SAMAÚMA REDD+ PROJECT

Terra Vista Gestora de Recursos Ltd.

http://terravista.eco.br

Project Title	Samaúma REDD+
Version	1.0
Date of Issue	16/12/2022
Project Location	Apuí-AM– State of Amazonas, Brazil
Project Proponent(s)	● Terra Vista Gestora de Recursos Ltd. Rômulo P. S. Arantes projetos@terravista.eco.br (11) 4883-1165 ● Ituxi Administração e Participação Ltd. Ricardo Stoppe Júnior aamericardo@gmail.com (18) 99600-3009
Prepared By	Terra Vista Gestora de Recursos Ltd.
Validation Body	Ecolance Private Limited
Project Lifetime	20 December 2020 – 20 December 2050; 30-year lifetime

GHG Accounting Period	20 December 2020 – 20 December 2050; 30-year total period
History of CCB Status	Not applicable
Gold Level Criteria	The Samaúma 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). According to the vulnerability criteria described by the CCB, the Samaúma project provides exceptional benefits for biodiversity as it presents endangered and critically endangered species (IUCN Red List), such as: *Virola surinamensis, Manilkara elata, Vouacapoua americana, Pteronura brasiliensis, Ateles chamek, Lagothrix lagothricha cana, Sotalia fluviatilis, Pteroglossus bitorquatus, Inia geoffrensis.*
Expected Verification Schedule	April 2023

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1 SUMMARY OF PROJECT BENEFITS

The Samaúma project is the result of a partnership between Terra Vista Gestora de Recursos Ltd. and Ituxi Administração e Participação Ltd., which manages with excellence the Fortaleza Ituxi REDD+, Unitor REDD+ and Evergreen REDD+ projects. These projects have the same representative and project proponent, Dr. Ricardo Stoppe Junior.

The project will be developed in the municipality of Apuí, in the state of Amazonas, Brazil - within the Agriculture, Forestry and Other Land Use (AFOLU) sector under the Reducing Emissions from Deforestation and Forest Degradation (REDD) category. The project will conserve 71,822.56 hectares of native Amazon Rainforest in a region where deforestation pressure is mainly due to pasture activities, part of which will be designated to Avoiding Unplanned Deforestation (AUD) (56,349.96 ha), other to Avoiding Planned Deforestation (APD) (14,158.28 ha) and the remaining hectares corresponding to water resources (314.32 ha) (Table 1). For the total area (AUD+APD) and by the end of the project, it is estimated a total avoided emissions of 23,452,633.10 tons of Greenhouse Gases (tCO2e). Of the total avoided GHG emissions, 54.47% (12,775,055.9 tCO2e) refers to the AUD area and 45.53% (10,677,577.2 tCO_2e) to the APD area.

The project will follow the CCB Standards, with benefits for Climate, Community, and Biodiversity. As benefits for climate, the maintenance of forest cover results in exceptional benefits for adaptation to the impacts caused by climate change, such as changes in 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 quantifiable benefits for Communities, the project will implement groundwater collection and distribution systems, installation of solar panels for electricity generation and provision of 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, in compliance with the vulnerability criteria of the CCB Gold Level, as it presents species classified as Critically Endangered (CR) and Endangered (EN) according to the IUCN, such as the flora species *Vouacapoua americana*, *Virola surinamensis* and *Manilkara elata*, and the fauna species *Pteronura brasiliensis, Inia geoffrensis, Ateles chamek, Lagothrix lagothricha cana, Sotalia fluviatilis and Pteroglossus bitorquatus*.

Table 1. Distribution of areas of the Samaúma project.

Camadas	Hectares	(%)
Property Area	71,822.56	100
Water resources	314.32	0.4
Multiple Use Area - Planned Deforestation Avoided - APD	14,158.28	19.7
Permanent Preservation Area (PPA)	3,088.20	4.3
Legal Reserve - Unplanned Deforestation Avoided - AUD	57,349.96	79.9
Project Area (APD+AUD)	71,508.24	99.6

1.1 Unique Project Benefits

The outcome or impact expected by the activities of the Samaúma project during its lifetime are shown in Table 2 below.

Table 2. Summary of the expected benefits in the 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.	G1.5
2) Increase the number of children, young people and adults with an Internet connection, providing greater life opportunities.	G1.5
3) Contribute to maintaining the functioning of the Amazon biome, located in the Amazon river basin, through the conservation of forests in the project area, preventing the biome from losing its self-sustainability capacity.	2.1.5
4) Conserve and monitor an area of 71,822.56 ha of Amazon Rainforest with great biological importance, resulting in positive impacts for the conservation of biodiversity in the region.	5.1.5

1.2 Standardized Benefit Metrics

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

Table 3. Estimates of the net benefits of different metrics that Samaúma 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	23,452,633.10 tCO_2e	G1.9
Forest cover	For REDD projects: Estimated number of hectares of reduced forest loss in the project area measured against the without-project scenario	71,508.24	G1.3
	For ARR projects: Estimated number of hectares of forest cover increased in the project area measured against the without-project scenario	Not applicable	
Improved land management	Number of hectares of existing production forest land in which IFM practices are expected to occurred as a result of project activities, measured against the without-project scenario	Not applicable	
	Number of hectares of non-forest land in which improved land management practices are expected to occurred as a result of project activities, measured against the without-project scenario	Not applicable	
Training	Total number of community members who are expected to have improved skills and/or knowledge resulting from training provided as part of project activities	56	G1.5

Category	Metric	Estimated by the End of Project Lifetime	section Reference
	Number of female community members who are expected to have improved skills and/or knowledge resulting from training as part of project activities	19	G1.5
Employment	Total number of people expected to be employed in project activities, expressed as number of full-time employees	4	G1.5
	Number of women expected to be employed as a result of project activities, expressed as number of full-time employees	2	G1.5
Livelihoods	Total number of people expected to have improved livelihoods or income generated as a result of project activities	75	G1.5
	Number of women expected to have improved livelihoods or income generated as a result of project activities	27	G1.5
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	75	G1.5
	Number of women for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	27	G1.5

Category	Metric	Estimated by the End of Project Lifetime	section Reference
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	12	G1.5
	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	5	G1.5
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	58	G1.5
	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	58	G1.5
Well-being	Total number of community members whose well-being is expected to improve as a result of project activities	75	G1.5
	Number of women whose well-being is expected to improve as a result of project activities	27	G1.5
Biodiversity conservation	Expected change in the number of hectares managed significantly better by the project for biodiversity conservation, measured against the without-project scenario	57,349.96 and 14,158.28 = 71,508.24	2.1.5
	Expected number of globally Critically Endangered or Endangered species benefiting from reduced threats as a result	9	5.5.1

Category	Metric	Estimated by the End of Project Lifetime	section Reference
	of project activities, measured against the without-project scenario		

2 GENERAL

2.1 Project Goals, Design and Long-Term Viability

2.1.1 Summary Description of the project (G1.2)

The Samaúma project is located in the western region of the municipality of Apuí, in the state of Amazonas. The municipality of Apuí has one of the highest deforestation rates in the state of Amazonas, and is among the 50 most deforested municipalities in Brazil. Between 2010 and 2020, Apuí presented an average annual deforestation rate of 21.3% and from 2008 to 2021 presented an accumulated deforestation increment of 1,942.25 km², according to PRODES system data (INPE)[1] (Figure 1).

