

Data from DETER services will be used monthly to assess deforestation and forest degradation alerts ($ADegW,I$, $ADistPA,i,t$, $Aburn,i,t$). Deforestation and forest degradation alerts will be verified in the field by direct observation every four months. If deforestation is confirmed by PRODES data, it will be used to estimate GHG emissions due to deforestation of the project area ($ADefPA,i,u,t$) or leakage by displacement of activity ($ADefLK,i,u,t$) in the project scenario. If the DETER data are not confirmed by PRODES but are verified in the field through direct observation, they will be used to update the forest cover reference maps and will therefore also be counted as deforestation of the project area or leakage. DETER data have high temporal resolution and lower spatial resolution than PRODES data, which makes them suitable for generating deforestation alerts that can be used to guide rapid responses by project proponents.

Interpretation and Analysis

[154] Available at: http://www.dpi.inpe.br/prodesdigital/dadosn/. Accessed on: 12/12/2022.

Data from the PRODES project will be used to monitor deforestation in the project area (ADefPA,i,u,t) and leakage from displacement activity (ADefLK,i,u,t) under the project scenario. The net change in carbon stock as a result of deforestation in the project area and leakage belt will be calculated taking into account net changes in the carbon stock in all reservoirs in the design scenario (ΔCpools,Def,u,i,t). Calculations will be done according to equations 03 to 06 in module VMD0015 v2.2 and equations 01 to 07 in module VMD0009 v1.3.

An initial participatory rural appraisal of the communities in and around the project area was conducted to determine if there was potential for illegal logging to occur. Given the initial scope of the project, it was characterized that all families living within the project area exploit the forest for timber and fuel, which should be considered a low-impact subsistence activity. No logging or fuelwood economic activity was perceived by the proponents. In this sense, the proponents assumed that the extraction of trees for timber or firewood is a constant on the property where the community presence is perceived. Participatory rural appraisal will be carried out every two years, as established in the methodology.

In accordance with common practice in the Amazon, it is assumed that fire is used for land clearing after deforestation in the project area in the baseline and project scenarios. Non-CO_2 emissions due to biomass burning are considered according to equation 30 of module VMD00015 v2.2 and equations 01 and 02 of module VMD0013 v1.2.

Documentation

The monitoring report will bring relevant information about the time series of land use change and GHG emissions data, considering data sources and protocols for processing, data classification and accuracy assessment, following the module VMD0015 v2.2.

The digital files will be stored in the proponents' database. Terra Vista Resource Management Ltd. and Seringal São Miguel SPE Ltda. have accounts for storing digital data on the Google Drive platform, which will be managed throughout the duration of the project (30 years).

Printed copies of all documents will be filed at the headquarters of Terra Vista Gestora de Recursos Ltda., being made available to the validation and verification body (VVBs) at each verification process.

Estimation of *ex- post* changes in net carbon stock and GHG emissions

The *ex- post* estimates are performed according to the methodological procedures described in section **3.2.** A technical description of the monitoring task and an overview of the data collection procedures are described in section **3.3.3**.

3.3.4 Dissemination of Monitoring Plan and Results (CL4.2)

The results of climate monitoring will be made available on the project website and will also be publicly available on Verra's website. The results will be presented to local communities through communication campaigns, and scientific articles will be published in technical journals.

3.4 Optional Criterion: Climate Change Adaptation Benefits

The Jatobá project generates climate change adaptation benefits.

3.4.1 Regional Climate Change Scenarios (GL1.1)

The Amazon Rainforest is threatened by ongoing climate changes, which are expected to make this region increasingly hot and dry. These effects are more intense in global climate simulations by models that connect the temperature peaks of surface waters in the Pacific Ocean with the El Niño phenomenon. Past events suggest that the connection between Pacific Ocean surface temperature and El Niño is real. The estimated impacts of climate change in the Amazon are even worse in models that include biospheric feedback effects, pointing to the disappearance of forested areas and consequent heating of exposed soil, which leads to greater carbon emissions that further affect the climate and kill more forests.

A previously unconsidered climate threat became apparent in 2005, when a devastating drought hit the Amazon. This type of drought is linked to a water temperature gradient from the North Atlantic to the South, which is part of an increasingly intense oscillation. The formation of the hot water patch in the tropical North Atlantic is worsening due to the reduction of aerosol loads on this part of the ocean, a situation that is expected to intensify in the coming decades due to continued global warming. Whether such a scenario happens or not depends on our efforts to limit greenhouse gas emissions from burning fossil fuels and deforestation. Brazil is among the countries with the most to lose from global warming, possibly risking the loss of the Amazon rainforest[155].

Different climate models produce a wide range of results for the future climate of the Amazon. One model in particular, the UK Meteorological Center's Hadley Center model, indicates a catastrophic shift to a drier, warmer climate in the Amazon, resulting in the death of nearly all forest by 2080[156][157]. The

[155] Fearnside, P.M. 2009. A Vulnerabilidade da Floresta Amazônica perante as Mudanças Climáticas. Oecologia Brasiliensis 13(4): 609-618.Available at: http://philip.inpa.gov.br/publ_livres/2009/Vulnerabilidade%20da%20floresta%20Amaz%C3%B4nica.pdf. Accessed on:14/12/2022.

[156] Cox, P.M., Betss, R.A., JONES, C.D., Spall, S.A., Totterdell, I.J. 2000. An Acceleration Of Global Warming Due to Carbon-Cycle Feedbacks in a Coupled Climate Model. Nature 408: 184- 187. Available at: https://www.researchgate.net/publication/31936509_Cox_PM_Betts_RA_Jones_CD_Spall_SA_Totterdell_IJ_Acceleration_of_global_warming_due_to_carbon-cycle_feedbacks_in_a_coupled_climate_model_Nature_408_184-187 . Accessed on 14/12/2022.

[157] Cox, P.M., Betss, R.A., JONES, C.D., Spall, S.A., Totterdell, I.J. 2000. An Acceleration Of Global Warming Due to Carbon-Cycle Feedbacks in a Coupled Climate Model. Nature 408: 184- 187. Available at: https://www.researchgate.net/publication/31936509_Cox_PM_Betts_RA_Jones_CD_Spall_SA_Totterdell_IJ_Acceleration_of_global_warming_due_to_carbon-cycle_feedbacks_in_a_coupled_climate_model_Nature_408_184-187 . Accessed on 14/12/2022.

Intergovernmental Panel on Climate Change[158] 's Fourth Assessment Report (AR-4) and several other models indicated that the Amazon was becoming significantly drier, including the US National Center for Atmospheric Research (NCAR) model, and the ECHAM model from the *Max Planck Institute* in Germany. Some models, such as the CSIRO in Australia, indicated no change in the Amazon, while a model from the Geophysical Fluid Dynamics Laboratory (GFDL) in the US indicated more rainfall in the Amazon[159].

The indication of increased rainfall in the Amazon in the GFDL model was the result of an error in the already corrected model[160]. Even so, the results are quite varied and it is important to evaluate the different models for specific purposes of representing the future climate in the Amazon, as well as to consider the best way to interpret the meaning of the remaining uncertainty for the policy. The catastrophic results of the *Hadley Center* were first published in the journal Nature in 2000. It is extremely concerning that nine years of intensive work by several research groups have not identified a specific error that would invalidate this result, although results from other models are comparatively less catastrophic. Some comfort for us derives from the fact that Hadley's model indicates a current climate in Amazonia that is hotter and drier than the actual climate of today[161]. This means that the numerical values for temperature and drought in the simulated future climate are likely to be exaggerated as well. However, the simulated future climate goes well beyond the tolerance limits of trees in the Amazon rainforest, which would cause high mortality even if the changes were less extreme than the simulations indicate.

Climate change is already happening and is already having impacts, and the greater the warming, the greater the future impacts and risks that humanity will face, including the possibility of irreversible damage to ecosystems, biodiversity, agricultural production and the economy and society generally. Effective inclusion of adaptation to climate change can help build a more resilient society in the medium term.

In the Amazon, observed warming from 1949 to 2017 ranges from 0.6 to 0.7°C, according to various sources of temperature data. While there are some systematic differences, all sources point to greater

[158] Intergovernmental Panel on Climate Change [IPCC]. 2007. AR-4 Mitigation of Climate Change. IPCC Working Group III, Contribution to Fourth Assessment Report.BONN. Available at: https://www.ipcc.ch/site/assets/uploads/2018/03/ar4_wg2_full_report.pdf . Accessed on: 14/12/2022.

[159] Kundzewicz, Z.W. L.J. Mata, N.W. Arnell, P. Döll, P. Kabat, B. Jiménez, K.A. Miller, T. Oki, Z. Sen and I.A. Shiklomanov. 2007. Freshwater Resources and their Management. PP. 173-210. IN: M.L. PARRY, O.F. CANZIANI, J.P. PALUTIKOF, P.J. VAN DER LINDEN, AND C.E. HANSON (EDS.). Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of working. Available at: https://pt.scribd.com/document/536957936/PDD-ZeroCarbon-15-Set-2021 . Accessed on: 14/12/2022.

[160] Fearnside, P.M. 2009. Vulnerabilidade da Floresta Amazônica perante as Mudanças Climáticas. Oecologia Brasiliensis 13(4): 609-618. Available at: http://philip.inpa.gov.br/publ_livres/2009/Vulnerabilidade%20da%20floresta%20Amaz%C3%B4nica.pdf. Accessed on:14/12/2022.

[161] Cândido, L.A.; Manzi, A.O.; Tota, J.; da Silva, P.R.T.; Santos, R.N.N.; Correia, F.W.S. 2007. O clima atual e futuro da Amazônia nos cenários do IPCC: a questão da savanização. Ciência e cultura 59(3): 44-47. Available at: http://cienciaecultura.bvs.br/scielo.php?script= sci_arttext & pid=S0009-67252007000300017 .Accessed on: 14/12/2022.

warming in recent decades, with 2017 being the warmest year since the mid-20th century[162]. Figure 27 presents the observed temperature anomaly over 1961-1990 obtained from three data sources for the Amazon.

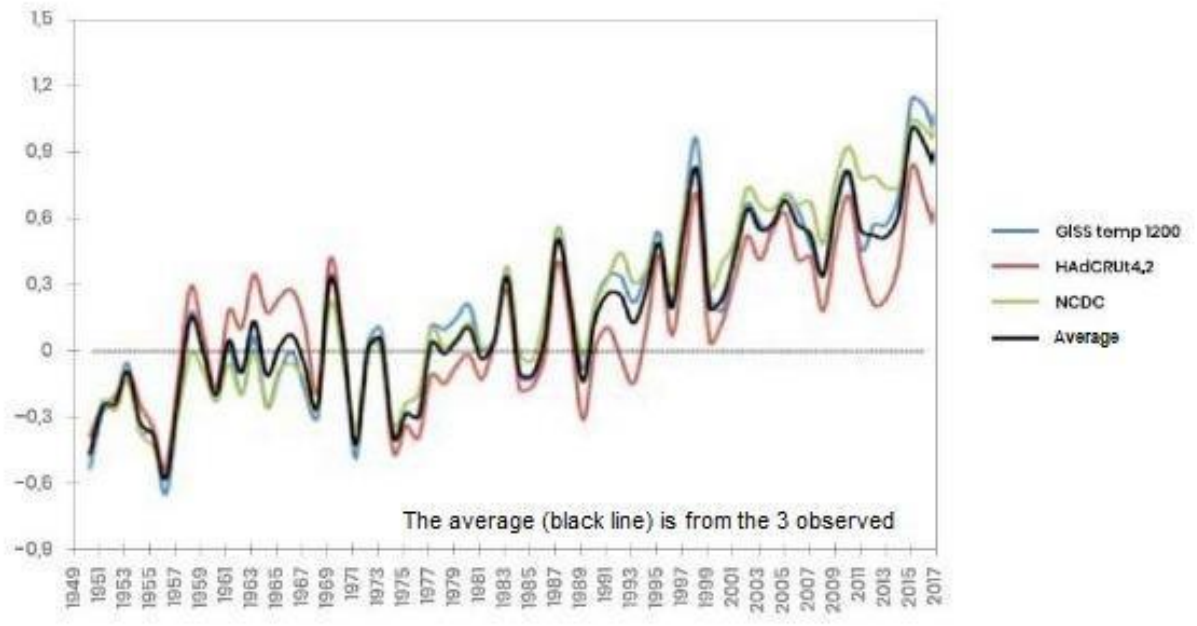


Figure 27. Observed temperature anomaly for 1961-1990 obtained from three data sources for Amazonia. Sources: GISS-NASA Goddard Institute for Space Studies, USA, NCDC-National Climatic Data Center, USA, HAdCRU-Hadley Centre-Climate Research United, United Kingdom.

Climate change scenarios for the Amazon, projected by complex climate models and presented by the IPCC, point to an increase in the average air temperature projected by the end of the 21st century well above 4ºC and a reduction in rainfall of up to 40% in the Amazon (Figure 28). This change in air temperature has the potential to generate major imbalances in vital ecosystems for the survival of humanity. According to the National Plan for Adaptation to Climate Change, South America is the continent with the highest risk of species extinction (23%). The attribution of causes suggests that human influence may be more important compared to natural causes, according to previous IPCC reports and the recent summary on global warming above 1.5°C (Figure 29).

[162] Marengo, J.A., Souza Jr, C. 2018. Climate Change: Impacts and Scenarios for the Amazon. SÃO PAULO. 2018. Available at: https://www.oamanhaehoje.com.br/assets/pdf/Report_Climate_Change_impacts_and_scenarios_for_the_Amazon.pdf . Accessed on 14/12/2022.

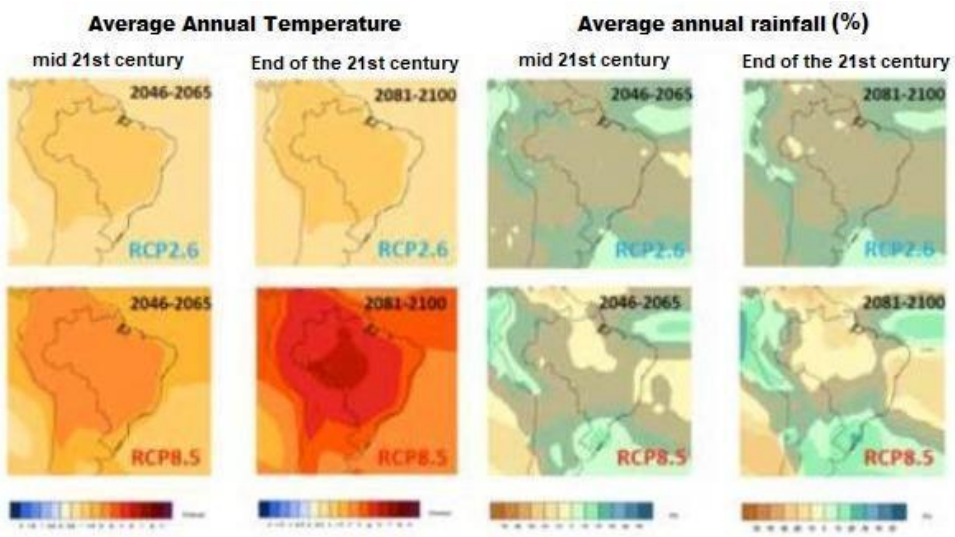


Figure 28. Projections of temperature and precipitation changes in the tropical region of South America produced by the IPCC AR5 model defined for 2046-2065 and 2081-2100 with low emission (RCP2.6) and high emission (RCP8.5) scenarios, for the period from 1981 -2010 [163].

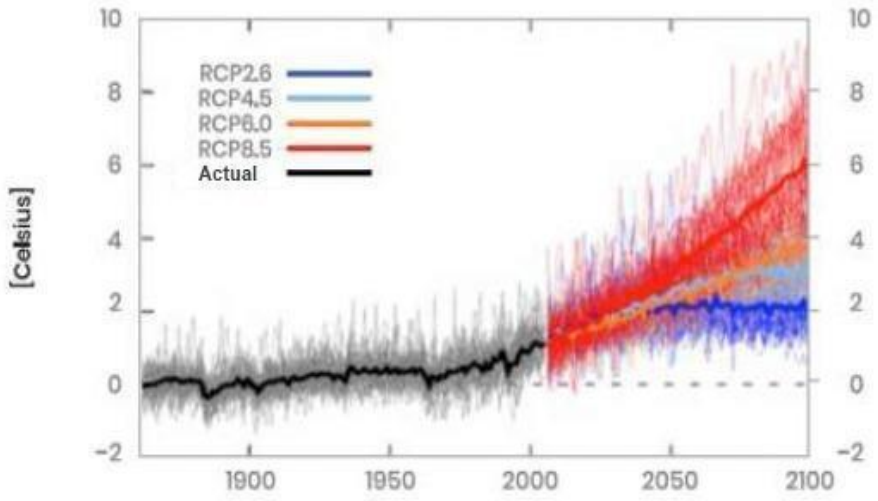


Figure 29. Projections of temperature changes up to 2100 for the various IPCC A5 emission scenarios for the Amazon[164].

[163] Marengo, J.A., Souza Jr, C. 2018. Climate Change: Impacts and Scenarios for the Amazon. São Paulo. 2018. Available at: https://www.oamanhaehoje.com.br/assets/pdf/Report_Climate_Change_impacts_and_scenarios_for_the_Amazon.pdf . Accessed on 14/12/2022.

[164] Marengo, J.A., Souza Jr, C. 2018. Climate Change: Impacts and Scenarios for the Amazon. São Paulo. 2018. Available at: https://www.oamanhaehoje.com.br/assets/pdf/Report_Climate_Change_impacts_and_scenarios_for_the_Amazon.pdf . Accessed on 14/12/2022.

3.4.2 Climate Change Impacts (GL1.2)

Global warming can have the most diverse consequences, many terrestrial, aquatic and marine species have already changed their geographic distribution, seasonal activities, migration patterns, abundance and intraspecific interactions in response to ongoing climate change (high confidence). According to IPCC AR5, the impacts of extreme weather events such as droughts and fires reveal the significant vulnerability and exposure of some ecosystems – and many human systems – to current climate variability. The impacts of such climate-related extremes include changing ecosystems, as is the case in the Amazon.

Human-induced climate change is recognized as one of the main threats to biodiversity in the 21st century. However, species/populations are not equally affected by climate change. Therefore, identifying where and which species are most vulnerable to climate change is especially important to guide conservation efforts. Ribeiro et al. (2016) [165] evaluated the exposure of mammals to climate change and assessed the effectiveness of the Amazonian network of Protected Areas (PAs) as a buffer for the impacts of climate change on "critically exposed" species. The authors also developed a spatial conservation scheme for mammals in the Brazilian Amazon that efficiently identifies highly exposed areas within current and future species distributions where conservation efforts should be directed in order to mitigate the impacts of climate change on the biodiversity encountered in the Brazilian Amazon. The authors found that mammals may face high exposure to climate change and Protected Areas are unlikely to be efficient enough to prevent the impacts of climate change on "critically exposed" species.

Climate change will have profound effects on biodiversity and carbon storage capacity in the Amazon, a critical region for the world's climate. Each scientific expedition describes new species at all levels of the phylogenetic scale, but their biology and ability to adapt to environmental changes are unknown. The effects of climate change can be opposite, depending on biology, adaptive capacity and the distribution and occurrence of species in different ecosystems. Supposedly, species with restricted habits and that occur in small populations are more vulnerable than species that have greater adaptive plasticity and are continuously distributed in wider regions. Species that suffered or suffer fragmentation in their environments may have a decrease in the size of their populations due to the increase of inbreeding that generates loss of genetic variability that, in turn, result in the reduction of the adaptive capacity and, consequently, in a reduction of the reproductive capacity. Populations of territorial fish species are naturally more structured than migratory species, which generally consist of only one population. Recent molecular studies, based on the characteristics of mitochondrial and nuclear DNA, have provided the identification of the real genetic diversity of animal and plant populations, subsidizing management plans for species under environmental pressure. Microsatellite loci (SSR – *Single String Repeats*) are the most used in this type of

[165] Ribeiro, B.R., Sales, L.P., de Marco Jr, P., Loyola, R. 2016. Assessing Mammal Exposure to Climate Change in the Brazilian Amazon. PLOS ONE 11(11): E0165073. Available at: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0165073 . Accessed on:14/12/2022.

study. Therefore, the fragmentation of ecosystems in the Amazon could potentiate the effects of climate change in the region [166].

Climate change will also have negative impacts on the well-being of communities and biodiversity in the Jatobáproject region. Weather events increase the vulnerability of human and natural systems. Global environmental and climate changes have been worsening over the last few decades, but only publicized by the media in recent years. This process poses a challenge to society and the government regarding the causes and role of environmental changes in health conditions. Climate change can impact human health in different ways. On the one hand, it impacts directly, as in the case of heat waves, or deaths caused by other extreme events, such as hurricanes and floods. But often this impact is indirect, being mediated by changes in the environment, such as changes in ecosystems and biogeochemical cycles, which can increase the incidence of infectious diseases, but also non-communicable diseases, which include malnutrition and mental illness. It should be noted, however, that not all health impacts are negative. For example, the high mortality observed in winters can be reduced with increasing temperatures. The increase in areas and periods of drought can also reduce the propagation of some vectors. However, it is generally considered that the negative impacts will be more intense than the positive ones[167].

Seasonal climate fluctuations affect the dynamics of vector diseases, such as the higher incidence of dengue fever in summer and of malaria in the Amazon during the dry season. Extreme events introduce considerable fluctuations that can affect the dynamics of waterborne diseases such as leptospirosis, hepatitis, diarrheal diseases, etc. These diseases can be made worse by floods or droughts that affect water quality and access. Respiratory diseases are also influenced by fires and the effects of thermal inversions that concentrate pollution, directly impacting air quality, especially in urban areas. In addition, situations of malnutrition can be caused by losses in agriculture, mainly subsistence, due to droughts and sudden floods, among others.

The main impacts expected in the project area and its surroundings are the following:

- Gradual savannization of the Amazon, mainly in the southern portion where the project area is located, with changes in ecosystems and in the patterns of natural occurrence of species;
- Loss of plant and animal populations, mainly endemic species;
- Forest fragmentation and habitat loss;

[166] Val, AL; VAL, VMF DE A. Climate Change and Biodiversity in the Amazon. Conference Biodiversity in the Amazon X Climate Change: Causes and Consequences. 60th Annual Meeting of the Brazilian Society for the Progress of Science (SBPC), CAMPINAS, SP. 2008. Available at: http://www.sbpcnet.org.br/livro/60ra/textos/CO-AdalbertoVal.pdf . Accessed on 12/14/2022.

[167] Barcellos, C.; Monteiro, A.M.V.; Corvalán, C.; Gurgel, H.C.; Carvalho, M.S.; Artaxo, P.; Hacon, S.; Ragoni, V. Mudanças Climáticas e Ambientais e as Doenças Infecciosas: Cenários de Incerteza Para o Brasil. Epidemiologia e Serviços de Saúde, V. 18, N. 3, P. 285-304, 2009. Available at: http://scielo.iec.gov.br/pdf/ess/v18n3/v18n3a11.pdf . Accessed on: 14/12/2022.