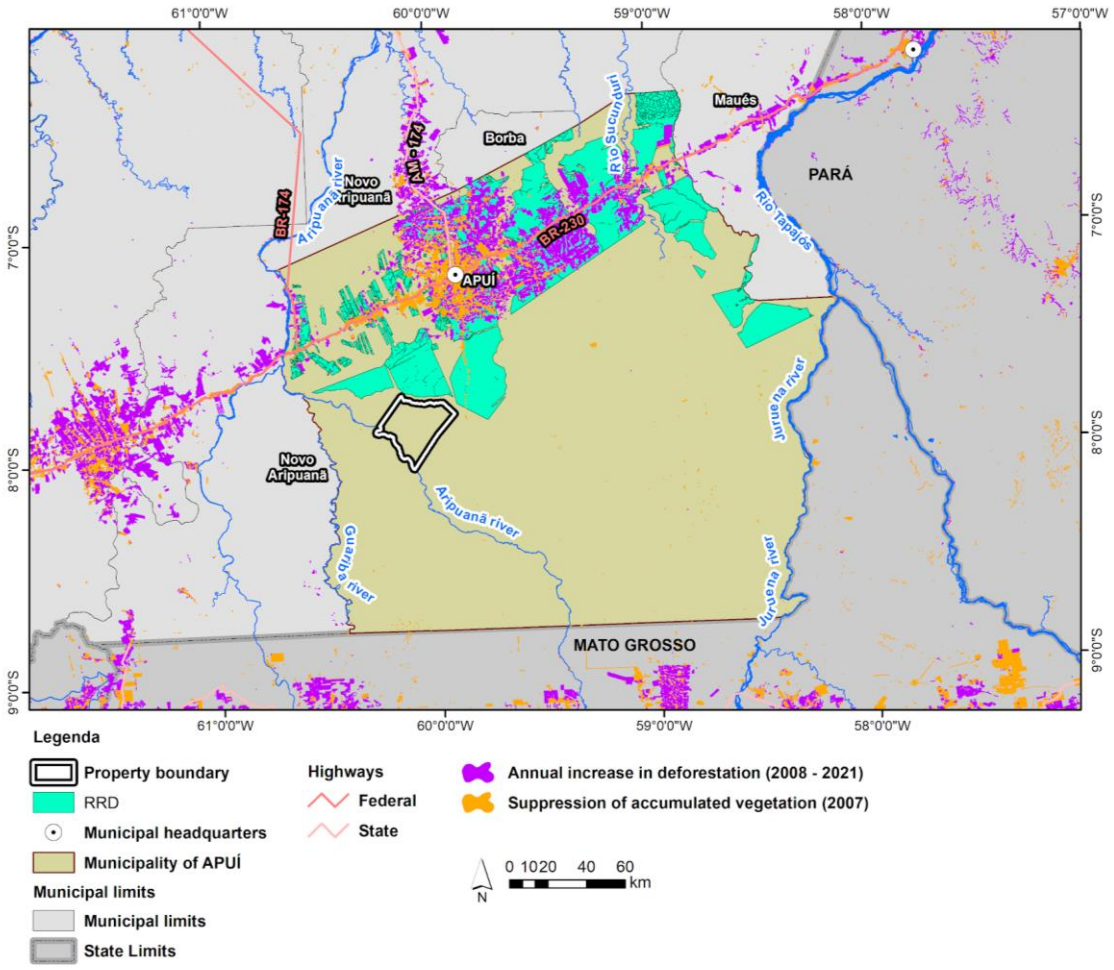
With the aim of generating benefits for the climate, community and biodiversity, the project hopes to contribute to the mitigation of climate change promoted by the implementation of carbon projects, thus avoiding the net emission of more than 23 million tCO_2e over the 30 year crediting period of the project, and bringing net positive benefits to communities and biodiversity through the implementation of activities that avoid planned (APD) and unplanned (AUD) deforestation.

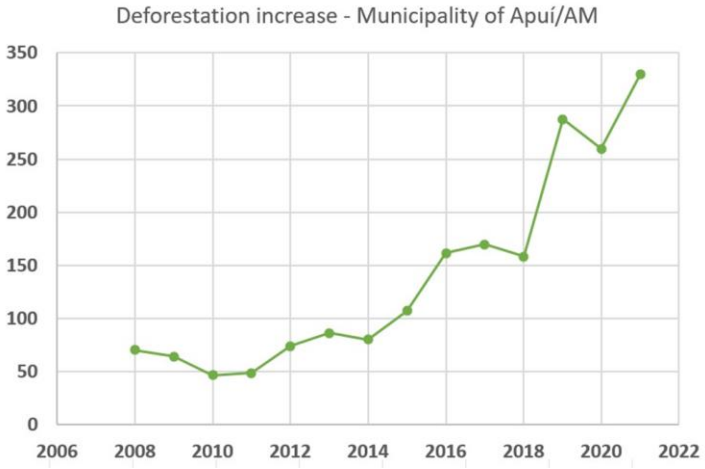
The project aims to generate economic incentives for landowners to conserve Amazon rainforests on their private lands, providing positive net impacts for traditional communities and for biodiversity conservation. According to the Brazilian Forest Code (Law No. 2.651/12)[2], landowners must conserve 80% 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.

Finally, the project aims to guarantee the conservation of forest areas, resulting in the maintenance of forest cover under pressure from illegal and 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 endangered species and social orientation activities with traditional communities residing in and around the project area.

[1] Available at: http://www.dpi.inpe.br/prodesdigital/prodesmunicipal.php

[2] Available at: http://www.planalto.gov.br/ccivil_03/_ato2011-2014/2012/lei/l12651.htm





Year	Area (km²)
2008	70,15
2009	63,99
2010	46,26
2011	48,52
2012	73,88
2013	86,11
2014	80,04
2015	107,01
2016	161,35
2017	169,54
2018	158,19
2019	287,69
2020	259,63
2021	329,88

Figure 1. Annual increase in deforestation (2008-2011) in the municipality of Apuí (AM) where the Samaúma 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 Samaúma 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. Samaúma project scale

Project Scale	
Project	
Large project	X

2.1.3 Project Proponent (G1.1)

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

Organization name	Terra Vista Gestora de Recursos Ltd.
Contact person	Rômulo P. S. Arantes
Title	Technical Director
Address	Rua Gumercindo Saraiva, nº 54, Sala 04, Jardim Europa, São Paulo, 01449-070 (postal code), 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, 01449-070 (postal code), Brazil
Telephone	+55 11 4883-1165
Email	projetos@terravista.eco.br

Organization name	Ituxi Administração e Participação Ltd.
Contact person	Ricardo Stoppe
Title	Landowner
Address	Av Calama, nº 5040 Sala 01, Porto Velho, Rondônia, Brazil
Telephone	+55 (92) 3634-7521; +55 (18) 99600-3009
Email	aamericardo@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 Samaúma project.

Organization name	Avix Engenharia e Estudos Técnicos Ltd.
Contact person	Fernando F. de Barros Ferraz
Title	Technical Support in Environmental Geoanalysis
Address	Praça Professor Sérgio Bonganhi, nº 120, Sala 107, Terras de Piracicaba, Piracicaba, São Paulo, Brazil
Telephone	+55 (19) 98877-2407
Email	ffbferraz@avix.com.br

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2.1.5 Physical Parameters (G1.3)

Project Location

The Samaúma project is located in the western region of the municipality of Apuí, in the state of Amazonas, inserted in the geographical coordinates 07º51'28''S and 60º05'30''W (Figure 2). The municipality borders two other states, Mato Grosso and Pará.

Land accessibility to the municipality is via the Transamazon highway (BR-230). The nearest port is in the city of Novo Aripuanã, where the Aripuanã and Madeira rivers meet, with river transport to the city of Manaus. The municipality of Apuí can also be accessed via the airport, which only allows daytime flights[3].

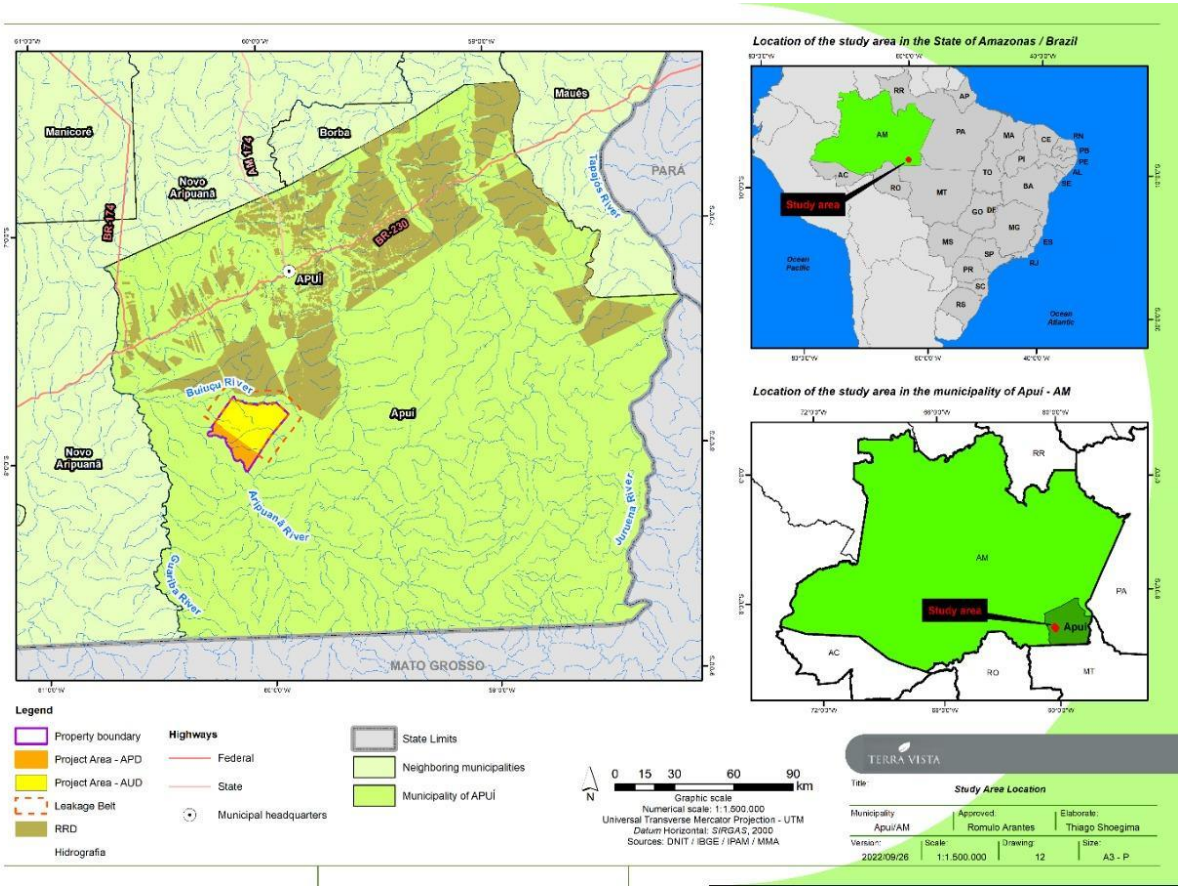


Figure 2. Location of the Samaúma project in the Municipality of Apuí in the Amazonas State, Brazil.

Geology, Geomorphology and Topography

The State of Amazonas is characterized by an extensive Phanerozoic sedimentary cover (comprising the last 542 million years) deposited over a Precambrian rock substratum (comprising a period of time from about 4.5 billion years ago to the Phanerozoic). The municipality of Apuí gathers a large contingent of sedimentary rocks, with chronostratigraphic establishment restricted to the Paleozoic, whose basin is

[3] WWF. 2010. Management Plan for the Mosaic of Conservation Units of Apuí. Available at: https://documentacao.socioambiental.org/ato_normativo/UC/2367_20160901_114249.pdf?_ga=2.253530953.1734345866.1658001805-1514520224.1658001805. Accessed on: 07/12/2022.

settled on Paleoproterozoic metavolcanic substrate, being recognized four sedimentary formations that were gathered in the Upper Tapajós Group[4].

In the project area the following geological units were identified: Indiscriminate Cenozoic Cover, Rio Negro-Juruena Formation and Continental water body (Figure 3).

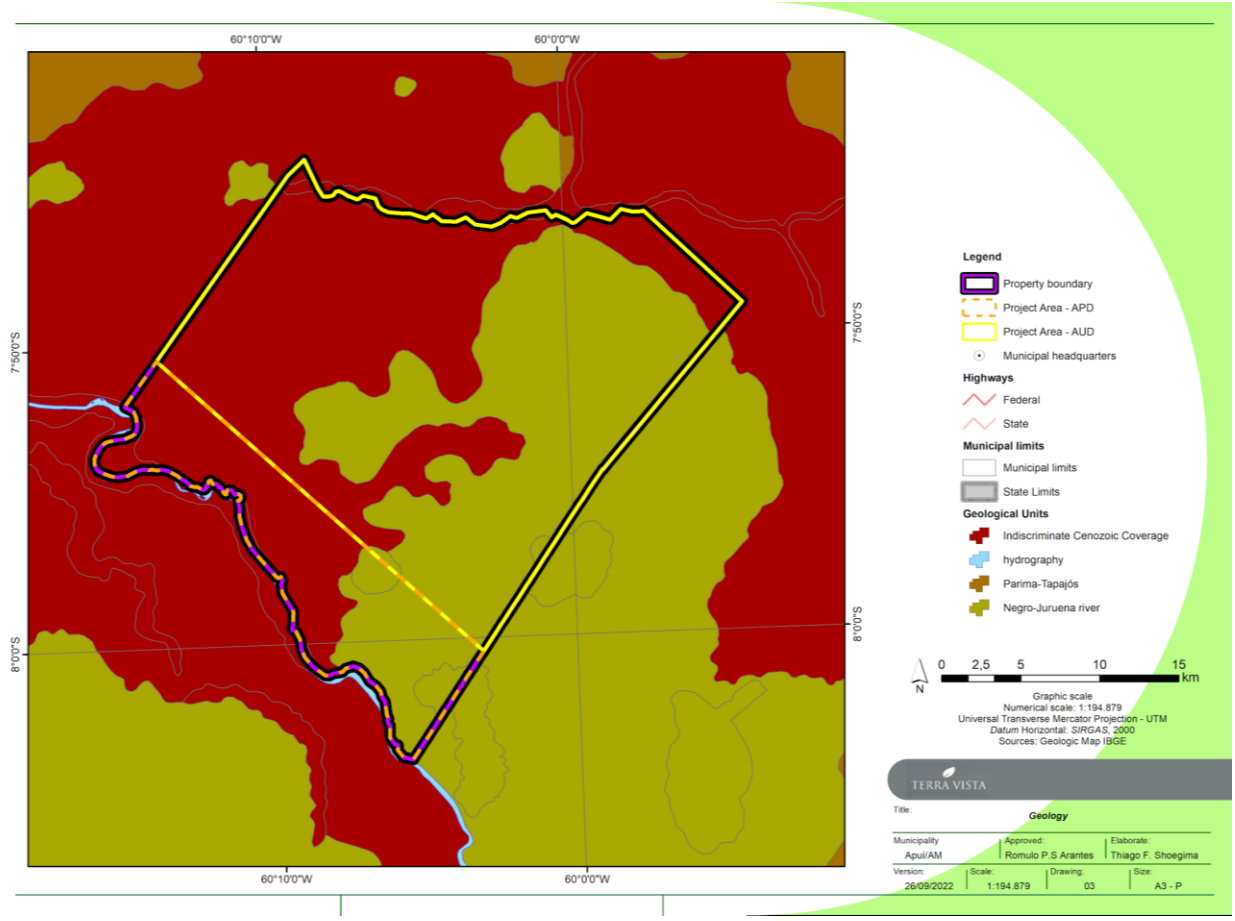


Figure 3. Geology of the region where the Samaúma project is located.