- Extreme weather events, with more intense rains and storms, also affecting family members and subsistence agriculture;
- Increased temperature, with a higher incidence of droughts and fires, and agricultural losses, affecting food security in the region;
- Migration of people from the communities in search of conditions and life in neighboring cities, and in other larger cities;
- Impacts on the ichthyofauna and effects on artisanal fishing, also affecting the food security of communities;
- Increased incidence of tropical diseases and other types of medium/large scale epidemics (possibly even pandemics);
- Stress and higher incidence of diseases in animals raised for the production of animal protein by traditional communities;
- Impacts on nutrient cycling and soil biota, reducing productivity in cultivated areas and in the forest itself.

3.4.3 Measures Needed and Designed for Adaptation (GL1.3)

Based on the causal model described, the measures initially proposed to help communities and biodiversity adapt to the likely impacts of climate change are described in Table 39.

Table 39. Measures to assist communities and biodiversity adapt to the likely impacts of climate change.

Item	Adaptation Measure	Directed to		Outputs	Results	Impacts
		Community	Biodiversity			
1	Permanent maintenance of contact with institutions that issue climate alerts for the region to issue climate alerts for the region	X	X	Weather alerts communicated to local population	The local population is warned about extreme weather events and risks of storms, fires, etc.	Less climate risk for the local population
2	Ongoing training on topics related to climate change, vulnerabilities, mitigation and	X	X	Training courses for extractive communities	Local population well-informed and motivated to adopt mitigation and	Less climate risk for the local population

	adaptation measures				adaptation measures to combat climate change	
3	Acquisition and donation of river emergency transport for health care and emergencies	X		River ambulance and better assisted population	Ease of emergency transport	Increased quality of life and improved health of the local population
4	River transport measures to adapt the local population to the effects of extreme weather events	X		Improved moorings along river banks	Ease of transport for the local population	Better infrastructure for the local population
5	River transport measures to adapt the local population to the effects of extreme weather events	X		Training courses for extractive communities	Use of a wider range of plants for food production by local people	Food, energy and water security for the local population
6	Training in practices of broader use of local biodiversity and adaptation of forest plants in crops	X	X	Training courses for extractive communities	Use of a wider range of plants for food production by local people	Food security for the local population
7	Monitor rates of deforestation and forest degradation in the region to analyze the effects of climate change on biodiversity		X	Biweekly analysis maps of forest cover in the project area	Improved knowledge about forest (and biodiversity) response to climate change	Biodiversity benefited
8	Continuous forest inventory		X	Annual carbon reports	Improved knowledge	Biodiversity benefited

	to analyze the effects of climate change on the adaptation of species to the environment throughout their lives			executed	about forest (and biodiversity) response to climate change	

4 COMMUNITY

4.1 Without-Project Community Scenario

4.1.1 Descriptions of Communities at Project Start (CM1.1)

The population of the municipality of Boca do Acre has its roots in two traditional peoples, the Capanas and Arípuanãs, who lived in the area several generations ago. Even before the creation of the municipality, the region received waves of workers from the rubber cycle. Between the second half of the 19th century and the first half of the 20th century, the Amazon region received a migratory population mainly from the state of Ceará, which reconfigured the occupation of the Amazonian riverbeds[168]. These workers looking for rubber absorbed the local culture and adapted to survive in the Amazon forest. The communities closest to the project rely heavily on the two rivers that flow into the municipality, the Acre River and the Purus River, ensuring a wide possibility of a reinforced economy in fishing[169] and extraction of primary products, commonly sold in nearby municipalities or in the capital Rio Branco in the state of Acre, which is much closer than Manaus, the capital of the state of Amazonas. Due to the presence of these communities on the riverbanks and their way of life and cultural aspects, these communities are considered riverine. Regarding the riverine people who inhabit the São Francisco, Curupati, Alegrete and Timorante creeks in the municipality of Boca do Acre, it is important to note that they live in an isolated area without access to basic services such as health and education. Houses are built with simple materials such as wood and thatch, and do not have basic sanitation or electricity.

The main economic activity of these families is the collection of Brazil nuts, which is carried out during the fruiting season of the Brazil nut tree, between the months of October and January. During this

[168] Barboza, Edson Holanda Lima. Retirantes cearenses na província do Amazonas: colonização , trabalho e conflito (1877 - 1979). Available at: <https://www.scielo.br/j/rbh/a/HHtgr7H83cgfjWqdbbwQ67k/?lang=pt.>. Acesso no: 14/12/2022.

[169] Almeida, Oriana trindade de, et al. "Characterization of the fisherman and commercial fishing fleet of Manoel Urbano and Sena Madureira (AC) and Boca do Acre (AM)." (2012). Available at: <http://repositorio.ufpa.br/jspui/bitstream/2011/3306/1/Artigo_CaracterizacaoPescadorFrota.pdf>. Accessed on : 14/12/2022.

period, Brazil nut gatherers travel long distances through the forest to collect the nuts, often camping in the woods for several consecutive days. The work is heavy and requires skill to open the Brazil nut shells and remove the fruit without damaging them. In addition to collecting Brazil nuts, they also engage in subsistence agriculture, raise animals for their own consumption and fish in the rivers and creeks of the region[170]. Brazil nut collection is a difficult and tiring activity, and in the region, it involves the participation of the entire family, men, women and children. Often, the collection is carried out in remote and difficult-to-access areas, which can pose risks to workers. The activity involves long walks in the forest, the use of manual tools to open the shells and remove the nuts, and the need to transport the collected nuts to selling points. Working conditions are precarious, with low wages, which can lead them to face financial difficulties[171]. The income of Brazil nut gatherers is variable and depends on the volume of nuts collected and the price on the market. Most of the collected nuts are sold to intermediaries who pay low prices and often do not offer adequate payment conditions. Brazil nut gatherers have deep knowledge about the Amazon forest and its resources, especially the Brazil nut tree. They know the fruiting seasons of the tree, the techniques for collecting the nuts, the locations with the highest concentration of the species, among other aspects. The activity of collecting Brazil nuts is also associated with environmental conservation practices since the Brazil nut tree is a key species in maintaining the Amazon forest and the ecosystems that depend on it.

The characterization of the communities located in the vicinity of the project area, along the banks of the São Francisco, Curupati, Alegrete, and Timorante streams, were carried out together. This global characterization is justified because, despite being distant, both communities have similar livelihoods based on the seasonal extraction of Brazil nuts, subsistence agriculture, fishing and hunting, and other small forest products. We identified 60 families of river dwellers that inhabit these streams and share a similar way of life (Table 40). It is worth mentioning that the region does not present community nuclei with delineated division and collective grouping. The residences are in isolated areas and far from each other, with access through the streams mentioned above.

Table 40. Number of families that inhabit the streams in the Jatobá project area.

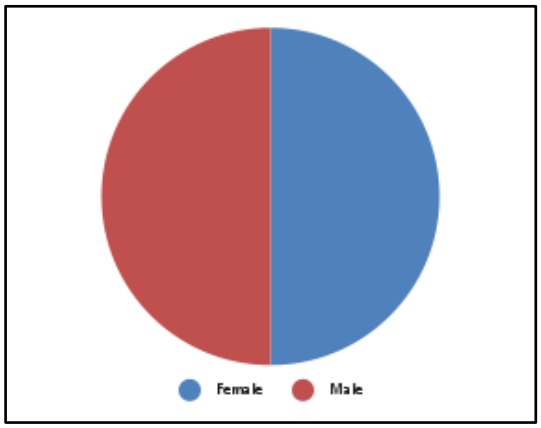
Igarapé (creek)	N°. of families / households
São Francisco 01	10

[170] Martello, Emily Ferreira, and Maria Corette Pasa. "Análise Da Rentabilidade E Aspectos Sociais No Extrativismo De Castanha-Do-Brasil No Município De Cotriguaçu–Mt." Biodiversidade 21.4 (2022). Available at: <https://periodicoscientificos.ufmt.br/ojs/index.php/biodiversidade/article/download/14799/11720>. Accessed on: 25/03/2023.

[171] Martello, Emily Ferreira, and Maria Corette Pasa. "Análise Da Rentabilidade E Aspectos Sociais No Extrativismo De Castanha-Do-Brasil No Município De Cotriguaçu–Mt." Biodiversidade 21.4 (2022). Available at: <https://periodicoscientificos.ufmt.br/ojs/index.php/biodiversidade/article/download/14799/11720>. Accessed on: 25/03/2023.

Igarapé (creek)	N°. of families / households
São Francisco 02	10
Curupati	18
Alegrete	15
Timorante	7

The primary data mobilized here are the result of the application of the MVS methodology in field activities during the month of March 2023. Four activities were carried out based on the MVS questionnaire, with open and closed questions, covering a total of 14 families that make up the territorial sample. The profile of the interviewees was 50% male and 50% female (Figure 30). Regarding the age of the interviewees, the age bracket between 41 and 50 years old corresponded to the majority, corresponding to 50% of the interviewees. The age range between 26 and 30 years corresponded to 25% of the interviewees, and above 51 years also corresponded to 25%, as presented in Figure 31. All interviewees stated that they were born, grew up and live in the region during the nut fruiting and gathering season.



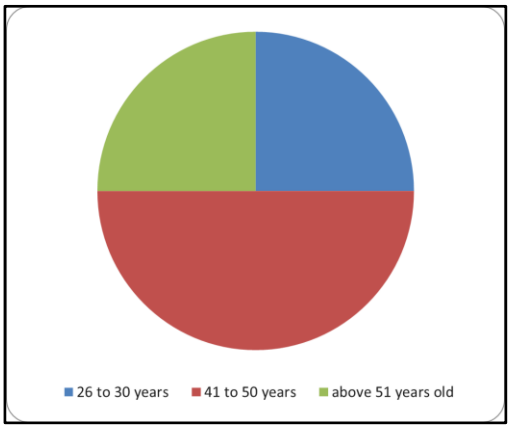


Figure 31. Frequency distribution of respondents' age groups.

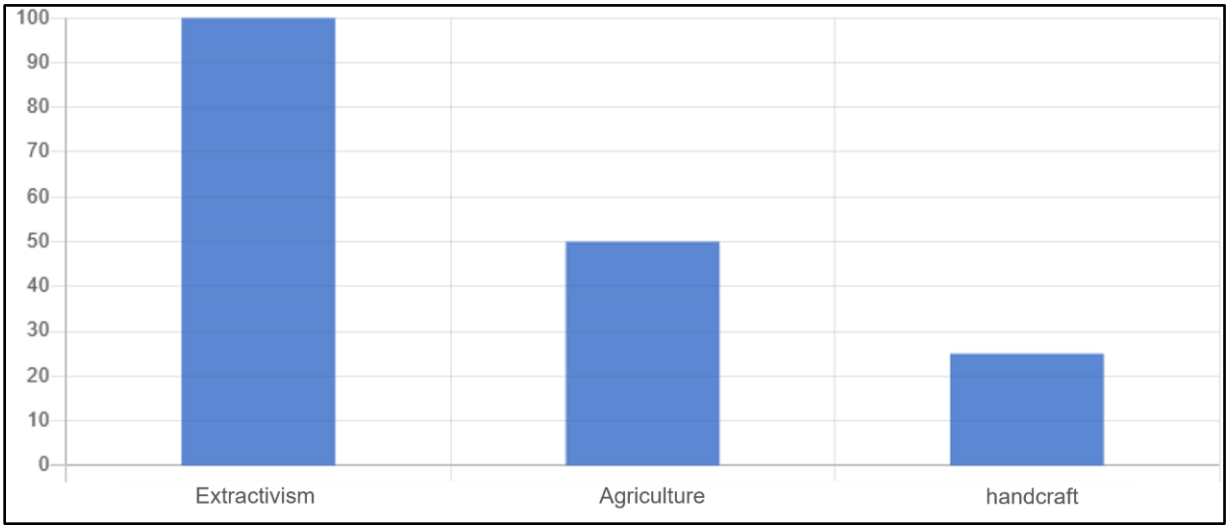
Figure 30. Distribution of respondents' gender frequencies.	

In terms of education, the interviewees showed a significant deficit in their schooling. Only 25% of the interviewees were literate, the rest never studied and cannot read and write. Currently in this location the school is closed due to the distance from the city of Boca do Acre and the logistical difficulties encountered by the municipality in providing professionals. The school structure is located in the Igarapé São Francisco, but it is in precarious conditions. In addition, there are homes that are very distant from this only school in the region, which needed to be transported 4 to 5 hours by canoe or *rabeta* (motor). The lack of educational infrastructure causes children to drop out of school, so many children go to help their parents collect Brazil nuts, limiting their future opportunities. The lack of infrastructure also causes migration to the city of Boca do Acre, being pointed out as a fundamental factor for local abandonment by 50% of the interviewees. The unstable conditions of access to electricity and consequently to the internet further weaken the community's access to education. In only one residence did we find electricity, which was poorly maintained and did not work. With a vast offer of education, training, and other learning opportunities available through the internet, this aspect of infrastructure deficiency further restricts the schooling and professionalization of these riverside dwellers. In addition, all the interviewees stated that they had not taken any capacity building courses, training, or workshops to develop new knowledge in their daily productive activities. There was no access to higher education on the part of the interviewees. Education and learning in the territory occurs from the teaching of traditional subsistence practices in the territory and for income generation, such as collecting Brazil nuts, fishing, hunting, subsistence agriculture, managing wood and other materials for building houses, boats, oars, and other structures and utensils. All the interviewees learned this knowledge from their families and that the children and young people are receiving this knowledge and participating in the income generation and subsistence activities of the families. All the interviewees affirmed that they use this traditional knowledge in their daily activities. In relation to income and work, the riverine women and men interviewed declared themselves as extractors of forest products in 100% of the answers. In addition, 50% said they perform agricultural activities and 25% handicrafts. The productive activities are carried out on a family basis, and there are no associations or cooperatives that

organize community labor activities. All respondents said that men and women perform the same productive activities and that young people work together with their families in the Brazil nut groves.

Figure 32. Income and labor generating activities

The main extractive activity in the region is the seasonal collection of the Amazon nut, which is the main source of income for the riverside dwellers. Between May and October, the riverside dwellers usually perform other income generating activities related to agriculture and handicrafts. In relation to agriculture, the highlight is the planting of corn and mainly manioc, to make flour and sell the surplus. The activities related to handicrafts are the making of necklaces and bracelets made with forest materials, and especially the making of boats and canoes. The financial return from the sale of the nuts is low, especially in a region where it is extremely difficult to sell the product. All interviewees affirmed that there was not enough financial return to cover the costs of Brazil nut production, and 75% said they had debts with banks, of which 33%



said they could not pay due to the price of the Brazil nut on the local market. At the moment, March 2023, the Amazon nut is quoted at 30 reais per bucket, and local production in the collection period ranged from 200 to 550 buckets per family, an average of 325 buckets per crop/family. The nuts are sold raw, without any processing that could add value to the product or certification. None of the families interviewed sell the product directly to the market in the city of Boca do Acre, so the nuts are sold to middlemen.

The dependence on middlemen to sell the extractive production of these families is concentrated in a main buyer that trades with 75% of the interviewees. Another two middlemen appeared as buyers in 50% of the answers. In relation to the equipment necessary to carry out extractive activities, 75% said they possessed the necessary items and 25% said they did not. Half of the interviewees said they had difficulty in obtaining the equipment, due to the long distances and the cost x return of the extractive activity. When questioned about the lack of equipment, all said that they do not have the ideal transportation for the nuts, having to walk for hours in the forest carrying the "panedo", a 1 meter high by 50cm diameter basket made out of vines, which holds approximately 40 kg of nuts. Brazil nut farmers believe that their productive activity contributes to the maintenance of the forest's natural resources. The nut harvesting occurs during seasonal seasons, and the maintenance of the forest is essential to maintain the ecosystem. They also unanimously evaluated that the Jatobá project will contribute to maintaining the forest and animals in the region, helping to maintain their way of life and contributing to improved income generation. As pointed out earlier, Brazil nut collecting is an extremely exhausting activity that presents a high risk of accidents. On average, the river dwellers take 2 hours to get to the *castanhal* (chestnut plantation), with 25% saying it takes less than 30 minutes and another 25% saying it takes more than 3 hours. Half of the interviewees said they worked more than 8 hours a day, while 25% said they worked between 6 and 8 hours, and another 25% said they worked between 4 and 6 hours. Regarding safety equipment, 75% of the interviewees stated that they only use boots as the only safety equipment for the activity, while 25% stated that they do not use any equipment. None of the people interviewed had taken courses in work safety. Among the risks to which they are submitted, snake bites, jaguar attacks, cuts with terracotta and falling nut hedgehogs stand out.

The main risk associated with the activity is snakebite, mainly from the surucucu-pico-de-jaca (Lachesis muta), the longest venomous snake in the western hemisphere. Accidents occur because the victims are unaware of its presence, which usually hides in the areas of chestnut groves. Its venom has cytotoxic, coagulating, hemorrhagic, and neurotoxic actions, causing swelling, local pain, necrosis, coagulation problems, hypotension, as well as diarrhea and decreased heartbeat, which can lead to shock and, in severe cases, even death. The only form of treatment against the surucucu bite is the anti-botropic serum. Due to the distance from the city and the lack of any kind of medical structure or support in the region, victims in the territory have to rely on luck and traditional forest medicine to survive. Access to health services in the region is extremely limited, making it difficult to diagnose and treat illnesses. The precarious living conditions and the heavy work in the nut collection can increase the incidence of health problems among the chestnut harvesters, such as muscle injuries, respiratory diseases, and skin problems, among

others. Regarding water consumption, all the houses visited had streams as their source of supply. In 75% of the houses visited it was found the presence of a pump to collect water, in the other houses the water is collected by the community with buckets and barrels. In relation to water quality and quality, it is in a satisfactory state in the perception of the riverside dwellers. However, water is not treated in 75% of households, and is consumed the same way it is captured in the streams, and in 25% of households water is treated with chlorine.

Regarding basic sanitation, none of the homes visited have a toilet or a septic tank system. Basic necessities are performed outdoors, in the woods around the houses, without proper disposal. Exposure to unsanitary environments causes the emergence of diseases such as leptospirosis, bacterial dysentery, schistosomiasis, typhoid fever, cholera, and parasitoids. The houses visited have an average of two rooms, a living room/bedroom, where the hammocks are hung, and a kitchen. The predominant material of the houses' structures is wood, responsible for the floor, walls and foundation. The roof can be made of zinc tiles or woven ubim straw, an indigenous knowledge inherited from the Amazon river dwellers. To make this roof, the straw is gathered from the forest, woven into small wooden strips and placed less than 20 cm from the next, and finally layered and fixed to the roof. A straw roof is naturally weather resistant and does not absorb much water, and also acts as a thermal insulator, keeping the building cool in summer and warm in winter. When harvested according to good management practices straw is a sustainable resource and an extremely environmentally friendly material. Regarding appliances, all households had a gas stove, however, the main fuel used in all households is firewood, and cooking gas is the second option. In only one of the residences was the presence of other appliances identified, a television and a blender. No other appliances were found in the residences. Regarding eating habits, hunting was the main activity for obtaining food, being an activity carried out for self-consumption and having as the main hunts: deer, tapir, and peccary. In second place was fishing, followed by subsistence farming, and lastly trading. The locals have plenty of food, both in quality and quantity, having at least two and at most four meals a day. Religiosity in the region is predominantly Protestant, with weekly services. Os cultos ocorrem em uma igreja na beira rio no igarapé São Francisco ou na casa dos ribeirinhos. Há também católicos e realizam missas em uma igreja local que tem como padroeiro São Francisco. A festa tradicional na região é a Festa de São Francisco, que ocorre na primeira semana de outubro. Além das estruturas precárias da igrejas para celebrações religiosas, não existem outras estruturas para atividades de lazer.

Sustainable Livelihoods

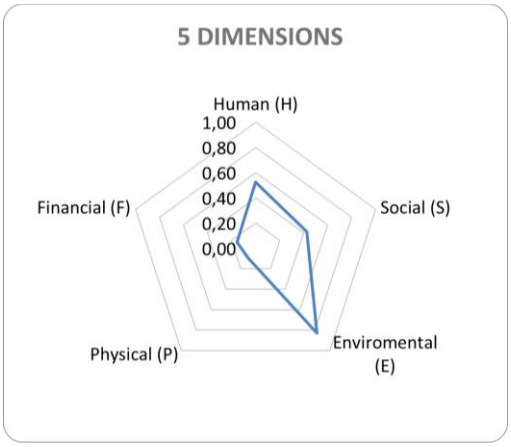
As explained in section 2.1.11, the methodology used to describe the baseline and its subsequent monitoring was Sustainable Livelihoods. For the purposes of carbon credit generation projects, 21 indicators were stipulated that are grouped into 5 dimensions: Human, Social, Environmental, Physical and Financial. Table 41 presents the indicators and the averages of each one of them obtained from the application of the questionnaires.

Table 41. Indicators and averages resulting from the application of the questionnaires with the communities.

Types of assets/dimensions	Information to be gathered for baseline description (Indicators)	Average
Human Dimension	H1 - Household food security	0.90
	H2 - Use and recognition of traditional/local ecological knowledge	1.00
	H3 - Access to new knowledge	0.00
	H4 - Satisfaction and motivation with work and life in the territory	0.44
	H5 - Labor safety	0.29
Social Dimension	S1 and S2 - Relations with communities, partnerships and institutions	0.41 and 0.00
	S3 - Visibility and opportunity for young adults	0.28
	S4 - Participation and valorization of women in productive activities	0.99
	S5 - Access to public policies aimed at strengthening their livelihoods	0.45
Environment Dimension	A1 - Access to water for human and animal consumption	0.88
	A2 - Access to land suitable for various traditional uses and their aspirations	0.73
	A3 - Conservation and use of forest and wildlife	0.89
Physical Dimension	P1 - Individual production infrastructure	0.26
	P2 - Collective production infrastructure	0,00
	P3 and P4 - Individual/family infrastructure for housing, transportation and welfare	0.13 and 0.00
Financial Dimension	F1 - Income	0.15

Types of assets/dimensions	Information to be gathered for baseline description (Indicators)	Average
	F2 - Product price and working capital, when applicable	0.03
	F3 - Commercialization	0.45
	F4 - Access to credit lines and other financial support policies	0.00

In the context of the Jatobá project, a safe sample was achieved, when representatives of 14 families distributed in the region directly related to the project were interviewed. This fieldwork ensured the application of the MVS in a formal manner, which made it possible to obtain a significant and robust baseline for measuring the impact and future monitoring plan of this project. Below are graphs with the results obtained for the Dimensions and for the Sustainable Livelihoods Indicators (Figures 33 and 34).



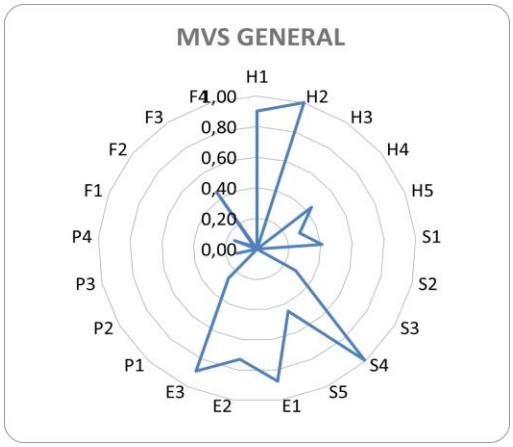
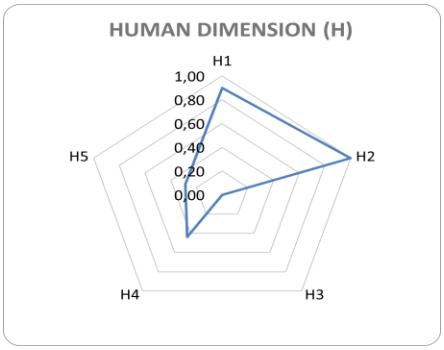
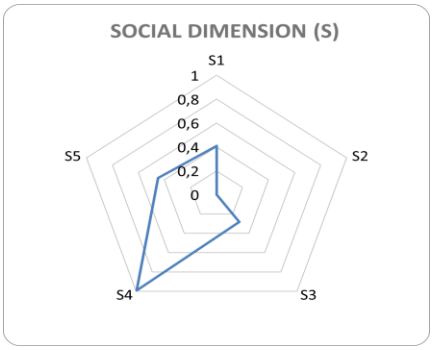


Figure 33. Average scores per dimension MVS	Figure 34. Average scores for MVS indicators

Only the environmental dimension, corresponding to what was inspected in the field, presented, in the mathematical conversion of the answers to the questionnaire mentioned above, an average score above 0.8 (within the margin of zero to one), considering that the community attributes itself with access to a relevant supply of ecosystem services and a collection of fauna and flora that guarantees them a basis for sustaining their livelihoods, that is, this dimension in the MVS demarcated by the benefits obtained in nature that seems to be sustaining the permanence of these people living in these localities (Figure 37). This was also evident in the enthusiasm many showed in participating in a future natural resource conservation project through the carbon credit project, indicating that nature is still the main source and strategy of their livelihoods. Hunting, fishing, wood for building their shelters and simple boats, planting areas, and water (untreated) were presented as the best evaluated resources in the subsistence axis of the riverine peoples. Following the environmental dimension were the Human and Social dimensions that had their indicators evaluated with scores of 0.5 and 0.4 respectively indicating that there is an availability of human factors such as health, motivation, local knowledge, and social agglutination that, even with reasonable averages, still maintain in some balance the web of the Sustainable Livelihoods graph (Figure 35 and Figure 36). Through these aggregated indicators it is highlighted that these communities are relatively fragile in these dimensions, since there are ups and downs especially in the motivation as extractivist-farmer and in the security of performing their work, within the human dimension, and that social relations in defense of their interests and collective rights do not occur, since the riparian dwellers are not organized into community groups, associations, or cooperatives. The Physical and Financial dimensions with the lowest scores in the aggregation of their respective indicators scored only 0.1 (from zero to one) indicating the perception of community members that the circulation of money, due to low income and access to credit channels, is insufficient and that it also reflects in material and physical conditions of the infrastructure of housing and work well below what was expected by respondents of the questionnaires (Figures 38 and 39, respectively). The lack of access to electricity and internet are also infrastructure factors considered by the respondents of the questionnaires as determinant for the low scores in the Material dimension, and not having beasts of burden or motorized means of transportation from the cashew groves





to the igarapés, greatly reduces the capacity of their production, directly affecting the income obtained by the riverside dwellers.

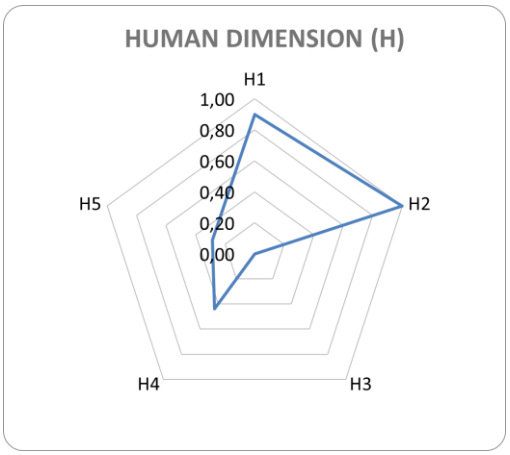


Figure 35. Polar graph with the indicators of the Human dimension of the MVS.

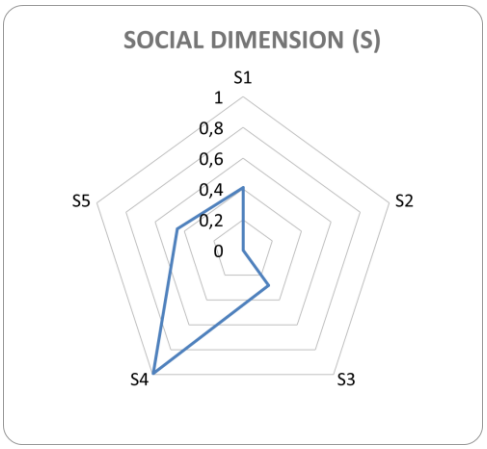


Figure 36. Polar graph with the indicators of the MVS Social dimension.

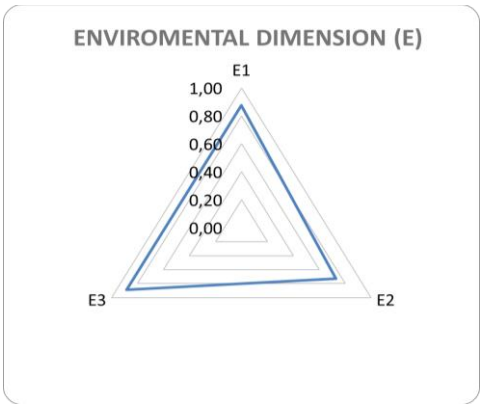


Figure 37. Polar graph with the indicators of the Environmental dimension of the MVS.

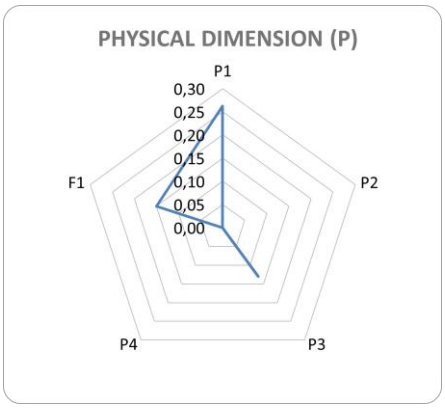


Figure 38. Polar graph with the indicators of the MVS Physical dimension.

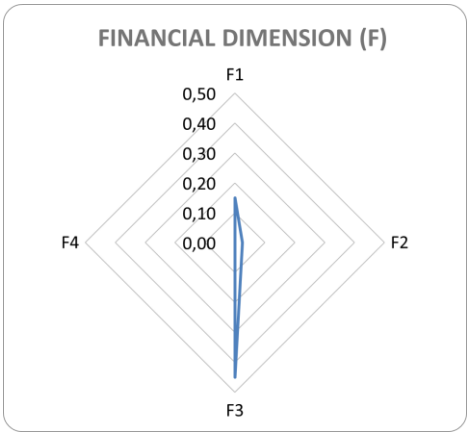


Figure 39. Polar graph with the indicators of the Financial dimension of the MVS.

4.1.2 Interactions between Communities and Community Groups (CM1.1)

Community interactions have great importance in the project region at various levels, these being commercial, religious, cultural, and family levels. As detailed in the previous chapter, the riverside dwellers in the area of influence of the project who inhabit the banks of the São Francisco, Curupati, Alegrete, and Timorante streams, do not meet in community nuclei, living in isolated houses from each other in family groups. Through field visits and local social surveys, the particularities of interactions could be exposed in order to define which interactions occurred at each level mentioned above. The project will follow the changes in interactions that may occur due to positive impacts, as dependence on certain factors will decrease, which, however, may imply the expansion of interactions at other levels.

Commercial Level

- All the 60 families identified in the study collect the Amazon nuts during the harvest season. None of the families interviewed sell their nuts directly to the market in the city of Boca do Acre. The main buyer of the nuts in the territory is Mr. José de Assis, appearing as the main buyer in 75% of the interviewees. The middlemen Mr. Tonho and Mrs. Nélia appeared as buyers in 50% of the answers.
- The collection of the nut occurs in the family chestnut grove, where the kinship group formed by grandparents, parents, siblings, children and grandchildren gather to perform the practice. Within the same kinship group, there are different family nuclei. Each family group has its "chestnut pique", the place where the chestnut trees are. For example: Mr. Guilherme has 10 children, as his children

grow to adulthood and start families, the chestnut grove is divided. It is common for relatives to get together to help collect nuts from other family groups and share the costs and profits of the harvest.

Religious Level

- Religiosity in the region is predominantly Protestant, with weekly services. The services take place in a church on the riverbank of the São Francisco creek or in the homes of the riverside dwellers. There are also Catholics and they hold masses in a local church that has São Francisco as its patron saint. The traditional feast in the region is the Festa de São Francisco, which takes place in the first week of October.

Cultural Level

- No social leisure activities were identified in the territory, such as sports practices, other than religious celebrations.

Family Level

- The family groups that inhabit the four igarapés are related to each other.

4.1.3 High Conservation Values (CM1.2)

The concept of High Conservation Values (HCVs) was developed by the Forest Stewardship Council (FSC)[172] for the certification of timber products from responsible forest management, according to principles, criteria, and standards that reconcile environmental and ecological safeguards with economic benefits and viability[173]. According to Jennings et al. (2003)[174],an HCV area represents a natural or managed area with exceptional values or critical importance, with social and cultural relevance for the reproduction of the communities' way of life. The Jatoba project is entirely within an area of high conservation value for the above mentioned community, directly related to three HCV criteria:

- HCV 4 - Ecosystem services: basic ecosystem services in critical situations, including protection of water catchments and control of erosion of vulnerable soils and slopes;

[172] Council, Forest Stewardship. Forest Stewardship Council®. Protocol for Endorsing National Initiatives. FSC. Doc, v. 1, n. 2,1996.Available at: <https://connect.fsc.org/document-centre/documents/resource/392>. Accessed on: 25/03/2023.

[173] Council, Forest Stewardship. FSC'S "Theory Of Change". Intended Impacts And Related Indicators. Available at: <https://ic. fsc. org/en/our-impact/program-areas/monitoring-and-evaluation/fsc-theory-of-change>. Accessed on: 25/03/2023.

[174] Jennings, Steve et al. The high conservation value forest toolkit. Edition I, ProForest, Oxford OX, v. 12, p. 1-62, 2003. Available at <https://www.researchgate.net/publication/228860500_The_high_conservation_value_forest_toolkit>. Accessed on: 25/03/2023.

- HCV 5 - Community needs: key areas and resources to maintain the basic needs of local communities (subsistence, food, health, water, etc.);
- HCV 6 - Cultural values: areas of special cultural, archaeological or historical significance nationally and globally and/or of cultural, ecological, economic or religious/sacred importance to local communities.

Table 42. Identification of areas of high conservation value within the Jatobá project.

High Conservation Value	• Dryland area where the "castanhais" (Brazilian nut plantation) trees of the riverside families are located (HCV 4; HCV 5); • Lakes and streams that flow between communities in the region (HCV 4; HCV 5); • Area of presence of animals for subsistence hunting (HCV 5); • Place for reproduction of the traditional way of life (HCV 6).
Qualifying Attribute	The entire area of the Jatobá project being protected favors the extractive activities of the Amazon nut (*Bertholletia excelsa*). The conservation also favors the increase of local fauna, used as an important food resource by the communities. These factors together favor the reproduction of the local populations' way of life.
Focal Area	Improved surveillance of property, remote monitoring of forest cover, monitoring and further studies of biodiversity, and activities to intensify community engagement with forest preservation and forest resources.

4.1.4 Without-Project Scenario: Community (CM1.3)

The forest area that the project aims to preserve would be vulnerable to gradual invasions for deforestation to sell land for cattle pasture, strongly affecting the local biome, an invasion that the stakeholders would not be able to prevent without the presence of the project, increasing municipal deforestation rates and affecting the community's livelihood, generating impacts that would drive rural exodus.

Illegal hunting in the scenario without the project is estimated to continue on the rise, threatening the local biome and directly impacting the diet of communities, which will have fewer animals for subsistence, increasing the possibility of periods of famine during the seasons when hunting is the main source of food, a factor that will affect the local HDI, decreasing the quality of life by increasing food insecurity, making communities more dependent on canned food, causing direct impact on health and welfare, or even motivating communities to perform the rural exodus. For the riverside communities we highlight the implementation of strategies aimed at improving the quality of life, which would not occur in the absence of the project, such as: implementation of a community photovoltaic system, implementation of a water collection and distribution system, implementation of residential bathrooms, internet supply

system to improve communication, educational and health infrastructure and support to improve the commercialization of the nut.

In the absence of the project, mortality rates may be largely affected by dysentery,worm infections from drinking untreated water, keeping the quality of life in lower categories, with the constant risk of families suffering from infant mortality, a serious issue that requires great efforts to keep at the lowest possible margins. In addition, without the legal medical support that the project foresees, there will continue to be a greater chance of deaths among the chestnut workers who are victims of work-related accidents, mainly due to snake bites. The limited access to electricity limits the possibility of the communities to deal with most of the problems they experience. Without the possibility of having a refrigerator and freezer, the riverside dwellers live a more immediate routine in the search for food, making it impossible to stock food for consumption in periods of scarce fishing, hunting, and agriculture. The lack of constant energy also limits the use of machinery to access drinking water, being a problem of difficult solution without adequate equipment and energy necessary for consumption. Without the actions of the project it is estimated that this problem will persist, since there is no solution in sight for the near future. In addition, access to energy and internet will enable the realization of online courses and school tutoring, improving educational indicators and bringing growth opportunities to young riverine people, a factor that does not present a scenario of improvement in the absence of the project. Due to the high cost of maintaining the activities that ensure the monitoring and security of the forest areas, it would be unfeasible for landowners to bear such costs and efforts in the long term and on a large scale, and it would not be possible to prevent unplanned deforestation and uncontrolled invasions. Thus, the scenario with the presence of the Jatobá project will guarantee the allocation of resources necessary for the conservation and protection of the project area, ensuring various benefits for the community and biodiversity in the region.

4.2 Net Positive Community Impacts

4.2.1 Expected Community Impacts (CM2.1)

The International Association for Impact Assessment (IAIA, 2003)[175] defines social impacts, for the purposes of impact assessment, as changes to one or more of the following:

- People's livelihood – how they live, work, have fun and interact on a daily basis;
- Culture – your beliefs, customs, values and shared language or dialect;
- Community – its cohesion, stability, character, services and facilities;

[175] Social and Biodiversity Impact Assessment (SBIA) Manual for REDD+ Projects Part 1 – Core Guidance for Project Proponents. 2011. Available at: <https://www.forest-trends.org/publications/social-and-biodiversity-impact-assessment-sbia-manual-for-redd-projects/>. Accessed on: 25/03/2023.

- Their political systems – the extent to which people participate in decisions that affect their lives, the level of democratization that is taking place and the resources made available for this;
- Environment – the quality of the air and water that people use; availability and quality of food they eat; the level of danger or risk, dust and noise to which they are exposed; the adequacy of sanitation, their physical security and their access to and control over resources;
- Health and well-being - health is a state of complete physical, mental, social and spiritual well-being and not merely the absence of disease or infirmity;
- Personal and property rights – particularly if people are economically affected or experience personal disadvantage which may include a violation of their civil liberties;
- Fears and aspirations – their perceptions about their safety, their fears about the future of their communities and their aspirations for their future and the future of their children.

The IAIA also defines social impact assessment as “the processes of analyzing, monitoring, and managing the intended and unintended social consequences, both positive and negative, of planned interventions (policies, programs, plans, projects) and any social change processes invoked for these interventions. Its primary purpose is to create a more sustainable and equitable biophysical and human environment" [176].

The impacts on communities presented below include benefits, costs, and risks, and are related to community, social, cultural, environmental, and psychological aspects. In addition to the observed impacts, consultations were held with community members seeking to capture their perception of the possible positive and negative changes that the project will bring. The impact evaluation activities took place in conjunction with family meetings and public consultation with the community between March 6 and March 8, 2023. Regarding the positive impacts, it was emphasized that forest preservation is essential to sustain the reproduction of their way of life and the well-being of riverside communities. The maintenance of biodiversity favors extractivism, in addition to making hunting and fishing more abundant, besides helping to preserve a mild climate, improving the quality of life.

Table 43. Description of impacts of project activities foreseen for specific community groups.

Community Group	Extractivist families from the São Francisco, Curupati, Alegrete and Timorante creeks

[176] Social and Biodiversity Impact Assessment (SBIA) Manual for REDD+ Projects Part 1 – Core Guidance for Project Proponents. 2011. Available at:: <https://www.forest-trends.org/publications/social-and-biodiversity-impact-assessment-sbia-manual-for-redd-projects/>. Accessed on: 25/03/2023.

Impact(s)	• Improved household infrastructure with the deployment of household photovoltaic systems and internet access points; • Increased instantaneous communication between communities in emergencies, events, negotiations and integration of populations in cyber environments and distance education; • Improved health with access to safe drinking water promoted by the implementation of treated water collection and distribution systems and dry pit toilets • Improvement of the health infrastructure with the provision of equipped *ambulancha (speedboat that works as a river ambulance)* and technical training courses; • New learning that adds value to the commercialized products and generates new income alternatives, providing more work opportunities and improvement in the families' income; • Strengthening of associationism and community management capacity; • Strengthening the inclusion of socially vulnerable groups in productive activities.
Type of Benefit/Cost/Risk	• Benefit: these impacts are directly related to the project, expected to occur in the short, medium and long term, presenting benefits for the extractivists who will learn processing techniques, management and marketing of their business, with direct support from trained professionals. These activities will also help the riverside dwellers with their family agriculture. The social organization will be favored, creating a favorable environment for the generation of new businesses and the expansion of the activities carried out. • Cost: no significant cost is expected from the community groups, only the time that the producers must invest in the development of the activities is considered a cost for the communities. • Risk: The risk identified is related to deforestation that has invaded areas surrounding the project. There is the possibility of riparian and extractivist communities suffering threats from criminals for being part of the project and thus assisting the inspection teams in the areas.
Change in Well-being	Positive impact, indirect and of great magnitude.

4.2.2 Negative Community Impact Mitigation (CM2.2)

The Jatobá project does not cause negative impacts on local communities and communication channels have been established to clarify doubts, receive suggestions, and receive complaints.

4.2.3 Net Positive Community Well-Being (CM2.3, GL1.4)

The viability of access to safe drinking water implies directly in the reduction of infant mortality rates from contaminated water consumption, and also affects the reduction of dysentery cases in all age groups. Improving the quality of life in these communities with accessible drinking water is an important step towards achieving more complex community goals. In addition, access to toilets with dry toilets will improve the basic sanitation of the communities, promoting a decrease in cases of worms and solitary worms, as well as providing decent housing conditions.

The implementation of solar panels, guaranteeing electric energy without charge, will have a considerably large impact on the well-being of the communities. This energy will bring the basis for a series of changes in the local routine and structure, giving access to the use of household appliances such as refrigerators, freezers, and fans, appliances of constant use that were unfeasible in a mode of using generators for only a few hours a day. The introduction of refrigerators and freezers in the livelihood of these communities will guarantee an advance in food preservation, giving the communities the possibility of storing food in a hygienic and safe way, reducing the immediate need for hunting or fishing to obtain protein for consumption, ensuring that the communities have less need to consume perished food, increasing the quality of life and reducing cases of foodborne infections.

Internet access will ensure better daily communication between the riverside communities, with solar panels access can be throughout the day, unlike the restrictions that the energy generator has in the daily routine, this will ensure that the community can be more integrated into events, access to websites of government agencies for services and schedules, digital inclusion of communities the social networks in a solid way. It is expected that through the saving of resources such as oil and gasoline for generators, the communities will have a greater availability of these resources for mobility, making possible commuting that was previously unfeasible due to the limited use of gasoline and oil available. The energy autonomy, added to the internet access in the communities and the support in the educational restructuring in the territory, will present a considerable improvement in local education. These actions constitute the basic infrastructure needed to facilitate the education of the community, improving literacy, reducing the school dropout rate, and adjusting the age/grade. Education is also fundamental to staying in the territory, improving family ties and reducing the exodus to the urban environment, where living conditions tend to be of high social vulnerability. The courses for training in production processing, in the search for new commercial partnerships, and in the development of the brand itself, relying on marketing and building new commercial relationships, will cause an increase in the income of the producing families, from the appreciation of the product and the reduction of dependence on a single buyer. These actions together will generate increased income for riverside families, improving the quality of life, strengthening the association and the permanence in the territory.

4.2.4 High Conservation Values Protected (CM2.4)

The project's activities consist in the conversation of the forest used as an area for extraction of products by the riverside dwellers of the São Francisco, Curupati, Alegrete, and Timorante creeks, in the municipality of Boca do Acre, State of Amazonas, and will serve to maintain the reproduction of their way of life and improve the supply of ecosystem services, such as nuts, hunting, and fishing.

4.3 Other Stakeholder Impacts

4.3.1 Impacts on Other Stakeholders (CM3.1)

The development of the Jatoba project is not expected to cause negative impacts on other stakeholders. However, it may cause positive impacts for other stakeholders. In this sense, the positive impact on the well-being of these other stakeholders will be related to the project's benefits activities. In order to share the positive impacts with all stakeholders, the project intends to:

- Benefit all stakeholders through forest conservation in the project area;
- Increase the commercialization of local extractivism products;
- Promote technical training not only for traditional communities, but also serve interested communities that live in the municipality headquarters and practice extractivism.

Although not anticipated to occur, negative impacts can be listed as:

- Conflict between the time dedicated to day-to-day activities and that available for conducting training and participating in the project;
- Failure in communication between the technical team and the community and, consequently, misunderstandings between the parties.

4.3.2 Mitigation of Negative Impacts on Other Stakeholders (CM3.2)

As mentioned, the Jatoba project is not expected to cause negative impacts on other stakeholders. The negative impacts listed above are unlikely to occur. As a mitigating measure, the project proposes that the development of the project happens in a participative way, allowing the free exercise of the manifestations of the other stakeholders, as well as an efficient and permanent communication between the project developer and all the stakeholders.