The Amazon has reliefs of different shapes defined based on the altitude variation of the plains. According to Ross' classification (1996[5]) the relief of the Southern Amazon presents two types of geomorphological units: the Residual Plateaus and the Depression of the Southern Amazon.

[4] CPRM, 2006. Study of the Physical Environment for Locating Favorable Targets for Drilling Tubular Wells in the City of Apuí-AM. José Moura Villas Boas ... [et. al.]. - Manaus: Geological Service of Brazil. Available at: https://rigeo.cprm.gov.br/xmlui/handle/doc/10228?locale-attribute=pt_BR. Accessed on 09/28/2022.

[5] ROSS, J. L. S., 1996. Geomorphology: Environment and Planning. São Paulo. Ed. Context. 85p.

The Samaúma project is predominantly located on the morphostructural domain of the Crystalline Basement (Figure 4a) and on the Roosevelt Depression at Aripuanã, in a region where the Juma River Plateau and the Apiacás Plateau are mostly present (Figure 4b). The region and the project area presents a Dissected relief with predominantly Tabular Top and partly Convex (Figure 4c).

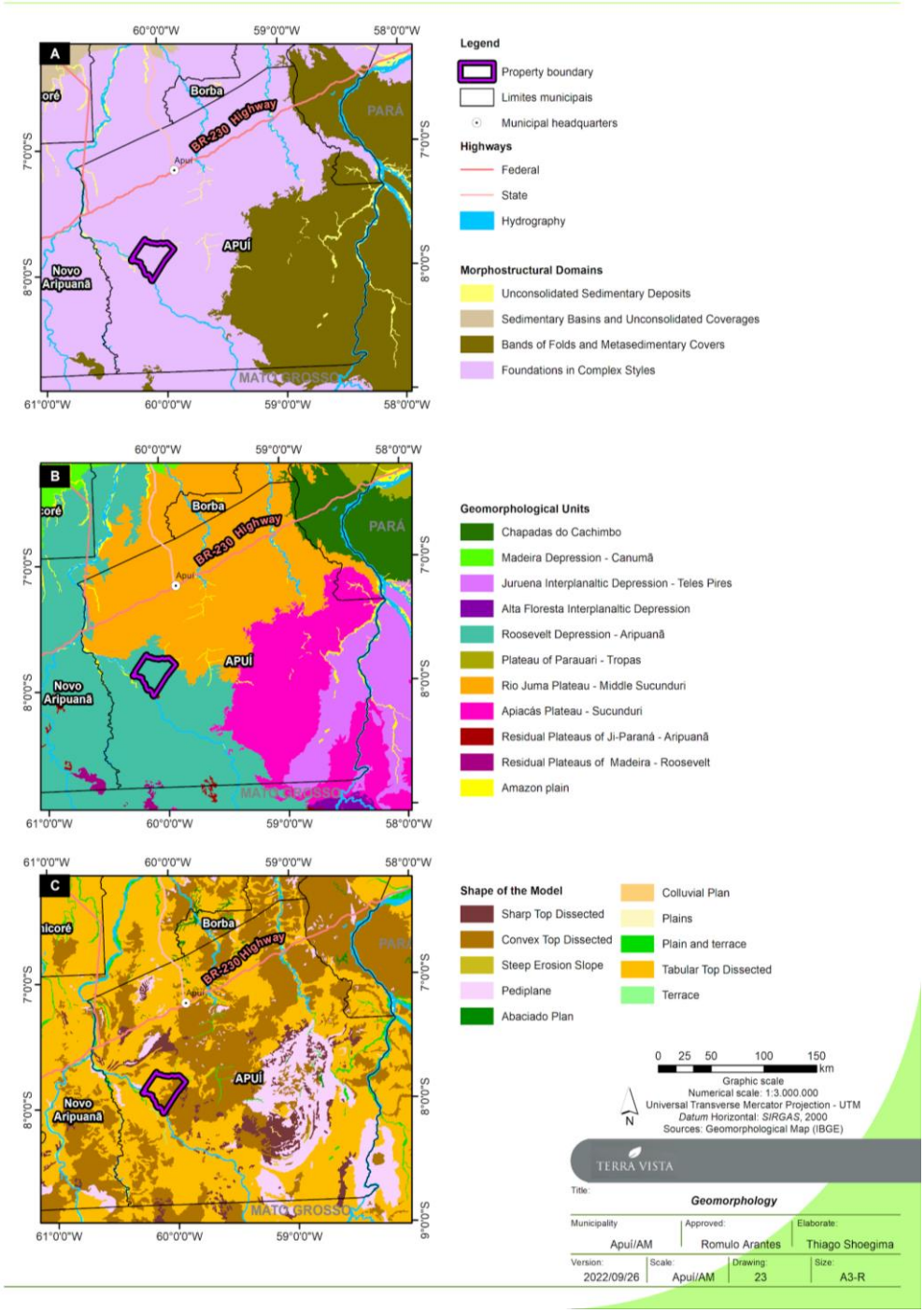


Figure 4. Geomorphology of the region where the Samaúma project is located.

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 Samaúma project. The predominant soil types in the region and in the project area are Red-Yellow Latosol (Oxisol) – LVA and Red-Yellow Argisol (Ultisol) - PVA (Figure 5). The Argisol are, together with the Latosol, considered the most expressive soils in Brazil, and are found in almost all regions.

Latosol are non-hydromorphic mineral soils that usually present a sequence of A, Bw horizons. They are deep, well-drained soils, high porosity with good aeration and permeability, even when very clayey[6,7].

The Argisol are also non-hydromorphic, deep and low fertility soils. In contrast to Latosol, they have a medium or sandy texture, and present a textural B horizon immediately below the A or E horizon, and this B horizon presents a higher clay content than the former, which hinders water infiltration, allowing prolonged waterlogging after the rainy season[8,9]. The Red-Yellow Argisol are chemically poor in essential nutrients for cultivated plants; especially in relation to calcium, magnesium, potassium and phosphorus, a deficiency that is quite common in dystrophic soils in the Amazon[10].

[6] CPRM. 2010. Geodiversity of the State of Amazonas. Ministry of Mines and Energy. Available at: https://www.terrabrasilis.org.br/ecotecadigital/pdf/geodiversidade-do-estado-do-amazonas.pdf Accessed on: 09/28/2022.

[7] ICMBIO. 2011. Juruena National Park Management Plan. Available at: https://documentacao.socioambiental.org/ato_normativo/UC/1587_20140813_154621.pdf. Accessed on: 09/28/2022

[8] CPRM. 2010. Geodiversity of the State of Amazonas. Ministry of Mines and Energy. Available at: https://www.terrabrasilis.org.br/ecotecadigital/pdf/geodiversidade-do-estado-do-amazonas.pdf Accessed on: 09/28/2022.

[9] ICMBIO. 2011. Juruena National Park Management Plan. Available at: https://documentacao.socioambiental.org/ato_normativo/UC/1587_20140813_154621.pdf. Accessed on: 09/28/2022

[10] 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: 09/25/2022.

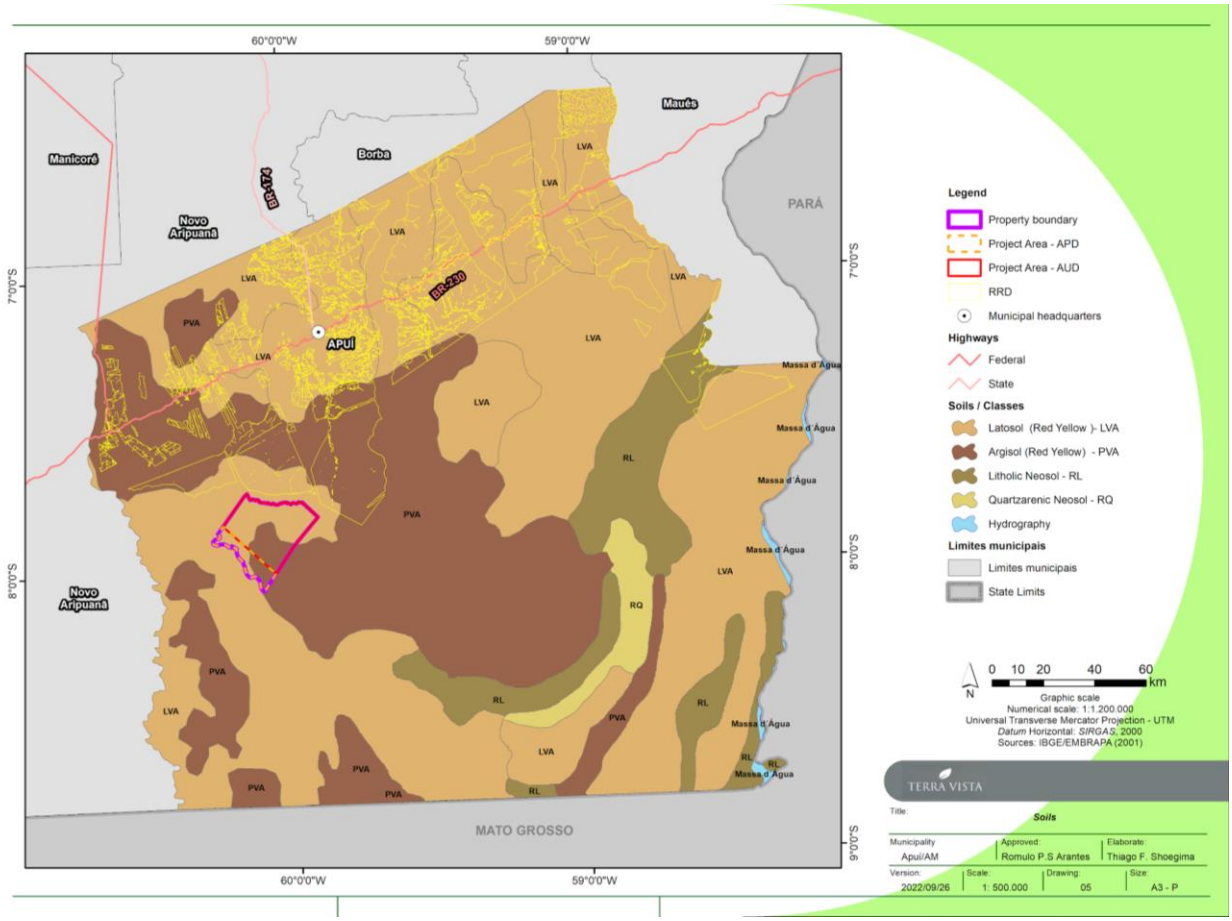


Figure 5. Soil classes in the region where the Samaúma project is located.

Climate

The climate in the municipality of Apuí is classified as hot and humid, type "Am" according to Koppen's classification (1948)[11], with average annual temperature varying from 26ºC to 27ºC, with a rainy season from December to May and a dry season from June to October[12].

In the region there is a predominance of southeast to southwest winds in the rainy season, with a maximum speed of 2m/s, and in the dry season with southeast to south winds with a maximum speed of 2.5 m/s[13].

[11] KÖPPEN, W. 1948. Climatologia: con un estudio de los climas de la terra. Mexico. Fondo Cult. Econ. 479p.

[12] SIQUEIRA, L.F et al.. 2014. Characterization of the wind regime in the municipalities of Humaitá-AM and Apuí-AM. Year 7, Vol XII, Number 1, Jun-Jul, 2014, Page 99-112. Available at: https://www.researchgate.net/publication/262068386_Caracterizacao_do_regime_de_ventos_no_municipio_de_Humaita-AM_e_Apui-AM Accessed on: 09/10/2022.

[13] SIQUEIRA, L.F; et al. 2014.

The average annual rainfall is around 2000 mm. The rainiest period in the Apuí region occurs from January to March and the least rainy period (driest season) from June to August (Figure 6). The lowest temperatures were recorded in June and July, with minimums of 10°C to 16°C[14,15].