4.3.3 Net Impacts on Other Stakeholders (CM3.3)

The Jatoba project is not expected to negatively impact other stakeholders. As stated above, the project only intends to positively impact other stakeholders. By preserving the forest area used by extractivists and allowing access to local communities, the project will have positive impacts on

communities and other stakeholders by encouraging traditional ways of life as well as their maintenance and strengthening. The project aims to serve all stakeholders and is intended to achieve the inclusion and well-being of the 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)

The Sustainable Livelihoods (SLM) methodology adopted makes it possible to recognize the future aspirations for change of the community members in line with the forest conservation and protection measures. Because of its multidimensional aspect (human, social, environmental, physical, and financial), the baseline assessment allows the project to consider precisely that the fragile foundations are strengthened and the expected changes come with a structured tying together of these changing dimensions. This will occur from a governance that transversely considers the participation of communities in the process of deliberation of local projects and their monitoring following the light of changes that are sustainable. Figure 40 presents the conditional processes between improvement in the dimensions of the MVS with access to and influence of policies, management, structure, and laws.

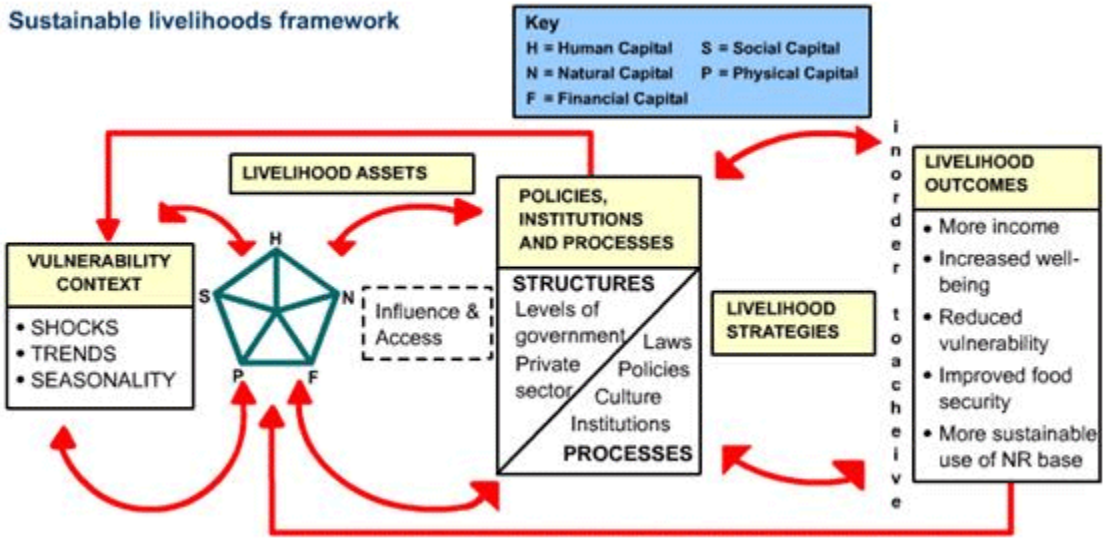


Figure 40. Processes for improvement in the MVS dimensions.

An exogenous driver or factor can be an impact as a major force that strengthens, empowers, or disrupts and unbalances this tenuous web of interactions between what was available in their livelihoods and what they can make happen to improve access and/or strengthen that asset base. Carbon credit projects, to generate maximum positive impacts, must be chosen and recognized in their viability in accordance with the communities' way of life, either by ensuring or enhancing access to the assets of the five dimensions, while maintaining balance and respecting the dreams and goals of the collectivity. Since

most extractivists and riverbank dwellers are from socioeconomically vulnerable social groups, the projects to strengthen their assets in the five dimensions should push individual, family, and community forces towards rebalancing and positive impacts, so that the intervention process of the projects does not cause an insurmountable corrosion of available livelihoods. It must then be avoided that riparian and extractivist people have their asset bases and their aspirations and strategies for the future damaged.

Considering the role of the company that designs and implements the carbon credit project as a guarantor to supply elements that strengthen and encourage livelihoods and human rights associated with them, the methodology and expected results of this study and analysis need to account for the complexity of the interaction of internal and external factors with indicators that consider measuring this complex tangle of assets, aspirations, dreams, interests that are immaterial and material, so that the resident and user population of the carbon credit project areas knows how to promote their rights and livelihoods in order to positively achieve even greater strengthening of their assets for the autonomous and independent continuation of their family and community life.

As a starting option for the dialogue about the indicators for measuring the process and results of community carbon credit projects, with the description of the baseline and future monitoring, the methodology should cover its effects on the defense of rights, aspirations, needs and livelihoods of people, families and communities in the project territories that result from the investigation on the before and after each project prepared and executed by Terra Vista Gestora de Recursos Ltda. This can be made possible, of course, through an in-depth dialogue between the parties that are interested in making the actions resulting from the projects a differential in terms of qualified information, effective social participation, and the achievement of community development aspirations.

Table 44. Dimensions, indicators, and corresponding averages stipulated from the application of the MVS questionnaires.

Types of assets/dimensions	Information to be obtained for baseline description (Indicators)
Human Dimension	H1 - Family food security
	H2 - Use and appreciation of traditional/local ecological knowledge
	H3 - Access to new knowledge
	H4 - Satisfaction and motivation with work and life in the territory
	H5 - Work safety

Social Dimension	S1 and S2 - Relationships with community members, partners and institutions
	S3 - Visibility and opportunity for young people
	S4 - Participation and appreciation of women in productive activities
	S5 - Access to public policies aimed at strengthening their ways of life
Environmental Dimension	A1 - Access to water for human and animal drinking
	A2 - Access to land suitable for the various traditional uses and their aspirations
	A3 - Conservation and use of the forest and wild fauna
Physical Dimension	P1 - Individual production
	P2 - Collective production infrastructure
	P3 and P4 - Individual/family infrastructure for housing, transport and well-being
Financial dimension	F1 - Income
	F2 - Price of products and working capital, when applicable
	F3 - Commercialization
	F4 - Access to lines of credit and other financial aid policies

Sustainable livelihoods help to reference important aspects of the integrality of the lifestyles and aspirations of people, families and communities living and/or using the territories of the carbon credit projects. Subsequently, it will be possible to elaborate the projects in partnership with the communities in a dialogical way through informed and enlightened participation, respecting the autonomy and the way of seeing and living of each group in the territory. Clear and precise indicators will be adopted that can help measure the progress and results achieved each year, considering the positive impacts of the intended carbon credit project.

The evaluation will be done through the annual systematic application of the questionnaire based on the MVS, with a sample of up to 25% of the community members benefited, considering that the indicators measured in the baseline survey below the average 0.5 (from zero to one) should indicate a positive growth impact of 20% per year for the indicators of the human, social and physical dimensions, and 15% per year for the indicators of the financial dimension.

For indicators that in their baseline received an average score above 0.5, the expected improvement is that the score will rise in general for indicators in all these dimensions by 5% per year.

This metric is justified by the fact that the resource base of all five dimensions, with the exception of the natural dimension (have forest, hunting, fishing, ecosystem services that give them subsistence) were rated with an average score below 0.5, proving to be insufficient for a sustainable basis for their livelihoods and indicating that more rapid change is needed in order to ensure stability especially so that young people and women do not give up and become willing to emigrate.

In this case, reaching the median level of the component indicators of the MVS dimensions will create a more sustainable livelihood base, considering that programming from this level will be slower because it will depend on a series of factors outside the governance of the project, and will have greatly reduced the risk of the people of these communities giving up on being extractivists and forest stewards with the project.

4.4.2 Monitoring Plan Dissemination (CM4.3)

The indicator monitoring plan will be disclosed by email and in meetings with the communities. All results will be available for public consultation on the internet and summaries will be communicated to communities and other stakeholders through informative materials. The monitoring and verification results of this project will be published on the Verra platform. The process will be agreed with the communities in participatory workshops with the bulletin informing the progress of the project.

4.5 Optional Criterion: Exceptional Community Benefits

4.5.1 Exceptional Community Criteria (GL2.1)

As described in sections **2.1.8** Stakeholder Identification (G1.5) and **2.1.19** Permanence of Benefits (G1.11), 60 families living in the São Francisco, Curupaiti, Alegrete and Timorante creeks in the municipality of Boca do Acre were identified as beneficiaries of the project. The project will have the communities as protagonists in the definition of socio-environmental programs and activities in the territories, enabling the extraction of non-timber products and access to projects for improving the production chain, associativism, and improving the quality of life.

As described in section 2.1.6 Social Parameters (G1.3), the riparian dwellers live in a region of social vulnerability, in which there are people below the poverty line, defined as individuals who live on less than R$457.00 per month.

The FIRJAN Municipal Development Index (IFDM) for Boca do Acre in 2016 was 0.478 points, which is considered an average performance, ranking Boca do Acre in 286th place in the national ranking of 5,570 municipalities, which, added to the IFDM Health and Education, represents an average performance at the national level. According to the Central Registry of Companies, consulted through the IBGE's Cities portal, in the year 2020, the average monthly salary of formalized workers in Boca do Acre was 1.5 minimum wages[177]. However, only 7.2% of the population was formally employed in the period and, considering the monthly incomes of up to half a minimum wage per person, Boca do Acre had 49.7% of its population in this condition[178]. This indicates a situation of wide salary inequality and a labor market characterized by high informality. Thus, when comparing the average salary situation with the average of the state of Amazonas, Boca do Acre occupies a low position, 48th out of 62, and when compared with other municipalities in Brazil, it occupies the 4,887th position out of 5,570.

One can add to the data presented above, the proportion of people employed in the labor market in the municipality compared to the average found in Amazonas and Brazil. Boca do Acre ranked 14th in relation to the state in which it is inserted. In comparison with the country, it occupied the 4,421st place, out of 5570 Brazilian municipalities. These data indicate that the average salary is restricted and a worrying concentration of income, since the pattern for the municipality is unemployment and informality, appearing as one of the worst municipalities in Brazil when it comes to occupation in the labor market. Thus, it can be said that the population of Boca do Acre is in a condition of social vulnerability.

4.5.2 Short-term and Long-term Community Benefits (GL2.2)

As described in section **4.2.1** Expected Impacts for Communities (CM2.1), the project has activities that generate short and long term benefits for the communities. As short-term benefits, the communities will be benefited with direct jobs in the surveillance of the project area, in addition to training and courses aimed at strengthening the production chain, new income alternatives, associativism and female empowerment. In addition, structuring actions will be implemented to provide water security, basic sanitation, electricity, internet access, transportation, and education and health infrastructure. These actions together generate benefits that last from the medium to the long term.

The actions taken in the short term will generate the following benefits in the medium term: (i) Water Security; (ii) Basic Sanitation; (iii) Energy autonomy; (iv) Access to means of communication; (v) Reduced effort in household and income generation jobs; (vi) Educational development through access to remote classes and technology-mediated classroom instruction; (vii) Decreased school dropout and age-grade

[177] IBGE - Instituto Brasileiro de Geografia e Estatística. Salário médio mensal dos trabalhadores formais. IBGE, Cadastro Central de Empresas 2020. Rio de Janeiro: IBGE, 2022. Available at <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/panorama> Accesses on: 06/04/2023.

[178] IBGE - Instituto Brasileiro de Geografia e Estatística. Salário médio mensal dos trabalhadores formais. IBGE, Cadastro Central de Empresas 2020. Rio de Janeiro: IBGE, 2022. Available on: <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/panorama> Accessed on: 06/04/2023.

distortion; (viii) Learning in the use of new technologies and management techniques for agroforestry products; (ix) Increased capacity and speed in transporting production; (x) Added value to the marketed product; (xi) Decreased dependence on a single buyer, ensuring the sale of fairer prices; (xii) Adding value to associated products; (xiii) Increased income due to the construction of new business relationships, development of own brand and activities to promote products; (xiv) Resilience to crisis through diversification of production.

In the long term, the project tends to provide the following impacts: (i) Decrease in the rate of water-borne diseases, such as diarrhea, cholera and diseases caused by worms; (ii) Decrease in women's workload in water collection and domestic activities; (iii) Dissemination of social technologies; (iv) Increased permanence in the territory; (v) Access to rights and citizenship; (vi) Strengthening of family autonomy; (vii) Improvement in educational indices; (viii) Strengthening of associationism; (ix) Adding value to the productive chain; (x) Increasing the value of carbon credits by increasing the socio-environmental value and bio-economy of the projects; (xi) Strengthening the ways of life of traditional local communities and their economic and cultural reproduction; (xii) Reducing the rural exodus and urban marginalization; (xiii) Mitigating the risks of extreme climate events; (xiv) Improving the quality of life.

4.5.3 Community Participation Risks (GL2.3)

Regarding the risks associated with the participation of communities in the Jatoba project, as described in section 4.2.1 Expected Impacts for Communities (CM2.1), it was pointed out possible threats suffered by invaders of lands that are close to the project area. As pointed out in section 4.2.2 Mitigation of Negative Impacts on Communities (CM2.2), as a way to mitigate the possible risk of threats, it is proposed the creation of a channel for reporting possible threats, directly directed to a specialized team that will take the appropriate legal actions to safeguard the integrity of the community.

In relation to the risks associated with not carrying out the project, as described in section **4.1.4** Scenario Without the Project: Community (CM1.3), the project will ensure the allocation of resources necessary for the conservation and protection of the project area, ensuring various benefits for the community and biodiversity in the region. For the community, we highlight the implementation of strategies aimed at improving the quality of life of local communities, as described in the previous section. It is noteworthy that by preserving the forest area used for extractivism and subsistence and that is at imminent risk of deforestation, the project tends to provide the strengthening of the ways of life of local traditional communities and their economic production.

4.5.4 Marginalized and/or Vulnerable Community Groups (GL2.4)

The project will guarantee the allocation of resources necessary for the conservation and protection of the project area, ensuring several benefits for the community and biodiversity in the region. For the community, we highlight the implementation of strategies aimed at improving the quality of life of local communities, as described in the previous section. It is noteworthy that by preserving the traditionally

occupied area that is in imminent risk of deforestation, the project tends to provide the strengthening of the traditional local communities' ways of life and their socioeconomic production.

In the annual investment forecast meetings and in the semi-annual evaluation, the riverine community will have their participation not only encouraged, but also facilitated on the issue of transportation, so there is a growing trend of empowerment of this specific group regarding governance in the municipal region and in the Jatobá project. The initial way to manage the risks of these groups not receiving the benefits of the project in an equitable way was to design a participatory management of the project by including a representative of this sector in the Steering Committee, monitoring the actions and investments to ensure that the benefits are being distributed equitably.

4.5.5 Net Impacts on Women (GL2.5)

The process of socio-economic diagnosis, public consultation, and communication with the extractivist in the territory occurred in an open and participatory manner with no distinction of sex or gender. In this sense, there was a concern on the part of the technical team to enable women's participation throughout the project development process. During the meetings, activities, and interviews, there was participation and influence of the women of the community on decision-making and on the development of the actions to be adopted in the territory.

To enable equal participation between men and women in the activities and benefits of the project, knowing that women's activities are more associated with housework and child-rearing, while men are more dedicated to activities outside the domestic environment, there should be an equal distribution of places for the training courses. Places for capacity building in social technologies will be designated and secured for women by establishing participatory quotas of 45% of the total number of places. To ensure female participation in the training, the presence of children and other children will be welcomed.

As a way of ensuring gender equality and improving the quality of life of the riverine and extractivist women in the project, a support network for women who are victims of domestic violence and attempted femicide will be implemented in the communication channel. This channel will be a space where only women will work so that there will be a comfortable welcome for the victims, where they can express themselves and report abuses and aggressions. These reports will be received by a professional who will forward the necessary actions to the psychosocial support. The search for this action aims at the possibility of a space where these women can talk about issues that they cannot or have no interest in sharing with the closest person they trust, usually the husband or the father and mother, being a safe, accessible, and cost-free place for these women.

The project will seek, through training, to expand the possibility of creating a riverine women's association in the project areas, in order to enable a union among the women of the communities so that a space can be created to help each other with psychophysiological issues that occur in the communities, enabling a greater range of representation and community support among women, thus ensuring the

exposure of problems hidden by the limitation of communication that these women currently have as their place of speech. The organization of the activities and net impacts on the women are presented in the table below.

Table 45. Activities and Impacts directed towards women.

Activities	Impacts
Training courses with exclusive openings for women.	Increased scope of professional opportunities for riverside and extractivist women in the project.
Reporting channel on Whatsapp for reports of assaults and attempted feminicides.	Improved safety and decreased gender vulnerability suffered by the riverside and extractivist women in the project.
Immersion in associative structures to enable the creation of a women's association for women.	Expansion of safe spaces for riverine and extractivist women in the project, ensuring greater representation and debate towards their problems and challenges that are out of the question in traditional media today.

4.5.6 Benefit Sharing Mechanisms (GL2.6)

The Jatobá project is focused on training local multipliers, through the dissemination of knowledge and information about the project in all its phases, building efficient and assertive communication with the communities, and guaranteeing the maturity of the communities in the appropriation of the actions that involve their territory. Stakeholders want and need to be involved in the design, implementation, monitoring, and evaluation throughout the life of the project. As detailed in section **2.5.3** Free, Prior, and Informed Consent (G5.2), all stages of the project are carried out with participatory and propositional consultations, including pre-mobilization, mobilization, execution, and publicizing.

The public meetings of the project design had moments of clarification of the benefits, costs, and risks provided by the project, as presented in section **2.3.7** Stakeholder Consultations (G3.4). In addition, the periodic meetings to be held in the communities will also seek to reassess the benefits, costs, and risks.

The public meeting is the legal and normative tool developed for the collective participation of the communities, in which they deliberate on their willingness to be involved, at what level this will take place, and what the expectations are in terms of benefits. For the definition and approval of the project's actions, public consultations were held by parent groups in the territory of the São Francisco, Curupati, Alegrete, and Timorante streams, and a public hearing in the city of Boca do Acre, in which, after explaining the project and clarifying all the doubts of the communities, their consent, support, and participation were

received. The results of the public hearings can be seen in detail in section **2.3.7** Stakeholder Consultations (G3.4).

As detailed in section **2.3.8** Ongoing Consultation and Adaptive Management (G3.4), the project has developed a permanent channel of communication and consultation between the project proponents and the communities, and other stakeholders. Communication takes place instantaneously by email and/or messaging applications. Prior to each verification, communities and other stakeholders will be contacted and consulted to receive updates about project activities and results. Added to this transparency and communication factor is the presentation of the project monitoring results in periodic meetings with the communities, in addition to the availability of summarized information in the appropriate language and in public on the websites of Verra and of the proponent Terra Vista Gestora de Recursos Ltd.

Based on the socio-economic diagnosis, the result of interviews and meetings held with the participating communities, with the objective of knowing the local reality and the expectations of the target audience, the main social demands and mitigating actions capable of promoting improvements in local infrastructure and quality of community life were identified.

As pointed out in section **2.1.11** Project Activities and Theory of Change regarding community infrastructure, the project will facilitate the transfer of social technologies, through a) acquisition and implementation of a family photovoltaic system; b) implementation of water collection and distribution systems with the use of filters for treatment; c) construction of toilets with dry septic tanks; d) implementation of internet access systems; e) acquisition of an equipped ambulance boat.

The communities involved will also benefit from training and courses directed to: a) Strengthening the productive chain of the Amazon nut, adding value to the product and potentiating the capacity of community management; b) Increasing the income of the extractivist families, strengthening associations; d) Encouraging the training and engagement of young people and women in economic activities, increasing inclusion and strengthening vulnerable social groups. As a result, the project activity will have a positive impact by strengthening the autonomy of families, providing decent conditions for community infrastructure, ensuring better conditions for permanence in the territory, and developing new knowledge that provides the improvement of productive capacities.

During these meetings, all the benefits, costs, and risks were presented in the appropriate language to the communities participating in the project. In these meetings, the communities expressed their perspectives, conditions, and needs about participating in the project, thus influencing the project design and development process. As agreed in a meeting with the communities, the project's benefit sharing reaches all participating communities.

In regards to the Jatobá project's costs and funds, the process of generating carbon credits and the revenue from their sale will be made available in a transparent manner for access via the project's website. The information about the process of generating carbon credits and the revenue from their sale will also be made available in meetings between the technical team and the communities.

4.5.7 Benefits, Costs, and Risks Communication (GL2.7)

The public project design meetings had moments of clarification of the benefits, costs, and risks provided by the project, as presented in section **2.3.7** Stakeholder Consultations (G3.4). In addition, periodic meetings in the communities will seek to reassess the benefits, costs, and risks.

4.5.8 Governance and Implementation Structures (GL2.8)

As detailed in section **2.4.1** Project Governance Structures (g4.1), the communities will participate in the project management through the communication channels developed and periodic meetings in the communities, respecting the right to Free, Prior and Informed Consultation.

4.5.9 Smallholders/Community Members Capacity Development (GL2.9)

The Jatobá project plans to build broad technical capacity for community members, integrating social technologies for traditional riverside families living along the banks of the São Francisco, Curupati, Alegrete, and Timorante streams, addressing the strengthening of the production chain, community associations, and the inclusion of vulnerable groups in economic activities. The communities involved will benefit from training and courses focused on: a) Strengthening the production chain of the Amazon nut, adding value to the product and enhancing community management capacity; b) Increasing the income of extractivist families, strengthening associations; c) Encouraging the training and engagement of young people and women in economic activities, increasing the inclusion and strengthening vulnerable social groups. As a result, the project activity will have a positive impact by strengthening the autonomy of the families, ensuring better conditions for their permanence in the territory, and developing new knowledge that will provide the improvement of productive capacities.

5 BIODIVERSITY

5.1 Without-Project Biodiversity Scenario

5.1.1 Existing Conditions (B1.1)

The Amazon is characterized by having a great biodiversity, providing several ecosystem services that are considered fundamental for climate maintenance, regulation of hydrological and biogeochemical

cycles, carbon stock, in addition to the conservation of several species[179] [180] [181]. It is estimated that about 10% of the world's biodiversity, including threatened and endemic species, is found in the Amazon[182].

The importance of the Amazon in terms of biodiversity stems mainly from its extensive land area, which encompasses a wide range of environments and includes diverse terrestrial and aquatic habitats. This results in a remarkable variety of flora and fauna, with approximately 45,000 species of plants and vertebrate animals documented in the Amazon region[183].

The area where the project is located, which lies within the Purus River sub-basin, is renowned for presenting natural ecosystems of great relevance and biological diversity. However, surveys on fauna groups are still incipient in the region, which indicates gaps in knowledge regarding its biodiversity[184] [185].