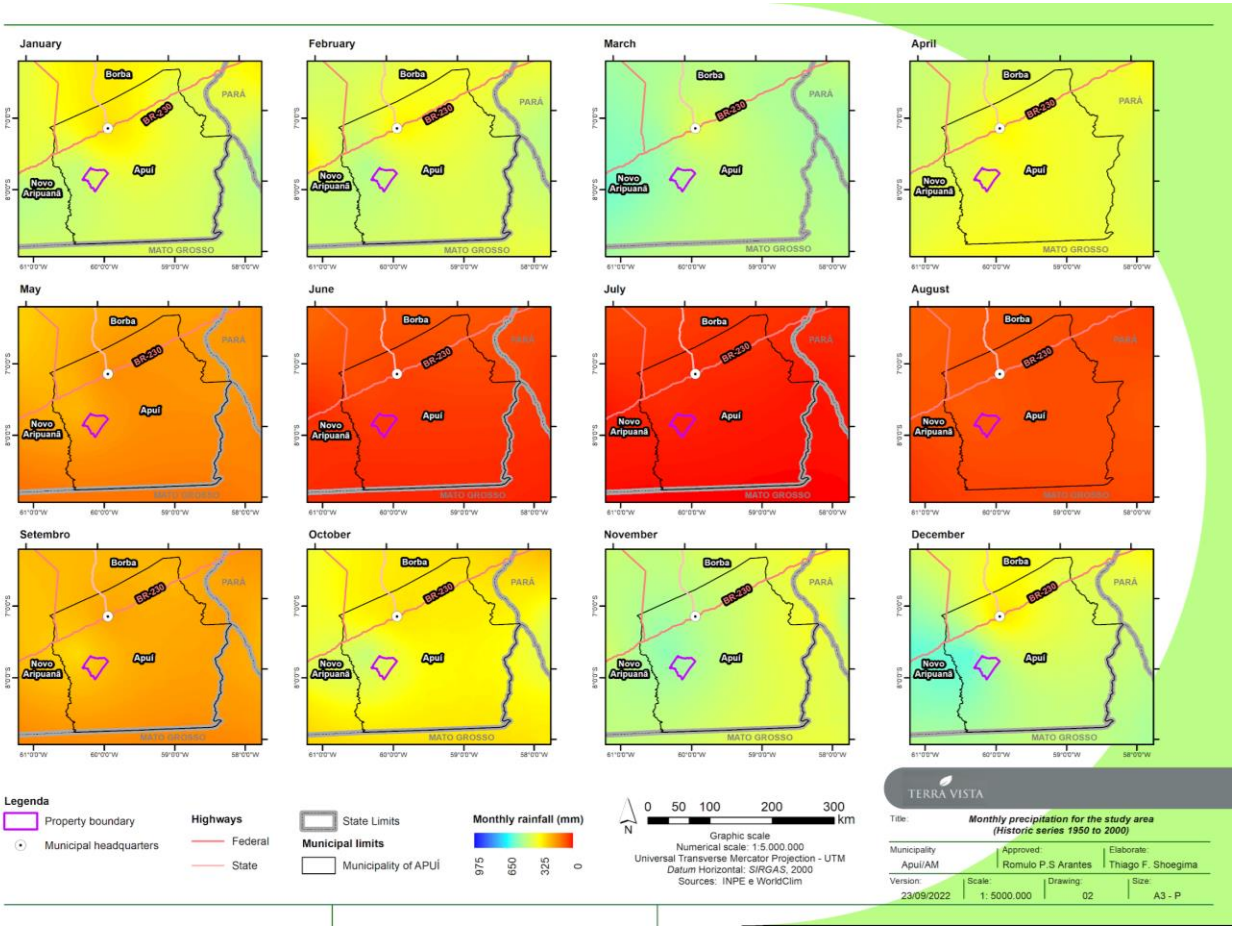


Figure 6. Average monthly rainfall in the region (historical series 1950 to 2000) where the Samaúma project is located.

Hydrology

The Amazon river basin is formed by the most extensive hydrographic network on the planet, occupying a total area of ca. 6,110,000 km², from its sources in the Peruvian Andes to its mouth in the

[14] CPRM 2001. Project for Integrated Environmental Management of Amazonas. Ecological-Economic Zoning of the Madeira River Valley. Southeast-South Area. Manaus, CPRM, 92 p.

[15] FONSECA, F.O.R. Simulation of deforestation in Apuí-am from land use rules. Universidade Federal do Amazonas - UFAM, Manaus - AM, 2012 IBAMA - Brazilian Institute of Environment and Renewable Natural Resources. Available at: https://tede.ufam.edu.br/handle/tede/2304. Accessed on: 09/28/2022.

Atlantic Ocean, in the northern region of Brazil. This basin is characterized by the Amazon River, its tributaries, and the floodplain (várzea) lakes that interact with the rivers. The greatest demands for water use in the region occur in the sub-basins of the rivers Madeira, Negro and Tapajós, and are intended for animal and human consumption, representing respectively 32% and 33% of the total demand in the region (78.8 m^3/s). In general, the estimated consumptions are not very significant when compared to the water availability per sub-basin (ANA, 2013). During the period of high river levels, flooding occurs throughout the system.

The rivers and floodplains (várzeas) of the Amazon constitute a complex of rivers, channels, islands, lakes, and depressions permanently modified by sedimentation. They carry solids in suspension, influencing the succession of terrestrial vegetation by the constant modification of their banks, and by the removal and deposition of material in the soils.

The municipality of Apuí is drained by the Sucunduri-Canumã river basin to the east and by the Aripuanã river basin to the west, with approximate directions NS. Its main tributaries are the rivers Acari (180 km long), Camaiú (240 km long), and the Sucunduri which is more than 150 km long with springs located near the border of the Amazonas and Mato Grosso States [16].

The Aripuanã river basin, formed by the Guariba and Roosevelt rivers, is located west of the Sucunduri-Canumã basin, and has a general N-S direction, with springs in the states of Mato Grosso and Rondônia and flows into the Madeira river upstream of the city of Manicoré [17]. The Juma River is considered the main drainage for the city of Apuí [18]. Figure 7 shows the hydrography of the municipality of Apuí, in the Amazonas State.

[16] LAGES, A.S. 2010. Geochemistry of black water from rivers in the municipality of Apuí, Amazonas. Dissertation presented to the Graduate Program in Geosciences of the Federal University of Amazonas. Available at: < https://tede.ufam.edu.br/handle/tede/3270> Accessed on: 08/20/2022.

[17] LAGES, A.S. 2010. Geochemistry of black water from rivers in the municipality of Apuí, Amazonas. Dissertation presented to the Graduate Program in Geosciences of the Federal University of Amazonas. Available at: < https://tede.ufam.edu.br/handle/tede/3270> Accessed on: 08/20/2022.

[18] LAGES, A.S. 2010. Geochemistry of black water from rivers in the municipality of Apuí, Amazonas. Dissertation presented to the Graduate Program in Geosciences of the Federal University of Amazonas. Available at: < https://tede.ufam.edu.br/handle/tede/3270> Accessed on: 08/20/2022.