To characterize the fauna and flora that potentially occurs in the region, we relied on secondary data derived from the Conservation Units Management Plans in the vicinity of the project area, namely: (i) Management Plan of the Mapiá-Inauini National Forest[186]; (ii) Management Plan of the Purus National Forest[187]; (iii) Participatory Management Plan of the Arapixi Extractive Reserve[188] and Management Plan

[179] Fearnside, P. M. 1997. Environment services as a strategy for sustainable development in rural Amazonia. Ecological Economics, v. 20, n. 1, p. 53-70. Available at: <https://www.sciencedirect.com/science/article/abs/pii/S0921800996000663>. Accessed on: 22/10/2022

[180] Nepstad, D. 2007. The Amazons vicious cycle: drought and fire in the greenhouse. Ecological and climatic tipping points of the worlds' largest tropical rainforest, and practical preventive measures. Gland Switzerland: WWF international, 24 p. Available at: <https://wwfeu.awsassets.panda.org/downloads/amazonas_eng_04_12b_web.pdf>. Accessed on: 22/10/2022

[181] Santos, A.C; Kano, C; Quartarolli, C.F; Tosto, S.G. 2019. Mapeamento do uso e cobertura das terras e estoque de carbono no solo em área de floresta na bacia hidrográfica de Apuí/AM. 13º Congresso Interinstitucional de Iniciação Científica – CIIC 2019 30 e 31 de julho de 2019 – Campinas, São Paulo. Available at: <https://www.alice.cnptia.embrapa.br/alice/bitstream/doc/1111354/1/5075.pdf>. Accessed on: 22/10/2022

[182] WWF. 2012. ARPA Biodiversidade. Available at: <https://www.terrabrasilis.org.br/ecotecadigital/index.php/estantes/pesquisa/1694-arpa-biodiversidade>. Accessed on: 18/10/2022

[183] WWF. 2012. ARPA Biodiversidade. Available at: <https://www.terrabrasilis.org.br/ecotecadigital/index.php/estantes/pesquisa/1694-arpa-biodiversidade>. Accessed on: 18/10/2022

[184] Waldez, F., Menin, M. & VOGT, R.C. Diversity of amphibians and Squamata reptilians from lower Purus River Basin, Central Amazonia, Brazil. Biota Neotrop. 13(1) Available at: <http://www.biotaneotropica.org.br/v13n1/en/abstract?inventory+bn03113012013>. Accessed on: 18/10/2022

[185] Sampaio, R.; Coutinho, T.A; Neto, A.; Konrath, L.; Pimenta, L.F; Sena, A.E.C. 2017. Diversidade de primatas no sul do Amazonas: oportunidades para a gestão de unidades de conservação. ICMBIO. Available at: <https://revistaeletronica.icmbio.gov.br/BioBR/article/view/643/555> Accessed on: 18/10/2022

[186] ICMBIO. 2009. Plano de Manejo da Floresta Nacional Mapiá-Inauini. Available at: <https://www.gov.br/icmbio/pt-br/assuntos/biodiversidade/unidade-de-conservacao/unidades-de-biomas/amazonia/lista-de-ucs/flona-mapia-inauini/arquivos/flona_mapia_inauini_pm.pdf> Accessed on: 18/10/2022

[187] ICMBIO. 2009. Plano de Manejo da Floresta Nacional do Purus. Available at: <https://www.gov.br/icmbio/pt-br/assuntos/biodiversidade/unidade-de-conservacao/unidades-de-biomas/amazonia/lista-de-ucs/flona-do-purus/arquivos/flona_purus.pdf> Accessed on: 18/10/2022

[188] ICMBIO. 2010. Plano de Manejo Participativo da Reserva Extrativista Arapixi. Available at: <https://www.gov.br/icmbio/pt-br/assuntos/biodiversidade/unidade-de-conservacao/unidades-de-biomas/amazonia/lista-de-ucs/resex-arapixi/arquivos/resex_arapixi.pdf> Accessed on: 18/10/2022

of the Cazumbá-Iracema Extractive Reserve[189]. Additionally, information obtained from the Integrated Biodiversity Assessment Tool - IBAT was used[190].

Due to the limited data available for the project area, primary data surveys will be conducted at the beginning of the project implementation and conducted throughout its lifetime via environmental monitoring to enhance our knowledge about the specific biodiversity of the project area. The baseline diagnostics for fauna and flora groups are provided below.

Fauna

According to the data collected in the region, the group of mammals is composed of about 211 species. From those, the primate species *Callicebus moloch* (zogue-zogue)[191] and *Leontocebus fuscicollis primitivus*[192] are considered endemic to the Brazilian Amazon. For the avifauna group, 626 species were recorded, including the endemic specie of Brazil *Psarocolius bifasciatus* (japuaçu)[193].

A total of 259 species of herpetofauna were recorded, including 113 amphibians and 146 reptiles. As indicated in the literature, the southwestern Amazon region contains a high diversity of amphibians and reptiles[194], supporting the secondary data collected for the project region. For the fish group, about 111 species were recorded in the watercourses of the region, including both large and small migratory species, as well as ornamental species[195].

Considering all the groups, a total of 37 species are considered threatened in the region (Table 46). For the mammalian fauna, 22 threatened species were recorded, 12 of which are classified as "Vulnerable"

[189] ICMBIO. 2007. Plano de Manejo da Reserva Extrativista do Cazumbá-Iracema. Available at: <https://www.gov.br/icmbio/pt-br/assuntos/biodiversidade/unidade-de-conservacao/unidades-de-biomas/amazonia/lista-de-ucs/resex-do-cazumba-iracema/arquivos/resex_cazumbairacema.pdf> Accessed on: 18/10/2022

[190] IBAT Proximity Report, 2022. Generated under license number 31998-37010 from the Integrated Biodiversity Assessment Tool on 25th November 2022. Available at: <http://www.ibat-alliance.org>. Accessed on: 25/11/2022.

[191] IUCN - Ravetta, A.L., Carvalho, A.S., Buss, G. & Boubli, J.P. 2021. *Plecturocebus moloch* (amended version of 2020 assessment). The IUCN Red List of Threatened Species 2021: e.T41556A192452656. <https://dx.doi.org/10.2305/IUCN.UK.2021-1.RLTS.T41556A192452656.en> Accessed on: 19/10/2022.

[192] Moura, E.F. 2021. *Leontocebus fuscicollis* ssp. *primitivus* (amended version of 2020 assessment). The IUCN Red List of Threatened Species 2021: e.T43951A192314951. Available at: <https://dx.doi.org/10.2305/IUCN.UK.2021-1.RLTS.T43951A192314951.en>. Accessed on: 04/01/2023.

[193] BirdLife International. 2022. Species factsheet: *Psarocolius bifasciatus*. Available at: <http://www.birdlife.org>. Accessed on: 20/10/2022

[194] França, G.G.R; Venâncio, N. M. 2010. Reptiles and amphibians of a poorly known region in southwest Amazonia. Biotemas, 23 (3): 71-84. Available at: <https://periodicos.ufsc.br/index.php/biotemas/article/view/2175-7925.2010v23n3p71> Accessed on: 19/10/2022

[195] ICMBIO. 2009. Plano de Manejo da Floresta Nacional do Purus. Available at: <https://www.gov.br/icmbio/pt-br/assuntos/biodiversidade/unidade-de-conservacao/unidades-de-biomas/amazonia/lista-de-ucs/flona-do-purus/arquivos/flona_purus.pdf> Accessed on: 18/10/2022

and five as "Endangered" by the IUCN. At the national level, 12 species are considered "Vulnerable" and two "Endangered" with extinction.

For herpetofauna, two species of reptiles are classified as "Vulnerable" by the IUCN, especially the chelonian species Tracajá or Yellow-spotted river turtle (*Podocnemis unifilis*), which suffers great anthropic pressure in the region.

For the avifauna, a total of 13 threatened species were recorded, eight of which are "Vulnerable" and two are "Endangered" with extinction according to the IUCN. At the national level, six species are classified as "Vulnerable", one as "Endangered" and two as "Critically Endangered". In this group, the species *Crax globulosa* and *Sporophila maximiliani* stand out as "Endangered" at the international level, with very small and declining populations, probably as a result of intense hunting activity and the loss and degradation of their habitats [196] [197] [198].

Table 46. List of fauna species threatened with extinction (VU = Vulnerable, CR = Critically Endangered, EN = Endangered).

Scientific Name	Popular Name	Threat Category
Mammalian fauna		
Myrmecophaga tridactyla	Giant anteater	VU (IUCN, 2014; MMA, 2022);
Priodontes maximus	Giant armadillo	VU (IUCN, 2014; MMA, 2022)
Panthera onca	Jaguar	VU (MMA, 2022)
Pteronura brasiliensis	Otter	EN; VU (IUCN, 2021; MMA, 2022)
Inia geoffrensis	Red button	EN (IUCN, 2018; MMA, 2022)
Tayassu pecari	White-lipped peccary	VU (IUCN, 2013; MMA, 2022)
Tapirus terrestris	South American tapir	VU (IUCN, 2019; MMA, 2022)

[196] ICMBIO. 2009. Plano de Manejo da Floresta Nacional do Purus. Available at: <https://www.gov.br/icmbio/pt-br/assuntos/biodiversidade/unidade-de-conservacao/unidades-de-biomas/amazonia/lista-de-ucs/flona-do-purus/arquivos/flona_purus.pdf> Accessed on: 18/10/2022

[197] BirdLife International (2022) Species factsheet: *Crax globulosa*. Available at: <http://www.birdlife.org>. Accessed on: 24/10/2022

[198] BirdLife International (2022) Species factsheet: Sporophila maximiliani. Available at: <http://www.birdlife.org>. Accessed on: 24/10/2022

Atelocynus microtis	Short-eared Bushdog	VU (MMA, 2022)
Sotalia fluviatilis	Tucuxi	EN (IUCN, 2020)
Callimico goeldii	Goeldii's marmosets	VU (IUCN, 2021)
Speothos venaticus	Bush dog	VU (MMA, 2022)
Leopardus wiedii	Margay	VU (MMA, 2022)
Cebuella pygmaea	Pygmy marmoset	VU (IUCN, 2021)
Lagothrix lagothricha	Common woolly monkey	VU (IUCN, 2021)
Alouatta puruensis	Purús	VU (IUCN, 2015)
Ateles chamek	Peruvian spider monkey	EN (IUCN, 2015); VU (MMA, 2022)
Cebuella niveiventris	Eastern pygmy marmoset	VU (IUCN, 2015)
Cebus unicolor	Spix's white-fronted capuchin	VU (IUCN, 2020)
Lagothrix lagothricha cana	Silvery woolly monkey	EN (IUCN, 2020)
Leopardus tigrinus	Oncilla	VU (IUCN, 2016); EN (MMA, 2022)
Trichechus inunguis	Amazon manatee	VU (IUCN, 2016; MMA, 2022)
Furipterus horrens	Bat	VU (MMA, 2022)
Herpetofauna		
Podocnemis unifilis	Yellow-spotted river turtle	VU (IUCN, 1996)
Chelonoidis denticulatus	Yellow-footed tortoise	VU (IUCN, 1996)
Avifauna		
Harpia harpyja	Harpy eagle	VU (IUCN, 2021; MMA, 2022)

Pionites leucogaster	Green-thighed parrot	VU (IUCN, 2021)
Neomorphus geoffroyi	Rufous-vented ground cuckoo	VU (IUCN, 2021; MMA, 2022)
Crax globulosa	Wattled Curassow	EN (IUCN, 2016; MMA, 2022)
Sporophila maximiliani	Great-billed seed-finch	EN; CR (IUCN, 2019; MMA, 2022)
Agamia agami	Agami heron	VU (IUCN, 2016)
Chaetura pelagica	Chimney swift	VU (IUCN, 2018)
Cnipodectes superrufus	Rufous twistwing	VU (IUCN, 2017; MMA, 2022)
Primolius couloni	Blue-headed macaw	VU (IUCN, 2021)
Tinamus tao	Grey tinamou	VU (IUCN, 2018; MMA, 2022)
Calidris subruficollis	Buff-breasted sandpiper	VU (MMA, 2022)
Morphnus guianensis	Crested eagle	VU (MMA, 2022)
Nyctibius leucopterus	White-winged potoo	CR (MMA, 2022)

Flora

The forest formation in the Jatobá project area is predominantly Ombrophylous Forest, ranging between two phytophysiognomies: Lowland Open Ombrophylous Forest (55.9%) and Alluvial Open Ombrophylous Forest (44.1%), as presented in section **2.1.5**.

The Open Ombrophylous Forest of the Lowlands is a formation that occurs at altitudes ranging from 5 to 100m, and is composed of more widely spaced trees, with a low-density shrub stratum and characterized by phanerophytes and woody lianas[199]. The Alluvial Open Ombrophylous Forest is characterized by presenting formations along the water courses, occupying the plains and terraces

[199] IBGE 2012. Manual Técnico da Vegetação Brasileira. 2aed. Available at: <https://biblioteca.ibge.gov.br/index.php/biblioteca-catalogo?view=detalhes&id=263011> Accessed on: 13/10/2022.

periodically or permanently flooded, which according to the Technical Manual of Brazilian Vegetation[200], in the Amazon constitute physiognomies of floodplain forests or igapó forests.

The characterization of the flora in the region was conducted using secondary data obtained from the IBAT - Integrated Biodiversity Assessment Tool database[201] and the Management Plans of RESEX Arapixi (AM), FLONA Mapiá-Inauini (AM), and RESEX Cazumbá-Iracema (AC). About 510 (morphological) tree species were recorded[202], distributed among 271 genera and 77 botanical families. The ten most representative families in terms of the number of species were: Fabaceae (63 species), Annonaceae (34 species), Rubiaceae (28 species), Moraceae (24 species), Sapotaceae (20 species), Arecaceae (19 species), Lauraceae (18 species), Euphorbiaceae and Lecythidaceae (16 species each) and Apocynaceae (15 species).

Among the species surveyed, 235 species are classified as endemic to the Amazon, 26 as endemic to the Brazilian territory, and 14 as endemic to the Brazilian Amazon, that is, species that only occur in the Amazon phytogeographic domain in Brazil (Table 47).

Tabela 47. List of tree species endemic to the Brazilian territory and their respective endemism in the Amazon.

Family	Scientific Name	Popular Name	Endemism in the Amazon
Annonaceae	*Annona calcarata*	-	Endemic
Annonaceae	*Xylopia polyantha*	-	Endemic
Boraginaceae	*Cordia decipiens*	-	Endemic
Clusiaceae	*Garcinia brasiliensis*	Bacupari Fruit	Non-endemic
Euphorbiaceae	*Pausandra trianae*	Orelha-de-burro	Endemic
Fabaceae	*Inga virescens*	-	Non-endemic
Fabaceae	*Martiodendron mediterraneum*	-	Non-endemic

[200] IBGE 2012. Manual Técnico da Vegetação Brasileira. 2ªed. Available at: <https://biblioteca.ibge.gov.br/index.php/biblioteca-catalogo?view=detalhes&id=263011>. Accessed on: 13/10/2022.

[201] IBAT Proximity Report, 2022. Generated under license number 31998-37010 from the Integrated Biodiversity Assessment Tool on 25th November 2022. Available at: <http://www.ibat-alliance.org>. Accessed on: 25/11/2022.

[202] The subspecies and variations were considered when counting the total number of records

Family	Scientific Name	Popular Name	Endemism in the Amazon
Fabaceae	*Mora paraensis*	-	Endemic
Fabaceae	*Schizolobium parahyba var. amazonicum*	Angico	Endemic
Fabaceae	*Vatairea heteroptera*	Angelim	Non-endemic
Fabaceae	*Zollernia paraensis*	Pracauba, Pracuúba, Jenipapinho	Non-endemic
Lauraceae	*Aniba canelilla*	precious bark	Non-endemic
Lecythidaceae	*Eschweilera ovata*	-	Non-endemic
Malvaceae	*Quararibea amazonica*	-	Endemic
Moraceae	*Castilla ulei*	Caucho rubber	Endemic
Moraceae	*Naucleopsis jamariensis*	-	Endemic
Myrtaceae	*Myrcia aliena*	-	Endemic
Nyctaginaceae	*Guapira venosa*	-	Non-endemic
Phytolaccaceae	*Gallesia integrifolia*	Pau-alho	Non-endemic
Piperaceae	*Piper hispidinervum*	long-pepper	Non-endemic
Rubiaceae	*Duroia hirsutissima*	-	Endemic
Rubiaceae	*Psychotria carthagenensis*	Amyruca	Non-endemic
Sapotaceae	*Sarcaulus vestitus*	-	Endemic
Siparunaceae	*Siparuna glycycarpa*	-	Non-endemic
Violaceae	*Rinorea longistipulata*	Canela-de-Velho	Endemic

Family	Scientific Name	Popular Name	Endemism in the Amazon
Vochysiaceae	*Erisma bracteosum*	-	Endemic

In the secondary survey, a total of 13 tree species threatened with extinction were registered according to the official lists, three of which are exclusive to the IUCN international list[203], one to the national list of the Ministry of the Environment (MMA)[204], and nine species present in both lists (Table 48). Among the threatened species, three are endemic to Brazil and restricted to the Amazon phytogeographic domain[205], namely: *Annona calcarata* (biribá), *Rinorea longistipulata* (canela-de-velho) and *Sarcaulus vestitus.*

Table 48. List of threatened species in the Jatobá project region (VU = Vulnerable, EN = Endangered).

Family	Scientific Name	Popular Name	Threat Category
Annonaceae	*Annona calcarata*	Annona	VU (IUCN, 2018)
Bignoniaceae	*Handroanthus capitatus*	ipe	VU (IUCN, 2020)
Bignoniaceae	*Handroanthus serratifolius*	Yellow lapacho	EN (IUCN, 2020)
Fabaceae	*Amburana acreana*	cerejeira	VU (IUCN, 1998; MMA, 2022)
Fabaceae	*Apuleia leiocarpa*	grapia, garapa	VU (MMA, 2022)
Lauraceae	*Mezilaurus itauba*	Itaúba	VU (IUCN, 1998; MMA, 2022)
Lecythidaceae	*Bertholletia excelsa*	Brazil nut	VU (IUCN, 1998; MMA, 2022)

[203] IUCN Red List. Available at: <https://www.iucnredlist.org/>. Accessed on: 10/01/2023.

[204] MMA. 2022. Portaria 148 de 7 de junho de 2022. Available at: <https://www.in.gov.br/en/web/dou/-/portaria-mma-n-148-de-7-de-junho-de-2022-406272733>. Accessed on: 22/10/2022

[205] Flora e Funga do Brasil. Jardim Botânico do Rio de Janeiro. Available at: <http://floradobrasil.jbrj.gov.br/>. Accessed on: 10/01/2023.

Family	Scientific Name	Popular Name	Threat Category
Meliaceae	*Cedrela fissilis*	Cedro, Acaiacá	VU (IUCN, 2017; MMA, 2022)
Meliaceae	*Cedrela odorata*	Spanish cedar	VU (IUCN, 2017; MMA, 2022)
Meliaceae	*Swietenia macrophylla*	Mahogany	VU (IUCN, 1998; MMA, 2022)
Myristicaceae	*Virola surinamensis*	Baboonwood, Ucuuba, Ucuhuba	EN (IUCN, 1998); VU (MMA, 2022)
Sapotaceae	*Sarcaulus vestitus*	-	VU (IUCN, 2020; MMA, 2022)
Violaceae	*Rinorea longistipulata*	Canela-de-Velho	EN (IUCN, 2020; MMA, 2022)

Most of the threatened species listed above are considered to be timber species of high commercial value that have been suffering from strong extractive pressure along with a continuing decline in the extent and quality of their habitat. The table below shows the main uses of each species:

Table 49. Main uses of threatened species in the Jatobá project region.

Scientific Name	Popular Name	Uses
Amburana acreana	cerejeira	Noble wood used in the manufacture of luxury furniture. [206]
Annona calcarata	Biribá	Rare species, threatened mainly due to the loss of its natural habitat [207]. No information on its use was found.
Apuleia leiocarpa	grapia, garapa	Very resistant and durable wood, used in ship and construction, considered the best native wood for making beer barrels, wine and cachaça barrels;

[206] CNCFlora. *Amburana acreana* in Brazilian Flora Red List, version 2012.2 National Center for the Conservation of Flora. Available at: <http://cncflora.jbrj.gov.br/portal/pt-br/profile/Amburana%20acreana> Accessed on: 1/11/2022.

[207] Verspagen, N. 2021. Annona calcarata. The IUCN Red List of Threatened Species 2021: e.T33360A176433791. Available at: <https://dx.doi.org/10.2305/IUCN.UK.2021-3.RLTS.T33360A176433791.en> Accessed on: 03/01/2023.

Scientific Name	Popular Name	Uses
		Bark used in folk medicine for body aches and diabetes, with analgesic, anti-inflammatory, antifungal, and antisyphilitic properties. [208]
Bertholletia excelsa	Brazil nut	Wood used for light internal construction (floors and walls); Seeds exploited for industrial purposes (cosmetics manufacturing) and food. [209]
Cedrela fissilis	Cedro, Acaiacá	Wood widely used in civil construction, in the furniture industry and in the production of essential oils due to its unique and highly beneficial aroma for health. [210]
Cedrela odorata	Spanish cedar	
Handroanthus capitatus	Ipê	Wood widely used in civil construction and considered one of the most valuable in the market. [211]
Handroanthus serratifolius	Yellow lapacho	Excellent quality wood for furniture production. [212]
Mezilaurus itauba	Itaúba	Resistant and highly durable wood, being the main raw material for the construction of medium and large vessels; It is also used for external constructions (bridges, posts and piles), in civil construction (beams, slats, boards), in the manufacture of furniture and in the manufacture of, for example, train wagons, barrels and casks.[213]

[208] Embrapa: Árvores na Agricultura. Available at: <https://www.embrapa.br/en/agrobiologia/arvores-na-agricultura/especies> Accessed on: 1/11/2022

[209] Infoteca - Embrapa's Repository of Technological Information. Available at: <https://www.infoteca.cnptia.embrapa.br/infoteca/handle/doc/669639> Accessed on: 1/11/2022.

[210] Available at: <https://institutosoka-amazonia.org.br/en/cedro-brasileiro-aroma-e-qualidade-de-madeira-impares-2/> Accessed on: 28/10/2022

[211] Hills, R. 2021. *Handroanthus capitatus*. The IUCN Red List of Threatened Species 2021: e.T61985445A145654078. Available at: <https://dx.doi.org/10.2305/IUCN.UK.2021-3.RLTS.T61985445A145654078.en>. Accessed on: 20/12/2022.

[212] CNCFlora. *Handroanthus impetiginosus* in Lista Vermelha da flora brasileira versão 2012.2 Centro Nacional de Conservação da Flora. Available at: <http://cncflora.jbrj.gov.br/portal/pt-br/profile/Handroanthus20%impetiginosus>. Accessed on: 01/11/2022.

[213] CNCFlora. *Mezilaurus itauba* in Lista Vermelha da flora brasileira versão 2012.2 Centro Nacional de Conservação da Flora. Available at: <http://cncflora.jbrj.gov.br/portal/pt-br/profile/Mezilaurus20%itauba>. Accessed on: 01/11/2022

Scientific Name	Popular Name	Uses
Rinorea longistipulata	Canela-de-velho	Specific information about its use was not found. The main threat to this species is deforestation (habitat loss).[214]
Sarcaulus vestitus		Specific information about its use was not found. Logging is considered its main threat.[215]
Swietenia macrophylla	Mahogany	One of the most commercialized mahogany species, being valuable and widely exploited in Brazil. [216]
Virola surinamensis	Baboonwood, Ucuuba	A highly exploited wood, considered the second most economically important wood in the Amazon basin region; It presents other resources exploited by pharmaceutical industries for the production of cosmetics and pharmaceutical products. [217]

[214] CNCFlora. Rinorea longistipulata in Lista Vermelha da flora brasileira versão 2012.2 Centro Nacional de Conservação da Flora. Available at: <http://cncflora.jbrj.gov.br/portal/pt-br/profile/Rinorea20%longistipulata>. Accessed on: 03/01/2023.

[215] CNCFlora. Sarcaulus vestitus in Lista Vermelha da flora brasileira versão 2012.2 Centro Nacional de Conservação da Flora. Available at: <http://cncflora.jbrj.gov.br/portal/pt-br/profile/Sarcaulus20%vestitus>. Accessed on: 03/01/2023.

[216] CNCFlora. *Swietenia macrophylla* in Lista Vermelha da flora brasileira versão 2012.2 Centro Nacional de Conservação da Flora. Available at: <http://cncflora.jbrj.gov.br/portal/pt-br/profile/Swietenia20%macrophylla> Accessed on: 01/11/2022.

[217] CNCFlora. Virola surinamensis in Lista Vermelha da flora brasileira versão 2012.2 Centro Nacional de Conservação da Flora. Available at: <http://cncflora.jbrj.gov.br/portal/pt-br/profile/Virola20%surinamensis> Accessed on: 01/11/2022.

- The use of non-timber resources is widespread in the region. The most extracted products are oils, gums, latex, resin, roots, leaves, bark, straw, stem, and fruit, and they have as main uses: food, construction, household utensils, medicinal, crafts, religious worship (e.g. preparation of the "Ayahuasca" for Santo Daime cults) and as hunting blind for their consumption and commercialization[218]. According to the secondary data[219,220], 12 tree species were identified as being of great use and importance for the communities in the region, and which present potential for sustainable use and income generation: the patauá (*Oenocarpus bataua*), marajá (*Bactris sp.*), tucumã (*Astrocaryum tucuma*), açai (*Euterpe precatoria*), murumuru (*Astrocaryum murumuru*), cipó-titica (*Heteropsis sp*.), jagube or mariri liana (*Banisteriopsis caapi*), rainha or chacrona (*Psychotria viridis*), jarina (*Phytelephas macrocarpa*), Brazil nut tree (*Bertholletia excelsa*), rubber tree (*Hevea brasiliensis*), andiroba (*Carapa guianensis*), and the copaiba (*Copaifera spp*.). According to the data collected by the socio-environmental team, it was identified that the local communities near the project area conduct the exploitation of the Brazil nut tree.

Protected and Priority Areas for Conservation

In the region close to the Jatobá project, there are Conservation Units (i.e. Protected Areas) for Sustainable Use, which aim to make nature conservation compatible with the sustainable use of its natural resources, and Conservation Units for Integral Protection, whose purpose is to preserve nature, admitting only the indirect use of its natural resources (except for the cases foreseen in Law No. 9,985/2000[221]) (Figure 41). This mosaic of protected areas plays a crucial role in preserving substantial portions of the region's ecosystems that are under intense pressure due to the advance of the agricultural frontier, land grabbing and predatory logging.

The closest Conservation Units (<50 km distance) to the project area are: FLONA de Mapiá-Inauiní (368,733 ha), FLONA dos Purus (256,116 ha) and RESEX Arapixi (133,637 ha), both in the Amazonas State, and the Cazumbá-Iracema RESEX (750,795 ha) in Acre State (Figure 41). In the figure below, it is possible to observe that the Jatobá project area does not overlap with any Conservation Unit of Sustainable Use or Full Protection.

[218] ICMBIO. 2009. Plano de Manejo da Floresta Nacional do Purus. Available at: <https://www.gov.br/icmbio/pt-br/assuntos/biodiversidade/unidade-de-conservacao/unidades-de-biomas/amazonia/lista-de-ucs/flona-do-purus/arquivos/flona_purus.pdf>. Accessed on: 18/10/2022

[219] ICMBIO. 2009. Plano de Manejo da Floresta Nacional do Purus. Available at: <https://www.gov.br/icmbio/pt-br/assuntos/biodiversidade/unidade-de-conservacao/unidades-de-biomas/amazonia/lista-de-ucs/flona-do-purus/arquivos/flona_purus.pdf>. Accessed on: 18/10/2022

[220] ICMBIO. 2009. Plano de Manejo da Floresta Nacional Mapiá-Inauini. Available at: <https://www.gov.br/icmbio/pt-br/assuntos/biodiversidade/unidade-de-conservacao/unidades-de-biomas/amazonia/lista-de-ucs/flona-mapia-inauini/arquivos/flona_mapia_inauini_pm.pdf>. Accessed on: 18/10/2022

[221] Lei no 9.985/2000. Available at: <http://www.planalto.gov.br/ccivil_03/leis/l9985.htm>. Accessed on: 06/10/2022.

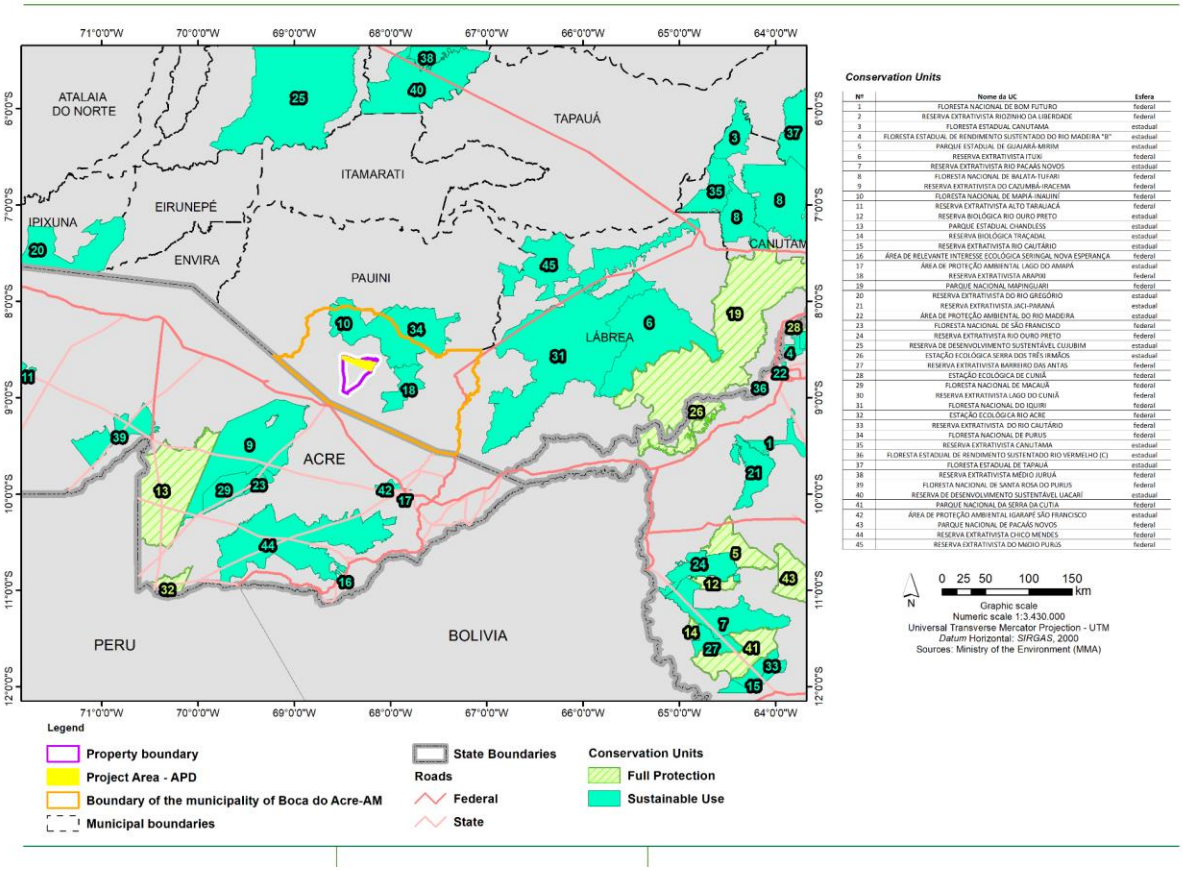


Figure 41. Conservation Units (or Protected Areas) in the region where the Jatobá project is located.

In addition to the protected areas, there are also areas considered priority for the Conservation and Protection of biodiversity close to the project area, varying in level of biological importance and priority of action (high, very high and extremely high), according to the Ministry of the Environment (MMA) (Figure 42). The Priority Areas for conservation, established by Ordinance Nº 5.092/2004[222], are considered a public policy instrument that aims to help in the decision making process, in an objective and participative manner, besides supporting the planning and implementation of actions for the conservation of Brazilian biodiversity[223].

The Jatobá project area, according to MMA (2018), is located close to an area of "High" relevance for the conservation and protection of biodiversity (AMZ-838) and two other areas of "Extremely High" relevance (AMZ-363 and AMZ-011) (Figure 42). As the project is located in the region with the highest rates

[222] Decreto nº 5.092/2004. Available at: <http://www.planalto.gov.br/ccivil_03/_ato2004-2006/2004/decreto/d5092.htm>. Accessed on: 06/10/2022

[223] Institute for Ecological Research - IPÊ. 2018. Priority Areas for conservation, sustainable use and benefit sharing of the Atlantic Forest biodiversity. Available at: <https://issuu.com/canoadocs/docs/produto01_ip_mataatlantica180220>. Accessed on: 10/08/2022

of deforestation in the Amazon (Arc of Deforestation)[224], the implementation of the project in this region is extremely important for the conservation of biodiversity.

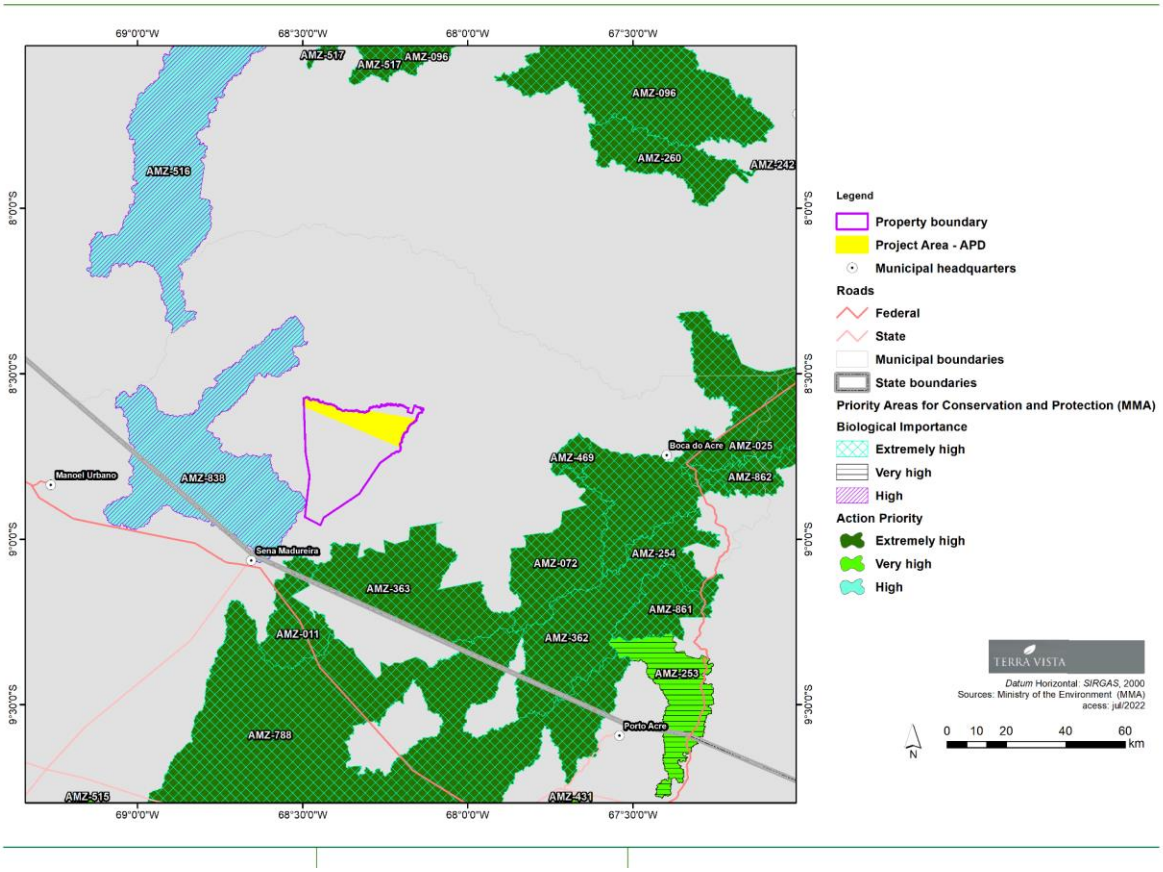


Figure 42. Priority Areas for Conservation in the region where the Jatobá project is located.

In addition to being close to Protected and Priority Areas for Conservation, thus reflecting the importance of the project's region for biodiversity conservation, according to the IBAT (Integrated Biodiversity Assessment Tool)[225] the property is located within a Key Biodiversity Area (KBA) called Tabocais (Figure 43). KBAs comprise an “umbrella” set of internationally recognized priority sites for biodiversity, which meet criteria based on a vulnerability and uniqueness framework defined in terms of threat levels to species and populations.

[224] O arco do desmatamento e suas flechas. Available at: <https://acervo.socioambiental.org/acervo/documentos/o-arco-do-desmatamento-e-suas-flechas>. Accessed on: 25/10/2022.

[225] IBAT Proximity Report, 2022. Generated under license number 31998-37010 from the Integrated Biodiversity Assessment Tool on 25th November 2022. Available at: <http://www.ibat-alliance.org>. Accessed on: 25/11/2022.

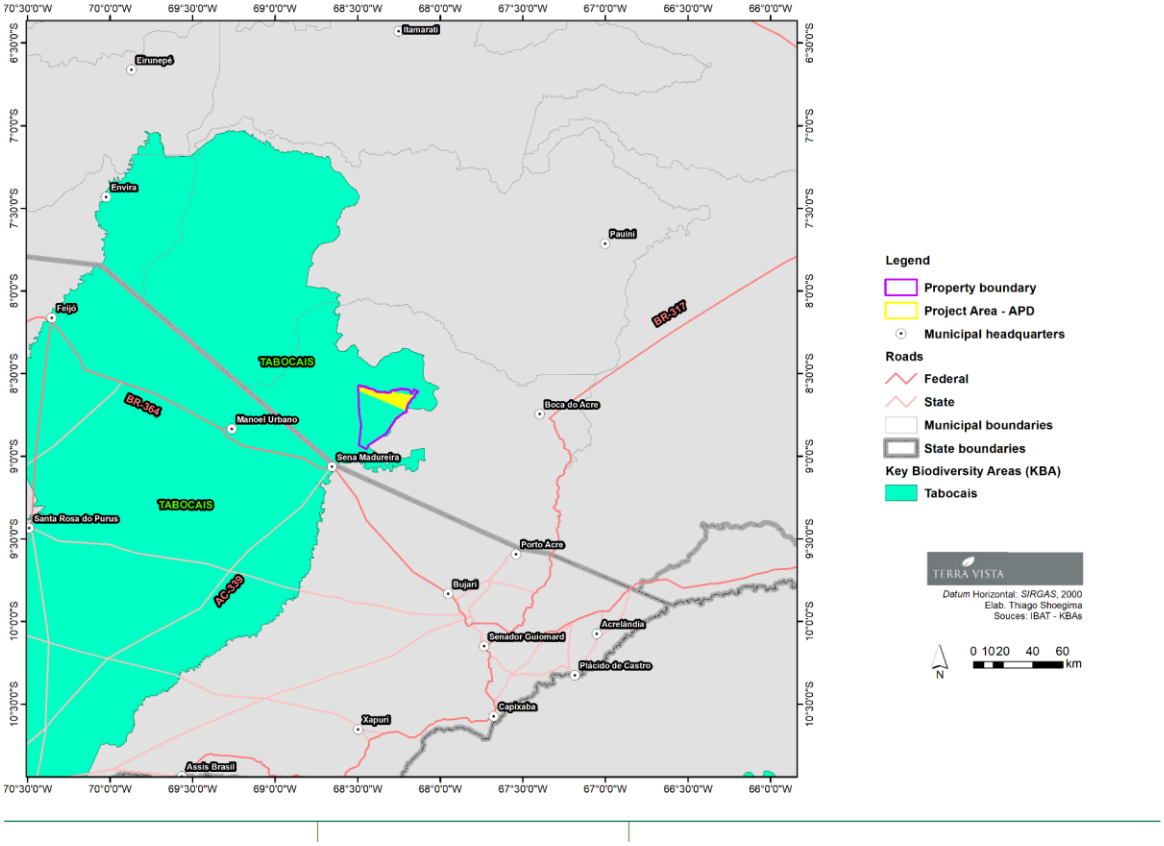


Figure 43. Key Biodiversity Areas KBAs) in the region of the Jatobá project.

5.1.2 High Conservation Values (B1.2)

According to the survey of secondary data in the region, the High Conservation Values - HCV were defined, according to the HCV Resource Network guide[226]. The table below presents information on the high conservation values related to biodiversity in the project region.

Table 50. High Conservation Value (HCV) related to biodiversity within the Jatobá project zone.

High Conservation Value	HCV 1 - Endemic and threatened Flora species
Qualification Attribute	In the project region, endemic flora species to Brazil and to Amazon were recorded, as well as species threatened with extinction at the international level according to the International Union for Conservation

[226] HCV - Common Guidance for the Identification of High Conservation Values. Available at: <https://www.hcvnetwork.org/library/common-guidance-for-the-identification-of-hcv-english-indonesian-french-portuguese>. Accessed on: 20/09/2022

	(IUCN) and at the national level according to the Ministry of Environment (MMA). According to the secondary data survey, 235 flora species endemic to the Amazon phytogeographic domain, 26 species endemic to the Brazilian territory, and a total of 13 threatened species were recorded. The species *Annona calcarata*, *Rinorea longistipulata* and *Sarcaulus vestitus* stand out, as they are restricted to the Amazon Domain in the Brazilian territory and are threatened with extinction.
Focus area	In project areas where potentially threatened species populations occur

High Conservation Value	HCV 1- Endemic and threatened fauna species
Qualification Attribute	Several threatened and endemic fauna species were recorded in the region. Regarding the threatened status of species, 22 threatened mammal species were recorded, 13 threatened bird species, and two species within the herpetofauna group. The species *Pteronura brasiliensis* (giant otter), *Inia geoffrensis* (red porpoise), *Sotalia fluviatilis* (gray porpoise), *Ateles chamek* (cuamba), *Lagothrix lagothricha cana* (macaco-barrigudo), *Crax globulosa* (mutum-fava) and *Sporophila maximiliani* (bicudo), were classified as "Endangered" by the IUCN. Regarding endemism, the region stands out for the presence of the primate endemic to the Brazilian Amazon *Callicebus moloch* (zogue-zogue) and *Leontocebus fuscicollis primitivus* (sagui-da-cara-preta), and the bird endemic to Brazil, *Psarocolius bifasciatus* (japuaçu).
Focus area	In all project areas

High Conservation Value	HCV 1- Protected, Priority and Key biodiversity areas (KBAs)
Atributo de Qualificação	The project area is located in a region near Conservation Units (UC) and in areas considered nationally as “Extremely High” and “High” priority for conservation and protection. In addition, the Jatobá project is within a Key Biodiversity Area (KBA) named 'Tabocais'.

	According to the IUCN[227], KBAs have global conservation value, due to their excellent ecological integrity, globally important ecosystems or significant populations of animals, fungi and plants. Thus, the conservation of these areas guarantees the conservation of the sites considered to be most important for biodiversity.
Focus area	In all project areas

[227] KBAs - Key Biodiversity Areas. Available at: <https://www.iucn.org/resources/conservation-tool/key-biodiversity-areas>. Accessed on: 25/11/2022.

5.1.3 Without-project Scenario: Biodiversity (B1.3)

○ The municipality of Boca do Acre is located in the Amazon region, where there has been a significant expansion of the agricultural frontier within the state. The main access road, BR-317, is flanked by deforested land, as well as the banks of the main rivers (Acre and Purus). Since the roads facilitates the opening of new frontiers, leading to disorderly occupation, increased deforestation, and subsequent socio-environmental impacts[228].

○ According to data provided by INPE, Boca do Acre is one of the top ten municipalities with the highest deforestation rates in the state of Amazonas in 2021[229]. Recent PRODES data[230] indicates that the municipality's deforestation rates have been steadily increasing since 2008, resulting in a total of approximately 1,133.20 km^2 of accumulated deforestation increments in the aforementioned period (2008-2021) (see Figure 1 of section **2.1.1).**

○ Several factors can be attributed as the cause of deforestation in the municipality. The main one is the cattle-raising activity, which occupy approximately 43% of the territory and characterize the economic base of the municipality, which ranks among the ten largest cattle herd producers in the state of Amazonas[231]. In addition to the use of altered areas for cattle-raising activities, the municipality has, to a lesser extent, extractivist and family agriculture, which accounts for 2.9% of the land used for permanent and temporary crops[232].

○ According to the history of land use and occupation in the region, the scenario without the Jatobá project, which is located in a private area, tends to be the replacement of areas of native vegetation by areas of pasture, in compliance with the provisions of Law 12.651/12[233], where the owner has the right to deforest about 20% of his area, as shown in section **2.5.**

○ In the absence of the project, deforestation and degradation of the area could cause severe impacts on biodiversity. Fragmentation and habitat loss could lead to the displacement and loss of species, particularly those with limited mobility and specialized characteristics, resulting in population decline or even the loss of species that are critically important for conservation, such as endemic species of the Amazon or those at risk of extinction.

○ In this context, the implementation of the REDD+ project ensures forest conservation through the implementation of monitoring activities within an area situated in a region that has a history of increased deforestation and recognized biological importance. Also, conserving the area helps maintain continuous forest environments, ensuring the maintenance of gene flow among species and the provision of ecosystem services to local communities.

5.2 Net Positive Biodiversity Impacts

5.2.1 Expected Biodiversity Changes (B2.1)

Table 51. Expected changes in biodiversity resulting from Jatobá project activities.

Biodiversity Element	Vegetation
Estimated Change	Reducing deforestation and conserving habitats
Change Justification	The Jatobá project aims to prevent deforestation and forest degradation, protecting a vegetation area of great biological importance. The factors that will contribute to change refer to forest conservation, periodic remote monitoring, and improvement of heritage surveillance in the area during project activities.