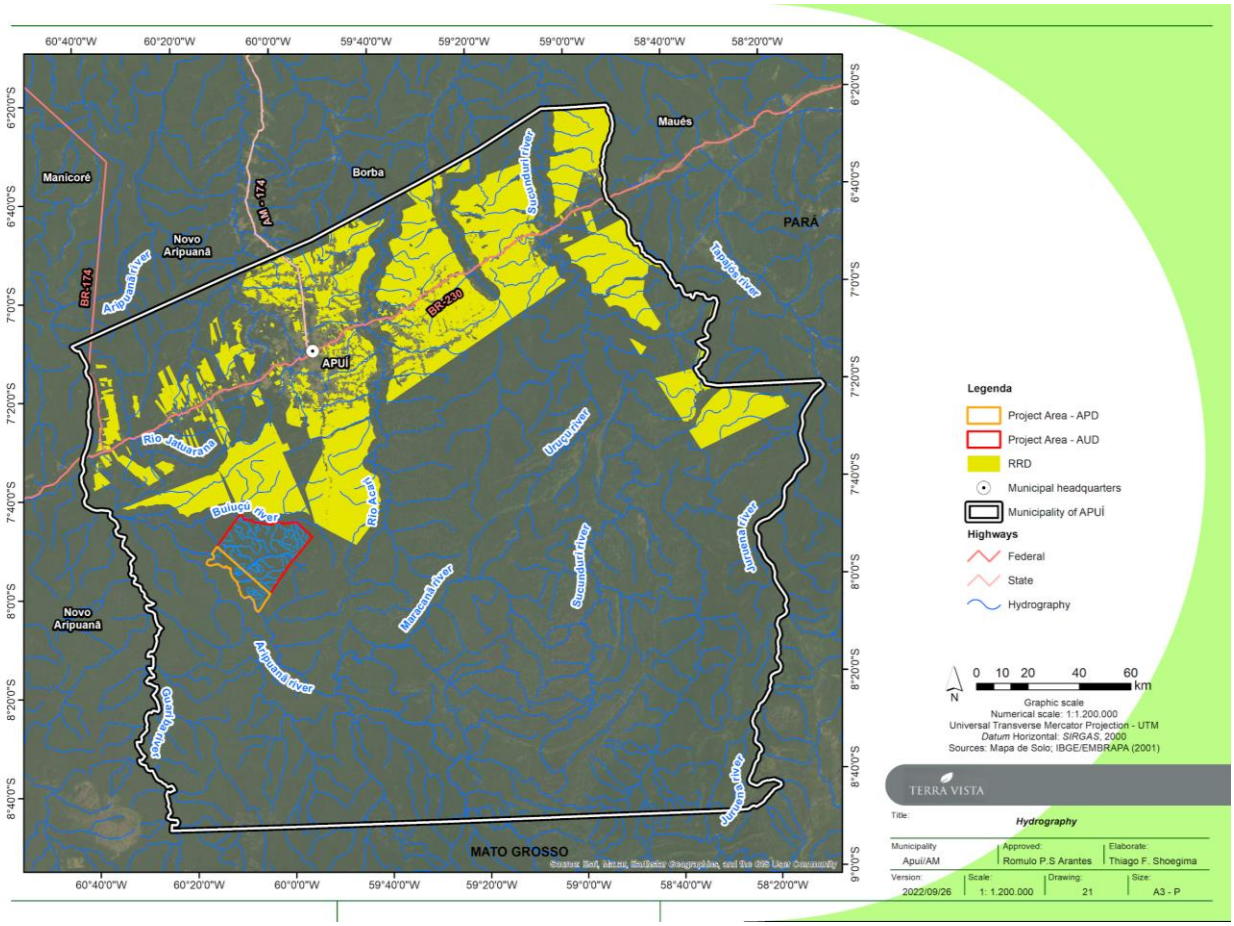


Figure 7. Hydrography of the region where the Samaúma project is located.

The project area is bordered by the banks of the Aripuanã River, considered one of the most important tributaries of the right bank of the Madeira River, which extends more than 1,100 km from its mouth to its headwaters, near the municipality of Juína, in the state of Mato Grosso[19]. In the project area, there are several watercourses with a total length of 74.81 km within the APD area and 316.15 km within the AUD area (Figure 8).

[19] ZAWADZKI, C. H; CARVALHO, P. H. 2014. A new species of the *Hypostomus cochliodon* group (Siluriformes: Loricariidae) from the Rio Aripuanã basin in Brazil. Neotropical Ichthyology, 12(1):43-51. Available at: https://www.scielo.br/j/ni/a/xDBtpK467gkNXPbw3FMXf9P/?lang=en Accessed on: 10/08/2022

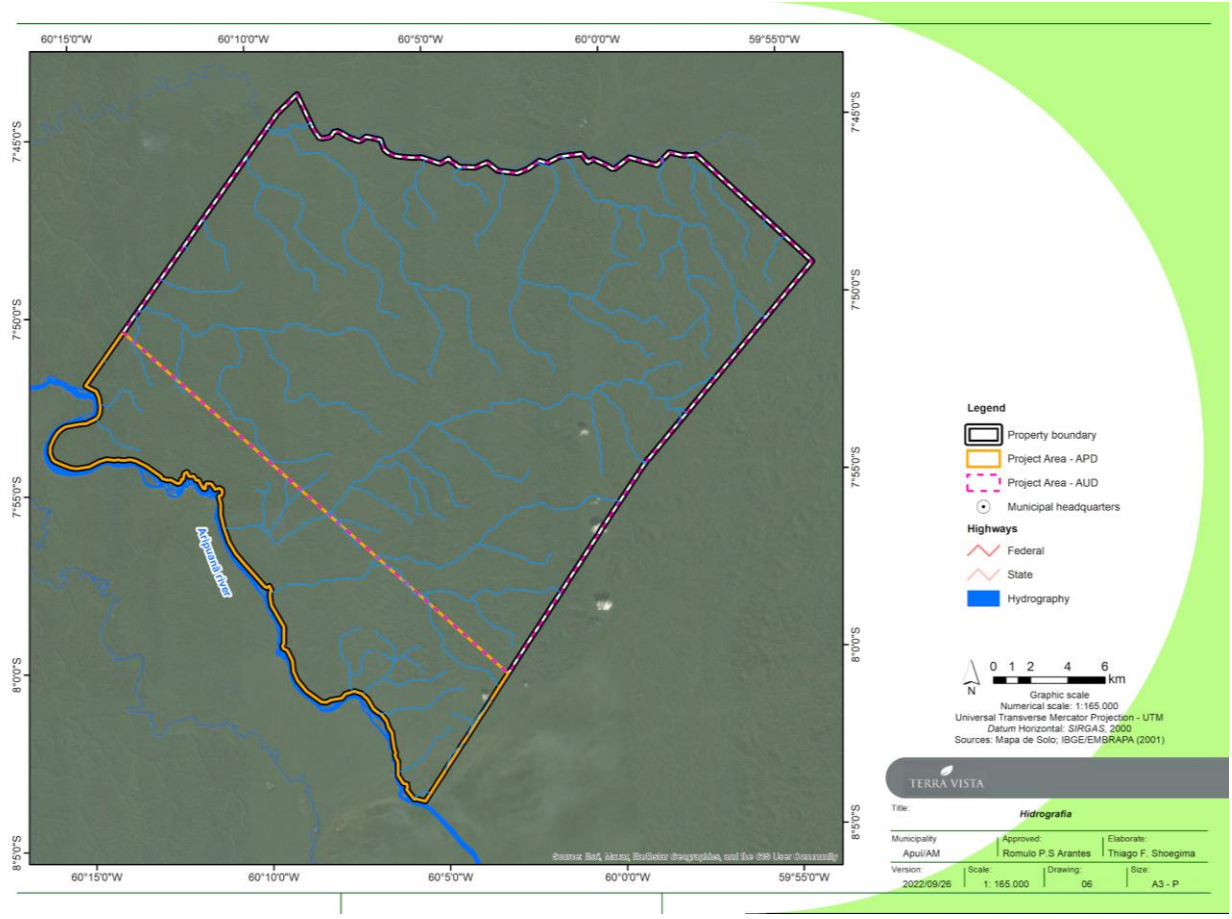


Figure 8. Hydrography of the Samaúma project area.

Vegetation Types

The Samaúma project is located in the Amazon Biome, being predominantly characterized by the presence of Dense and Open Submontane Ombrophilous Forest, classified in the following classes (IBGE - RADAM, 1997-2017): (i) Submontane Dense Ombrophilous Forest with emerging canopy (Dse); (ii) Submontane Open Ombrophilous Forest with palm trees (Asp); (iii) Alluvial Dense Ombrophilous Forest with emerging canopy (Dae); (iv) Submontane Open Ombrophilous Forest with lianas (Asc), and (v) Alluvial Dense Ombrophilous Forest with uniform canopy (Dau).

The vegetation types and the area occupied by each type within the project area are shown in Figure 9 and Table 7.