Biodiversity Element	Fauna and Flora
Estimated Change	Conservation and maintenance of biodiversity
Change Justification	The conservation of the project area will ensure the maintenance of local forest benefits, avoiding the loss of species (fauna and flora) and habitats in the region, and maintaining the connectivity between the environments. The factors that will contribute to change are related to the conservation of the area, monitoring and deepening the knowledge of biodiversity in the project area, environmental education actions with local communities aimed at raising awareness and engagement in the conservation of local fauna and flora.

[228] Piontkowski,V.J; Silva, S.S.; Pinheiro, T.S; Costa, F.C.; Mendoza, E.R.H. 2011. O avanço do desflorestamento no município de Boca do Acre, Amazonas: estudo de caso ao longo da BR-317. Anais XV Simpósio Brasileiro de Sensoriamento Remoto - SBSR, Curitiba, PR, Brasil. Available at: <http://marte.sid.INPE.br/col/dpi.INPE.br/marte/2011/07.15.13.22/doc/p1430.pdf >. Accessed on: 31/10/2022

[229] PRODES. Deforestation in the Municipalities of the Legal Amazon for the year 2008-2021. Available at: <http://www.dpi.INPE.br/prodesdigital/prodesmunicipal.php>. Accessed on: 25/10/2022.

[230] PRODES. Desmatamento nos Municípios da Amazônia Legal para o ano de 2008-2021. Available at: <http://www.dpi.INPE.br/prodesdigital/prodesmunicipal.php> Accessed on: 25/10/2022.

[231] IBGE. Instituto Brasileiro de Geografia e Estatística. Pecuária 2022. Available at: <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/pesquisa/18/16459>. Accessed on: 22/09/2022.

[232] IBGE. Instituto Brasileiro de Geografia e Estatística. Censo Agropecuário 2017. Available at: <https://cidades.ibge.gov.br/brasil/am/boca-do-acre/pesquisa/24/76693>. Accessed on: 22/09/2022.

[233] Lei nº 12.651, 2012. Available at: <https://www.planalto.gov.br/ccivil_03/_ato2011-2014/2012/lei/l12651.htm>. Accessed on: 17/03/2023.

5.2.2 Mitigation Measures (B2.3)

The Jatobá project aims to preserve the forest cover in the project area, contributing to the maintenance or improvement of HCV attributes (Table 52) and to the conservation of biodiversity in the region. For that, it is necessary to improve the knowledge of the structure and composition of the communities, mainly of the threatened and endemic species recorded in the region, and this will be accomplished through the monitoring of the fauna and flora groups in the project area.

In addition, to ensure the conservation of biodiversity, measures such as enhanced surveillance in the area to prevent invasions, deforestation, and illegal practices that harm flora and fauna will be taken, along with regular monitoring of forest cover through satellite imagery to detect any changes in land use in the area.

As the project advances, knowledge of the structure of the faunal and floristic communities will be deepened and additional measures can be proposed to safeguard the conservation of biodiversity.

Table 52. Measures for the maintenance and improvement of the HCV attributes identified in the Jatobá project area.

HCVs	Maintenance and Improvement Measures
HCV 1 - Protected, priority and key biodiversity areas (KBAs)	- Improvement of heritage surveillance in the area; - Remote monitoring of the area; - Periodic monitoring of fauna and flora; - Engagement and awareness of local communities; - Scientific understanding of the biodiversity in the project area.
HCV 1 - Endemic and threatened Flora species	
HCV 1 - Endemic and threatened species of fauna	

5.2.3 Net Positive Biodiversity Impacts (B2.2, GL1.4)

The implementation of the Jatobá project foresees the conservation of a 18,017.19 ha area of Amazon rainforests of great biological importance, resulting in positive impacts on the biodiversity of the region.

Such impacts are attributed to several factors, such as the reduction of deforestation and habitat degradation, biodiversity monitoring, improvement of heritage surveillance in the area, and the engagement and awareness of local communities.

The protection of the area allows the maintenance of local forest benefits, maintaining vegetation cover and the structure and composition of biodiversity. The implementation of the project, in addition to conserving biodiversity, will allow a greater knowledge about the local fauna and flora based on surveys carried out in the scope of the planned environmental monitoring, ensuring a better scientific knowledge of the region. Furthermore, the conservation of the area favors the maintenance of continuous forest environments, ensuring the maintenance of the gene flow of the species.

As presented in section **5.1.3**, the region where the project is located has a history of land use and occupation change, with a high rate of deforestation and degradation. In the absence of the project, the area would probably be deforested, considering the owner's right to clear about 20% of the area, causing several negative impacts on biodiversity due to fragmentation and loss of habitats and, thus, species. The proposed project activities would not be developed, which demonstrates that the scenario with the project guarantees net positive impacts for biodiversity compared to not implementing the project in the region.

5.2.4 High Conservation Values Protected (B2.4)

As presented in section **5.1.2,** the project area has high conservation values related to HCV 1 - Species Diversity. The proposed project activities aim to maintain and conserve biodiversity, ensuring the protection of 18,017.19 ha, not negatively affecting any of the identified HCVs.

5.2.5 Species Used (B2.5)

Not applicable. No new species, other than those native to the area, will be used within the scope of the Jatobá project.

5.2.6 Invasive Species (B2.5)

Not applicable. The Jatobá project will not introduce or increase the population of invasive species in the area affected by the project.

5.2.7 Impacts of Non-native Species (B2.6)

Not applicable. No invasive species will be introduced within the scope of the Jatobá project.

5.2.8 GMO Exclusion (B2.7)

Not applicable. The Jatobá project guarantees that no GMOs will be used for the purpose of generating reductions or removals of GHG emissions within the scope of the project.

5.2.9 Inputs Justification (B2.8)

Not applicable. No fertilizers, chemical pesticides, biological control agents, or other inputs will be used in the Jatobá project.

5.2.10 Waste Products (B2.9)

The Jatobá project activities have no intention of generating solid waste in the area. However, if any generation of waste is required in the project area, the criteria for classifying solid waste will be followed in terms of their potential risks to the environment and human health established in the National Policy for Solid Waste (PNRS) - no. 12.305/2010 and NBR 10004.

5.3 Offsite Biodiversity Impacts

5.3.1 Negative Offsite Biodiversity Impacts (B3.1) and Mitigation Measures (B3.2)

Negative impacts outside the Jatobá project zone will not be considered. The biodiversity conservation activities within the scope of the project does not foresee any actions that cause a negative impact on the ecosystem, both within the project area and outside the project zone. Therefore, the implementation of mitigation actions will not be necessary.

5.3.2 Net Offsite Biodiversity Benefits (B3.3)

As mentioned in the section above, the Jatobá project does not foresee negative impacts of its activities on biodiversity outside the project zone. Therefore, a comparative analysis between the unmitigated negative impacts outside the project zone and the positive impacts within the project zone will not be necessary.

5.4 Biodiversity Impact Monitoring

5.4.1 Biodiversity Monitoring Plan (B4.1, B4.2, GL1.4, GL3.4)

The monitoring of biodiversity is an important tool for the evaluation and follow-up of the project's activities, providing relevant information about the structure and composition of the fauna and flora communities during its implementation.

For flora monitoring, the characterization of tree vegetation will be carried out through forest inventory using permanent plots of 0.25 ha (20 x 125 m). The number of plots will be defined after field recognition of the project area and the allocation of the plots will be based on the physical and environmental characteristics of the area, which will be defined through satellite analysis and validated in the field. At each plot, all tree individuals with a diameter at breast height (DBH) greater than or equal to 10 cm will be tagged, measured, and identified to species level, when possible, by a botanical expert. At each monitoring

campaign, the plots will be revisited and the tree individuals sampled again. If there are recruits (i.e. individuals that were not present at the first sampling but reached the minimum DBH in the following campaign), they will be included in the sampling (tagged, measured and identified). In addition, remote monitoring of the area will be carried out annually using satellite images to assess the conservation status of the project area, more specifically, if there have been changes in forest cover.

For fauna, the Herpetofauna, Mammalian fauna and Avifauna groups will be monitored utilizing non-interventional methods. In order to obtain species records, linear transects will be carried out in the project area, where data will be collected through direct and indirect records in two periods of the day (morning and afternoon).

The survey of herpetofauna (amphibians and reptiles) in the transects will be performed through the Visual Active Search method, which involves walking slowly through visually accessible microhabitats with a higher probability of finding the animals. Additionally, the Active Search method will be used in reproductive sites, and opportunistic encounters will be recorded.

The mammalian fauna will be surveyed and monitored using the Active Search method along the transects to record animals in motion and their traces, such as footprints, feces, burrows, vocalizations, hair, carcasses, and nail marks. Furthermore, trap cameras (photographic traps) will be fixed at sampling points defined in the field to record medium and large animals.

The avifauna monitoring will be performed following the Mackinnon Lists methodology[234]. This method involves recording all the species seen and/or heard along pre-existing trails, which will be traversed randomly. In addition to this, occasional records of bird species during the survey campaign will also be included to supplement the information on the area's species richness.

The monitoring of the project area's flora and fauna is planned to take place continuously throughout the project's duration. An overview of the monitoring plan is detailed in table below:

Table 53. Summary of the biodiversity monitoring plan for the Jatobá project area.

Biodiversity parameters to be monitored	Variables to be monitored	Methodology	Frequency
Flora	• Species diversity • Vegetation conservation status • Number of threatened and endemic species	• Forest Inventory	• Periodic monitoring campaign

[234]Bibby, C.J.; Burgess N.D.; HILL, D.A.1992. Birds census techniques. London, Academic Press Inc. 257p. Available at: https://www.elsevier.com/books/bird-census-techniques/bibby/978-0-12-095831-3 Accessed on 20/10/2022

Biodiversity parameters to be monitored	Variables to be monitored	Methodology	Frequency
Flora	• Vegetation conservation status • Area (ha) preserved	• Remote monitoring by satellite images	• Annual monitoring
Avifauna	• Species richness • Number of threatened and endemic species	• Mackinnon's Lists • Indirect Records	• Periodic monitoring campaign
Mammalian fauna	• Species richness • Number of threatened and endemic species	• Active Search • Trap Cameras	• Periodic monitoring campaign
Herpetofauna	• Species richness • Number of threatened and endemic species	• Visual Active Search • Active Search • Indirect Records	• Periodic monitoring campaign

5.4.2 Biodiversity Monitoring Plan Dissemination (B4.3)

The findings of the biodiversity monitoring will be made available on both the project website and the Verra website, for public knowledge. Communication campaigns will also be launched to inform the local communities about the results.

5.5 Optional Criterion: Exceptional Biodiversity Benefits

5.5.1 High Biodiversity Conservation Priority Status (GL3.1)

In the Jatobá project region, the presence of threatened species of flora and fauna that meet the Gold Level criteria was verified, such as species classified as "Endangered" (EN), according to the IUCN Red List:

- Flora: *Virola surinamensis*, *Rinorea longistipulata* and *Handroanthus serratifolius*.

- Fauna: *Crax globulosa*, *Inia geoffrensis*, *Pteronura brasiliensis*, *Sporophila maximiliani, Sotalia fluviatilis*, *Ateles chamek* and *Lagothrix lagothricha cana*.

5.5.2 Trigger Species Population Trends (GL3.2, GL3.3)

Trigger species identified in the Jatobá project region and their respective population trends are described in the tables below. It is important to note that these species may change after conducting primary data surveys in the project area.

Table 54. Population trends of the trigger species identified in the Jatobá project region.

Trigger Species	*Rinorea longistipulata* (canela-de-velho)
Population Trend at the Start of the Project	According to the IUCN, populations of *Rinorea longistipulata*, a species endemic to Brazil and restricted to the Amazon biome, are in decline.
Without-project Scenario	In the absence of the Jatobá project, the population would continue to decline mainly because of deforestation and habitat loss due to agricultural activities in the region (e.g. cattle ranching and soybean planting) and the exploitation of its timber resources (CNCFlora, IUCN).
With-project Scenario	The Jatobá project, by monitoring forest inventories and conservation of the area, will prevent deforestation and forest degradation, and thus the loss of habitat for this species. In addition, the conservation and monitoring of the area will prevent the exploitation of this species. Therefore, with the Jatobá project it is expected that the population of *Rinorea longistipulata* will be maintained.
References	1. CNCFlora. *Rinorea longistipulata* in Red List of Brazilian flora version 2012.2 National Center for the Conservation of Flora. Available at: <http://cncflora.jbrj.gov.br/portal/pt-br/profile/Rinorea%20longistipulata>. Accessed on: 13/01/2023. 2. IUCN. Amorim, E., Fernandez, E., Crispim, G., Martinelli, G. & Souza, J. 2020. Rinorea longistipulata. The IUCN Red List of Threatened Species 2020: e.T35985A176126280. <https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T35985A176126280.pt>. Accessed on: 13/01/2023.

Trigger Species	*Pteronura brasiliensis* (ariranha)
Population Trend at the Start of the Project	According to IUCN data, there is no estimate of the current population size of this species, however, its population is in decline. This decline is mainly due to habitat loss and environmental degradation, representing the main threats to the species. Another aggravating factor for the species is predatory hunting. In the last 25 years, the population decline of this species has been more than 50% and a future reduction of more than 50% in population size is suspected in the next 25 years (IUCN). It should be noted that this species is listed in Appendix I of the CITES - Convention on International Trade in Endangered Species of Wild Fauna and Flora.
Without-project Scenario	In the absence of the Jatobá project, the population of *Pteronura brasiliensis* would probably continue to decline due to habitat loss from deforestation and environmental degradation that has been occurring in the region.
With-project Scenario	The project, by monitoring and conserving the area, will prevent deforestation and forest degradation, and thus the loss of habitat for this species. In addition, conservation and monitoring of the area will prevent predatory hunting of the species in the project area.
References	1. IUCN. Groenendijk, J., Marmontel, M., Van Damme, P., Schenck, C. & Wallace, R. 2021. Pteronura brasiliensis. The IUCN Red List of Threatened Species 2021: e.T18711A164580466. Available at: <https://dx.doi.org/10.2305/IUCN.UK.2021-3.RLTS.T18711A164580466.en>. Accessed on: 09/18/2022. 2. CITES (2022). Available at: https://cites.org/eng/app/appendices.php. Accessed on: 09/18/2022.

Trigger Species	*Ateles chamek* (black-faced black spider monkey)
Population Trend at the Start of the Project	The *Ateles chamek* population has declined by at least 50% in the last 45 years, according to IUCN data. This decline is related to habitat loss through deforestation, environmental degradation, and poaching activities. *Ateles chamek* is a species restricted to primary forest environments. The populations found in altered and fragmented environments, according to Peres (1990; 1997) cannot persist for longer periods, which makes the maintenance of their habitat essential for their survival.
Without-project Scenario	In the absence of the Jatobá project, the *Ateles chamek* population would likely continue to decline due to habitat loss from deforestation and environmental degradation that has been occurring in the region.
With-project Scenario	The Jatobá project, by monitoring and conserving the area, will prevent deforestation and forest degradation, and thus the loss of habitat for this species. In addition, conservation and monitoring of the area will prevent predatory hunting of the species in the project area.
References	1. IUCN. Alves, S.L., Ravetta, A.L., Paim, F.P., Mittermeier, R.A., Rabelo, R.M., Wallace, R.B., Messias, M.R., Calouro, A.M., Rylands, A.B., de Melo, F.R. & Boubli, J.P. 2021. *Ateles chamek* (amended version of 2020 assessment). *The IUCN Red List of Threatened Species* 2021: e.T41547A191685783. Available at: <https://dx.doi.org/10.2305/IUCN.UK.2021-1.RLTS.T41547A191685783.en>Accessed on: 09/18/2022. 2. Peres, C. A. 1990. Effects of hunting on western Amazonian primate communities. *Biological Conservation* 54: 47-49. 3. Peres, C. A. 1997. Primate community structure at twenty western Amazonian flooded and unflooded forests. *Journal of Tropical Ecology* 13: 381-405.

- **APPENDICES**

  - **Appendix 1: Stakeholder Identification Table**

Stakeholder Group Involved in the Project	Project Rights	Interests in your Participation in the Project	Participation Relevance
Project Proponent	Owner of the farm where the Jatobá project will be developed and co-owner of the credits and responsible for meeting the legal conditions for the development and permanence of the project.	Ensure support for the technical team to develop studies for crediting the carbon area, ensure access for community members who depend on the project area and support through projects their aspects of life determined as priorities, such as education, health, income generation, human rights, environment and culture.	High - As a project proponent, your engagement is an essential condition for the development of actions related to the CCB seal.

Stakeholder Group Involved in the Project	Project Rights	Interests in your Participation in the Project	Participation Relevance
Public Sector: City Hall of Boca do Acre (AM); Secretary of Environment and Civil Defense of Boca do Acre (AM); Secretary of Interior and Sustainable Rural Development of Boca do Acre (AM); Boca do Acre River Agency; Secretary of State for the Environment - Amazonas (SEMA); Amazonas State Agricultural and Forestry Defense Agency (ADAF); Department of Climate Change and Management of Conservation Units (Demuc); Amazonas Sustainable Development Agency - ADS; National Institute of Colonization and Agrarian Reform (INCRA); Chico Mendes Institute for Biodiversity Conservation (ICMbio)	Partners for the implementation or improvement of public policies with local stakeholders.	Strengthen the relationship between the communities benefited by the activities of the Jatobá project and the public authorities, sensitize the public authorities to the benefits of REDD+ projects and the Jatobá project, in particular in terms of communities, climate and biodiversity	High - Organizations are responsible for the elaboration and application of socio-environmental policies, as well as their monitoring.

Stakeholder Group Involved in the Project	Project Rights	Interests in your Participation in the Project	Participation Relevance
Extractivists who inhabit the riversides of the igarapés: São Francisco; Curupati; Alegrete and Timorante.	Beneficiaries of projects related to the CCB seal and property users authorized by the owner. Utilities and legitimate and legal occupants of the project area.	Continue to use areas where they can extract non-timber products and access projects to improve the production chain, create associations and improve the quality of life.	High - Essential agents for surveillance of the territory, control of deforestation and propagation of management practices, sustainability and strengthening of productive chains of non-timber forest products.
Third sector: State University of Amazonas (UEA); Boca do Acre Handicraft and Syringe Producers Association; Rural Union of Boca do Acre - AM; Association of artisanal professional fishermen and fisherwomen in the municipality of Boca do Acre AM; Association of Farmers and Boca do Acre; Entrepreneur Room Boca do Acre-AM; Agro Extractivist Association of Boca do Acre; Agroextractivist Cooperative Do Mapiá and Médio Purus;	Stakeholders in the defense of social rights and facilitation of integration into higher value production chains	Raise the awareness of stakeholders benefiting from the project about their rights, strengthen associative relationships, provide access to the productive chain of higher value non-timber forest products.	Medium - They are not executors of public policies, but can help improve production chains, offer training to add value to products and strengthen associations in communities benefited by the project. Eventually they can act as a representative instance of community members.

- **Appendix 2: Project Activities and Theory of Change Table**

Activity Description	Expected climate, community and/or biodiversity			Relevance to the Project Goals
	Short-term results (Outputs)	Medium-term results (Outcome)	Long-term results (Impacts)	
Conservation and monitoring of forest cover	Signing long-term conservation agreements with landowners in the Amazon biome. Periodic monitoring of changes in forest cover in the project area. Adaptive management of leakage and project risks. Continuous monitoring and identification of agents and drivers of deforestation and periodic updating of the baseline. Biomass inventory. Preparation of monitoring reports.	Periodic monitoring of forest cover using remote sensing data. Monitoring of emissions from unplanned deforestation (comparison with baseline). Opportunity for intervention if deforestation is increasing. Support to the field team to understand the context of local deforestation. Carbon stocks compartments to be verified and reported.	Maintenance of 18,017.19 ha of coverage and forest carbon stock. Understanding of the local context of the advance of deforestation. Improvement in intervention processes. Possibility of understanding the impacts generated by unplanned deforestation.	Reduction of GHG emissions from unplanned deforestation. Maintenance of forest cover and provision of ecosystem services. Increased family income for the communities. The Jatobá project, by providing forest cover maintenance in the project area, contributes to the improved well-being of the communities associated with the project through the management of ecosystems and their associated services, encouraging harmonious integration between biodiversity conservation and human development.

Sanitation and water security	Implementation of water collection and distribution systems with the use of filters for treatment. Implementation of toilets with dry septic tanks Training in maintenance of water catchment and treatment systems	Provide water to homes with improvements in home potability and sanitation systems with social technologies; Provide greater security in the use of water resources and less effort to access water; Increase in family income. Strengthen the autonomy of the families. Guarantee minimum autonomy in the maintenance of the system in regions of difficult access.	Decrease in the rate of waterborne diseases, such as diarrhea, cholera, and verminosis. Decrease of women's workload in water collection and domestic activities. Dissemination of social technologies. Provide decent housing conditions and ensure better conditions for their permanence in the territory.	Improve the quality of life, strengthening the five dimensions of sustainable livelihoods. Provide decent housing conditions, ensure better conditions to stay in the territory, and expand access to rights and citizenship
Energy Infrastructure	Acquisition and deployment of photovoltaic systems. Reduce the cost of power generation by fossil fuel generator systems (fuel transport and related atmospheric emissions). Training for maintenance of the photovoltaic system.	Enable autonomous generation of sustainable electricity, ensure basic infrastructure for internet, communication, household appliances and basic power tools that help reduce the strain on household chores and income generation. Ensure minimum autonomy in system	Provide decent housing conditions. Ensure communicative inclusion and access to rights and citizenship. Strengthen the autonomy of families.	

		maintenance in hard-to-reach areas. Enable the learning and use of new technologies and tools.		
Communication	Acquisition and implementation of a system that allows local community access to the internet. Training for maintenance of the communication system. Facilitate emergency communications, access to information, education, trade relations, and establish basic communication infrastructure with the Jatobá project.	Ensure minimum infrastructure for technology-mediated classroom instruction, facilitating training at the fundamental II, secondary and technical levels. Improve the infrastructure for learning new management techniques and quality of agroforestry products.	Consolidate a communication channel with the Jatobáproject. Contribute to the completion of the basic and productive training cycle, reducing the need to migrate to the city. Strengthen the autonomy of the families, provide decent housing conditions. Ensure basic communicative and digital inclusion to expand access to rights and citizenship.	
Education	Agreement with the City Hall to support public school teachers;	Decrease in school dropouts and age/grade distortion.	Contribute to the basic schooling of children and adults.	

	Revitalization of the school on Igarapé São Francisco; Increased security for children and adolescents to access formal education	Permanence of children and adolescents with their families during school time.	Reduction of school dropout and exodus to the municipal seat for educational reasons. Expansion of opportunities for family development and productive diversification.	
Income Generation	Amazonian Chestnut - Enable improvement in the chestnut trade through support for training in production processing; Search for new commercial partnerships (development of new products); Own brand development. Marketing and promotion; Building business relationships. Training and courses aimed at valuing the product; Working capital. Encourage the participation of young people and women.	Increase capacity and speed in transporting production to the city. Reduction of freight cost on delivery to buyers. Decrease dependence on a single buyer; Add value to the product to claim fairer prices; Valuing associated producers; Marketing and promotion; Building business relationships. Diversify private label products and increase	Increased income of extractive families; Strengthening associations; Valuing the productive chain of non-timber agroforestry products; Permanence in the territory and reduction of the exodus to the cities; Increase in the value of carbon credits by raising the socio-environmental value and the bioeconomy of projects.	

	Structure for processing and packaging	revenue from private label direct sales. Establishment of commercial partnerships, diversification of production and processing of chestnuts; New products and technologies; Search for new products that are already known by extractivists, but which are not processed due to lack of equipment and quality control training		
Health	Acquisition/donation of an ambulancha (boat equipped with medical equipment for emergency care); Training courses in the area of health for community members; Agreement with the City Hall to hire community members as local health agents	Emergency care in cases of snakebite and other accidents at work; Facilitate river travel to the city in case of serious illness. Technical training and better working conditions, increasing local income and diversifying economic activities;	Decrease in the number of deaths caused by illnesses and accidents at work.	

Associativism	Establishing rules of use and responsibility in the maintenance of the equipment received by the projects.	Ensure community autonomy in the management of the implemented infrastructure systems and projects. Ensure the durability of the infrastructure acquired by other activities.	Strengthen the autonomy of families, provide decent conditions for community infrastructure and ensure better conditions for permanence in the territory. Ensure basic communicative and digital inclusion to expand access to rights and citizenship.	
Periodic monitoring of the fauna and flora in the project area	Evaluate potential partnerships with local universities and the local community to participate in monitoring. Preparation of a list of species of fauna and flora in the project area.	Analysis of the structure and composition of the fauna and flora in the project area. Verification of the maintenance/ conservation of biodiversity in the project area. Perform scientific studies and research on biodiversity in the project area.	Maintenance and conservation of biodiversity. Knowledge of biodiversity in the project area, including the presence of species of high conservation value, such as endemic and threatened species. Maintenance of ecosystem functioning and provision of ecosystem services. Environmental education and awareness	Biodiversity monitoring will allow knowledge of the fauna and flora in the project area and knowledge about the dynamics of the ecosystem.

○ Appendix 3: Project Risks Table

The risk analysis was performed according to the VCS Afolu Non-Permanence Risk Tool, version 4.0, dated September 19, 2019.

Internal Risk

Table A1. Project Management Risks.

Risk factor	Risk Factor and/or Mitigation Description	Risk Rate
a)	Not applicable. Tree planting is not a project activity for which GHG credits will be issued.	0
b)	Not applicable. No carbon credits were previously issued on the project's carbon stock.	0
c)	The management team includes individuals with significant experience in all the skills needed to successfully carry out the project activities. ● *Forest Inventory*. The development of forest inventories and monitoring of the areas is based on the experience of **Leandro Silva Rodrigues**, forest engineer with 15 (fifteen) years of experience in consultancy in environmental and land regularization of rural properties, georeferencing, forest management, and forest inventory of native forests. ● *Environmental and land analysis.*For the investigation and resolution of possible land conflicts it is possible to count on the collaboration of **Karoline Pantoja do Nascimento**, lawyer with 5 years of experience in triple environmental responsibility and environmental and land regularization of rural properties. It also includes the participation of **Felipe Mendes de Godoy**, a lawyer with more than 10 years of experience in real estate and environmental law, working in law firms, companies in the forestry sector and investment banking. ● *Climate:* The climate area counts on **Alan de Brito**, a professional with more than 15 (fifteen) years of experience in projects for monitoring native vegetation and deforestation, as well as accounting for Greenhouse Gas (GHG) emissions. Besides **Luciane Cristina Lazzarin**, a forestry engineer with more than 15 (fifteen) years of experience teaching undergraduate and graduate courses.	0

	• *Community.* The implementation of social and infrastructure improvements will have the support of **Vivian Fernanda Carneiro Martins**, with more than 15 (fifteen) years of experience in the elaboration and coordination of socio-environmental projects in the Amazon. And also with **Gustavo Fernandes Moura**, a social scientist with 9 (nine) years of experience in the research and development of socio-economics, culture, cultural heritage, and archeological heritage projects with traditional communities. Also present is **Arthur Augusto Santos**, with 8 (eight) years of experience in socioeconomic studies with traditional peoples and communities, elaboration and execution of socioeconomic/cultural development projects, and in the planning and evaluation of reparation actions for socio-environmental damage. • *Biodiversity*. The biodiversity monitoring has the collaboration of **Gabriela Magalhães**, a biologist with more than 9 (nine) years of experience in the development and coordination of socio-environmental projects, biodiversity analysis, and environmental licensing. In addition, it also counts on **Nathália Vieira Hissa Safar**, a biologist with more than seven (7) years of experience in studies of forest dynamics, assessing the resilience of tropical forests and their role in biodiversity conservation and carbon mitigation. • *Strategic planning.* **Luíza Pagel Classen** is a production engineer with eight (8) years of experience. Luíza has experience in company and project management, emphasizing structuring and optimizing processes and workflows. Besides the activities mentioned above it is possible to verify in our organization chart that all the activities necessary for the implementation of the project are coordinated by a professional with at least 5 years of experience in the area. • The resumes of project team members are available for the validation/verification bodies.	
d)	The management team is entirely based in the country. The project proponents hired an employee from the project communities to contribute to management. A copy of each employee's employment contract and proof of residence was made available to auditors. The support team for technical advice and financial management is located in the country (Terra Vista, headquarters in São Paulo). The company also has an office located in Manaus, which is a 9-hour drive from the project area. Proof of office rent is available to auditors.	0

e)	The management team includes individuals with experience in AFOLU project design and implementation, carbon accounting, and reporting under the VCS Program. For example: ● **Rafaela Martins** (Climate Coordinator): Two years of experience in the design, management, and development of REDD+ projects and forestry and reforestation projects to offset carbon emissions, as well as environmental projects focused on sustainability and preservation of the environment. ● **Henrique Hugbert de Oliveira Reis** (Community Analyst): Four years in REDD+ projects in traditional communities, writing reports and project documents in VCS and CCB methodology, monitoring audits in REDD+ projects, production, and execution of participatory rural diagnostics and socio-economic surveys. ● **Alan de Brito** (Project Director): One year of experience in the technical coordination of REDD+ projects. The resumes of team members are available to the validation/verification bodies.	-2
f)	Not applicable. The project does not have a plan in place.	0
Total Project Management (PM) (a + b + c + d + e + f)]		-2

Table A2. Financial Viability Risks.

Financial Viability		
Risk factor	Risk factor/or Mitigation measure description	Risk Rate
a)	Not applicable. The payback of the project is less than 10 years.	0
b)	Not applicable. The payback of the project is less than 7 years.	0
c)	Not applicable. The payback of the project is less than 4 years.	0
d)	Cash flow break-even is less than 2 years from the current risk assessment. The financial worksheet was made available to the project auditors. Evidence of financial health is available to auditors.	0

Financial Viability		
e)	Not applicable. The project has secured more than 15% of the funding needed to cover total cash before the project's break-even point.	0
f)	Not applicable. The project has secured more than 40% of the funding needed to cover total cash before the project's break-even point.	0
g)	Not applicable. The project has secured more than 80% of the funding required to cover total cash prior to project break-even.	0
h)	The project has secured 80% or more of the funding required to cover total cash prior to project break-even.	0
i)	The project does not have at least 50% of its total cash available as required financial resources, other than purchased funds, before the project breaks even.	0
Total Financial Feasibility (FV) [as applicable, ((a, b, c or d) + (e, f, g or h) + i)] The total cannot be less than zero.		0

Table A3. Opportunity Cost Risks.

Opportunity Cost		
Risk factor	Description of the Risk and/or Mitigation Factor	Risk Rate
a)	Not applicable. The NPV of the most profitable alternative land use activity is lower than that associated with the project activities.	0
b)	Not applicable. The NPV of the most profitable alternative land use activity is lower than that associated with the project activities.	0
c)	Not applicable. The NPV of the most profitable alternative land use activity is lower than that associated with the project activities.	0
d)	Not applicable. The NPV of the most profitable alternative land use activity is lower than that associated with the project activities.	0
It is)	Not applicable. The NPV of the project activities is expected to be more than 50% higher than the most profitable alternative land use activity.	0
f)	The NPV of the project activities are expected to be more than 100% more profitable than the most profitable alternative land use activity. The calculation assumptions are available following this table. The	-4

Opportunity Cost		
	calculation sheets with the NPV of the project scenario and the NPV of the baseline scenario were delivered to the project validators.	
g)	Not applicable. The project proponent is not a non-profit organization	0
h)	Mitigation: There is a legal contract between the landowner and the project developer that provides for a project duration of 32 years.	0
i)	Not applicable. The project is not protected by a legally binding commitment to continue management practices that protect credited carbon stocks for at least 100 years.	0
Total opportunity cost (OC) [as applicable, (a, b, c, d, e or f) + (g + h or i)] The total can be less than 0.		-4

Justification:

The baseline scenario was pointed out in sections 2.2.1 and 2.2.2 of the PD. The most plausible scenario is the use of the project area to implement livestock in the project area.

The spreadsheet with the NPV of the project activities and the NPV of the most profitable alternative land use activity was made available to the project validators.

Premises

- By carrying out the planned deforestation of the area, the landowner profits from the implementation of livestock.
- The area available for cattle raising is equal to 18,017.19 hectares, which would be the area destined for planned deforestation.
- Income and expenses with cattle raising were taken based on the document “Sensitivity analysis in the creation of beef cattle in the state of Pará”, from 2021, by Diogo Claudio da Silva[235].
- It was considered that livestock is an activity that does not have gains of scale and that the costs of head of cattle/hectare remain constant.
- The minimum rate of attractiveness of the projects was considered to be equal to 13,81%, equal the SELIC rate.
- The Selic rate[236] on April 17, 2023 was 13.8%, as provided on the Central Bank website.
- The landowner assumes no operating costs (OPEX) of the project. All operating costs of the project are borne by the project developer, as demonstrated in the contract between the project proponents, made available to the project validator.

[235] https://repositorio.uft.edu.br/handle/11612/3127

[236] https://www.bcb.gov.br/controleinflacao/historicotaxasjuros

Carbon credit price references used

(i) CME Group[237], CBL Nature-Based Global Emissions Offset - USD 3.17 corresponding to 15/03/2023, 16:21:01 PM;

(iii) Platts Nature-Based Carbon Credits or CNC [238] - USD 2.60 corresponding to 02/09/2023.

References to recent company transactions were also made available to project validators.

Table A4. Project Longevity Risks.

Project Longevity		
Risk factor	Risk Factor and/or Mitigation Description	Risk Rate
a)	There is a legal contractual agreement to maintain project activities and maintain the project area as forest for at least 30 years from the project start date. The land owner is legally able to maintain project activities throughout the life of the project. The project area management and financing plans consider project operation for a period of 32 years.	18
b)	Not applicable.	0
Total Project Longevity (PL) Cannot be less than zero		18

Internal Risk	
Total Internal Risk (PM + FV + OC + PL) The total cannot be less than zero.	-2+0-4+18 12

[237] Available at: <https://www.cmegroup.com/markets/energy/emissions/cbl-nature-based-global-emissions-offset.html>.

[238] Available at: https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/agriculture/021023-charities-call-for-more-jurisdictional-science-based-approach-for-forest-based-credits (spglobal.com)

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- **External risks**

Table A5. Risks of Land Tenure and Resource Access.

Land Tenure and Access to Resources/Impacts		
Risk factor	Risk Factor and/or Mitigation Description	Risk Rate
a)	Ownership and access/use rights for resources are held by the same entity.	0
b)	Not applicable. Ownership and access/use rights for resources are held by the same entity.	0
c)	Not applicable. There is no dispute over ownership or ownership of land anywhere in the project area.	0
d)	Not applicable. There is no dispute or overlapping of access/use rights.	0
e)	Not applicable. The project is not a WRC project.	0
f)	There is a legal contract to maintain project activities and maintain the project area as forest for 32 years from the project start date.	0
g)	Not applicable. There is no dispute over tenure or ownership of the land, therefore the mitigation measure is not required	0
Full Land Tenure (LT) [as applicable, ((a or b) + c + d + e + f + g)] The total cannot be less than zero.		0

Table A6. Risks of Community Engagement.

Community Engagement		
Risk factor	Risk Factor and/or Mitigation Description	Risk Rate
a)	More than 50% of the families living in the project area and dependent on the project area were consulted.	0
b)	More than 20% of households living within a 20 km radius of the project's geographic boundaries and who are dependent on the project area were consulted.	0

Community Engagement		
c)	The project generates positive impacts for the communities and is in the CCB certification process.	-5
Total community engagement (CE) [when applicable, (a + b + c)] The total can be less than zero.		-5

Table A7. Political Risks.

Political Risk		
Risk factor	Risk Factor and/or Mitigation Description	Risk Rate
a)	Not applicable. The governance score is -0.203	0
b)	Not applicable. The governance score is -0.203	0
c)	The governance score is -0.203	2
d)	Not applicable. The governance score is -0.203	0
e)	Not applicable. The governance score is -0.203	0
f)	Is Brazil implementing REDD+ Readiness or other activities: e) The country has a Designated National Authority established under the CDM (Clean Development Mechanism) and has at least one registered Afforestation/Reforestation CDM project	-2
Political Total (PC) [as applicable ((a, b, c, d or e) + f)] The total cannot be less than zero.		0

Table A8. Total External Risks.

External Risk	
Total External Risk (LT + EC + PC) The total cannot be less than zero.	0-5+0 0

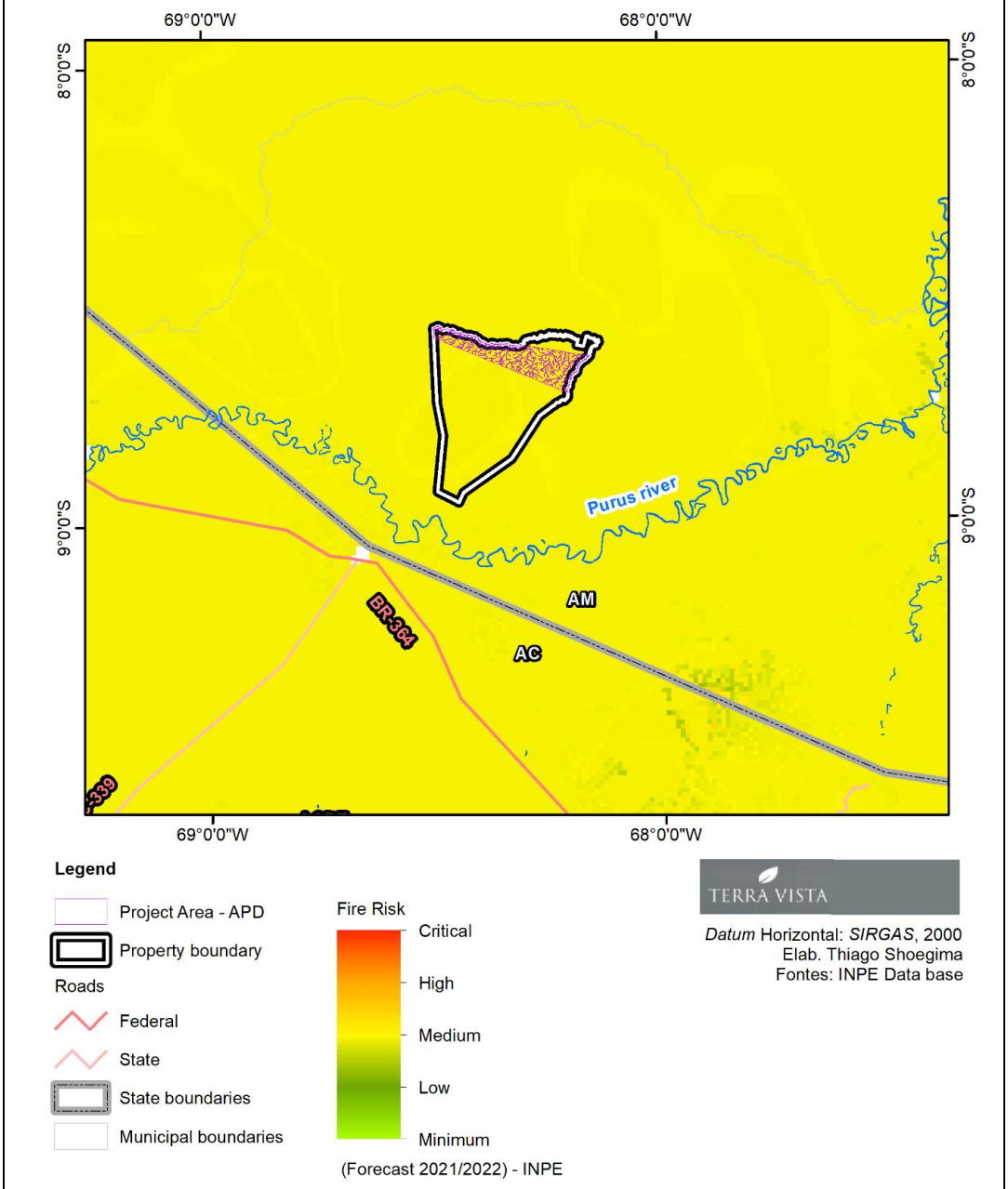
- **Natural Risks**

Table A9. Natural Risks of Fire.

Natural Risk - Fire	
Meaning	No losses. Although the environmental agencies classify the project area as having a medium probability of fire occurrence, this classification occurs on a very wide scale of study, as can be seen in the map below. In an analysis carried out on a smaller scale, observing the project area, it was found that there were no fire outbreaks in the area in the period from 1999 to 2022. Both the large and small scale analysis were based on data from INPE[239] [5].

[239] Available at: <https://queimadas.dgi.inpe.br/queimadas/bdqueimadas>. Accessed on 22/03/2023.

Natural Risk - Fire	



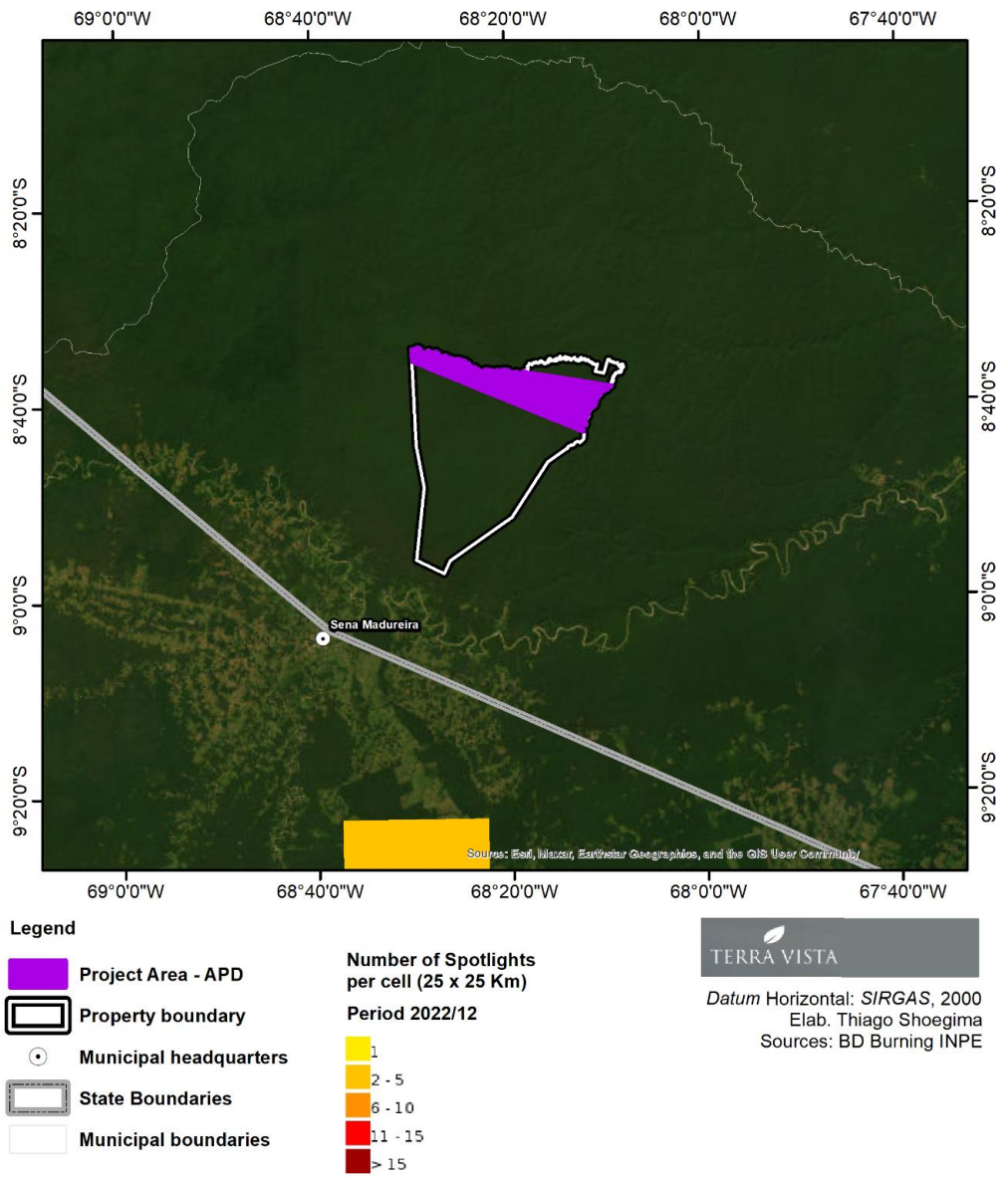
Natural Risk - Fire	
	
Probability	0
Score (LS)	0
Mitigation	None.

Table A10. Risks of Pest and Disease Outbreaks.

Natural Risk - Pest and Disease Outbreaks	
Significance	No losses. The project does not foresee an increase in pests and diseases, since no type of forest management will be carried out in the area, nor will the introduction and planting of new species be carried out in the area.
Likelihood	0
Score (LS)	0
Mitigation	Not applicable.

Table A11. Risks of Extreme Weather.

Natural Risk - Extreme Weather	
Significance	No losses. The climatic conditions necessary for the formation of hurricanes, cyclones, tornadoes and floods are not present in the project region, therefore, such events have a low possibility of occurring.
Likelihood	0
Score (LS)	0
Mitigation	Not applicable.

Table A12. Geological Risk.

Natural Risk - Geological Risk	
Significance	No losses. Neither volcanoes nor active tectonic faults are present in the project area.

Natural Risk - Geological Risk	
Likelihood	0
Score (LS)	0
Mitigation	Not applicable.

Table A13. Total Natural Risk.

Score for each natural risk applicable to the project (Determined by (LS × M)	
Fire (F)	0
Pest and Disease Outbreaks (PD)	0
Extreme Weather (W)	0
Geological Risk (G)	0
Other natural risk (ON) - Not applicable	0
Total Natural Risk (as applicable, F + PD + W + G + ON)	0