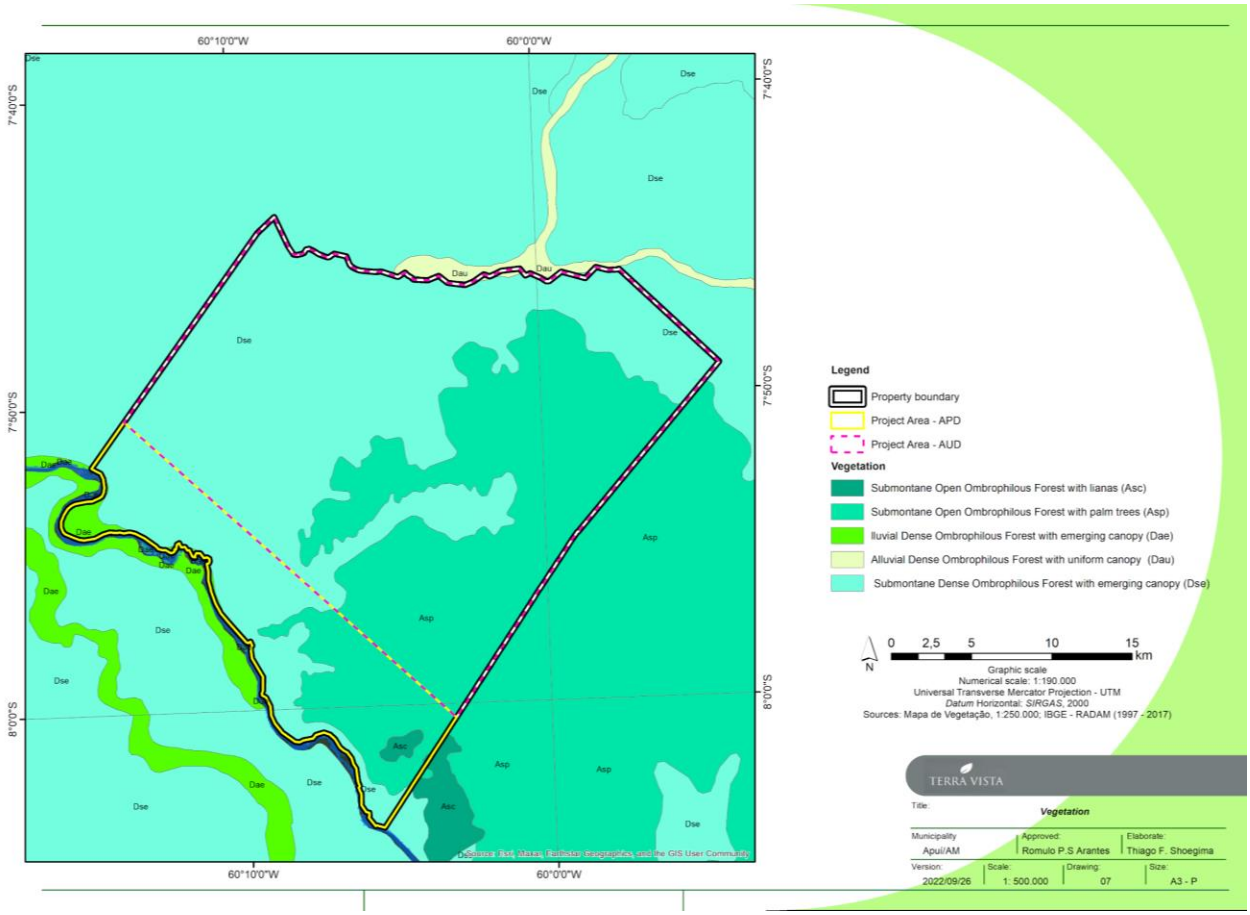


Figure 9. Vegetation types of the region where the Samaúma project is located.

The Submontane Dense Ombrophylous Forest with emerging canopy, predominant in the project area (ca. 57.6% of the APD area and 57.98% of the AUD), is characterized by the presence of species that vary according to latitude, being composed mainly of tall phanerophytes. It can exceed 50 m in the Amazon while rarely 30 m in other parts of the country, forming a vegetation cover with uniform characteristics, with the occasional presence of taller emerging trees[20]. As described in the Management Plan of the Apuí Mosaic[21], the forest is classified as exuberant with dense groups of emergent trees, generally forming stands of tall, thick and well-covered individuals, generating a shady understory, favoring the development of ombrophilous species.

The second predominant vegetation in the project area, the Submontane Open Ombrophylous Forest with palm trees (ca. 37% of the APD area and 41.04% of the AUD), is characterized by the presence of

[20] IBGE. 2012. Technical Handbook of Brazilian Vegetation. 2 revised and expanded edition. Available at: https://www.terrabrasilis.org.br/ecotecadigital/pdf/manual-tecnico-da-vegetacao-brasileira.pdf Accessed on: 20/08/2022

[21] WWF. 2010. Management Plan for the Mosaic of Conservation Units of Apuí. Available at: https://documentacao.socioambiental.org/ato_normativo/UC/2367_20160901_114249.pdf?_ga=2.253530953.1734345866.1658001805-1514520224.1658001805. Accessed on: 07/12/2022.

palm trees interspersed with woody trees, forming a uniform and continuous upper canopy. This vegetation generally occupies areas of flattened relief and valleys formed by the undulations of the dissected terrain and can be found in the midst of the slopes[22]. There is also the Submontane Open Ombrophylous Forest with lianas which affects 2.1% of the area of the APD project and 0.33% of the AUD. In the project area it is also present the phytophysiognomy of Alluvial Dense Ombrophylous Forest with uniform canopy in 0.25% of the AUD project area and with emerging canopy in 3.3% of the APD project area and 0.38% of the AUD.

Table 7. Type of vegetation registered in the Samaúma project area (AUD x APD) based on Brazilian vegetation classification.

Type of Vegetation	Project area (AUD) (ha)	Project area (AUD) (%)	Project area (APD) (ha)	Project area (APD) (%)
Submontane Open Ombrophilous Forest with lianas (Asc)	192.04	0.33	304.34	2.1
Submontane Open Ombrophilous Forest with palm trees (Asp)	23,540.14	41.04	5,233.6	37.0
Submontane Dense Ombrophilous Forest with emergent canopy (Dse)	33,255.01	57.98	8,150.54	57.6
Alluvial Dense Ombrophilous Forest with emergent canopy (Dae)	215.12	0.38	469.58	3.3
Alluvial Dense Ombrophilous Forest with uniform Canopy (Dau)	147.66	0.25	0.0	0.0
Total	**57,349.96**	**100**	**14,158.28**	**100**

Protected and Priority Areas for Conservation

The Samaúma project is located in a region that has a mosaic of Conservation Units, both of Sustainable Use (Uso Sustentável), which aims to make nature conservation compatible with the sustainable use of natural resources, and Full Protection (Proteção Integral), whose purpose is to preserve nature, in which case only the indirect use of its natural resources is allowed (except for the cases foreseen in Law Nº 9.985/2000[23]).

[22] WWF. 2010. Management Plan for the Mosaic of Conservation Units of Apuí. Available at: https://documentacao.socioambiental.org/ato_normativo/UC/2367_20160901_114249.pdf?_ga=2.253530953.1734345866.1658001805-1514520224.1658001805. Accessed on: 07/12/2022.

[23] Available at: http://www.planalto.gov.br/ccivil_03/leis/l9985.htm. Accessed in: 06/10/2022.

The project area is located near protected areas for conservation that are part of the Southern Amazon Mosaic and the Apuí Mosaic, with no overlap with any Conservation Unit (Full Protection or Sustainable Use) (Figure 10).

The Southern Amazon Mosaic (SAM) covers a region of ca. 7.1 million hectares, called the "Arc of Deforestation", which encompasses the limits of the states of Amazonas, Mato Grosso, Pará, and Rondônia. The Apuí Mosaic, which encompasses an area of the SAM, presents ca. 2,419,010 ha formed by nine Conservation Units[24].

This set of protected areas that form the Mosaics is considered extremely important for biodiversity conservation, creating ecological corridors in a region that is under great deforestation pressure.

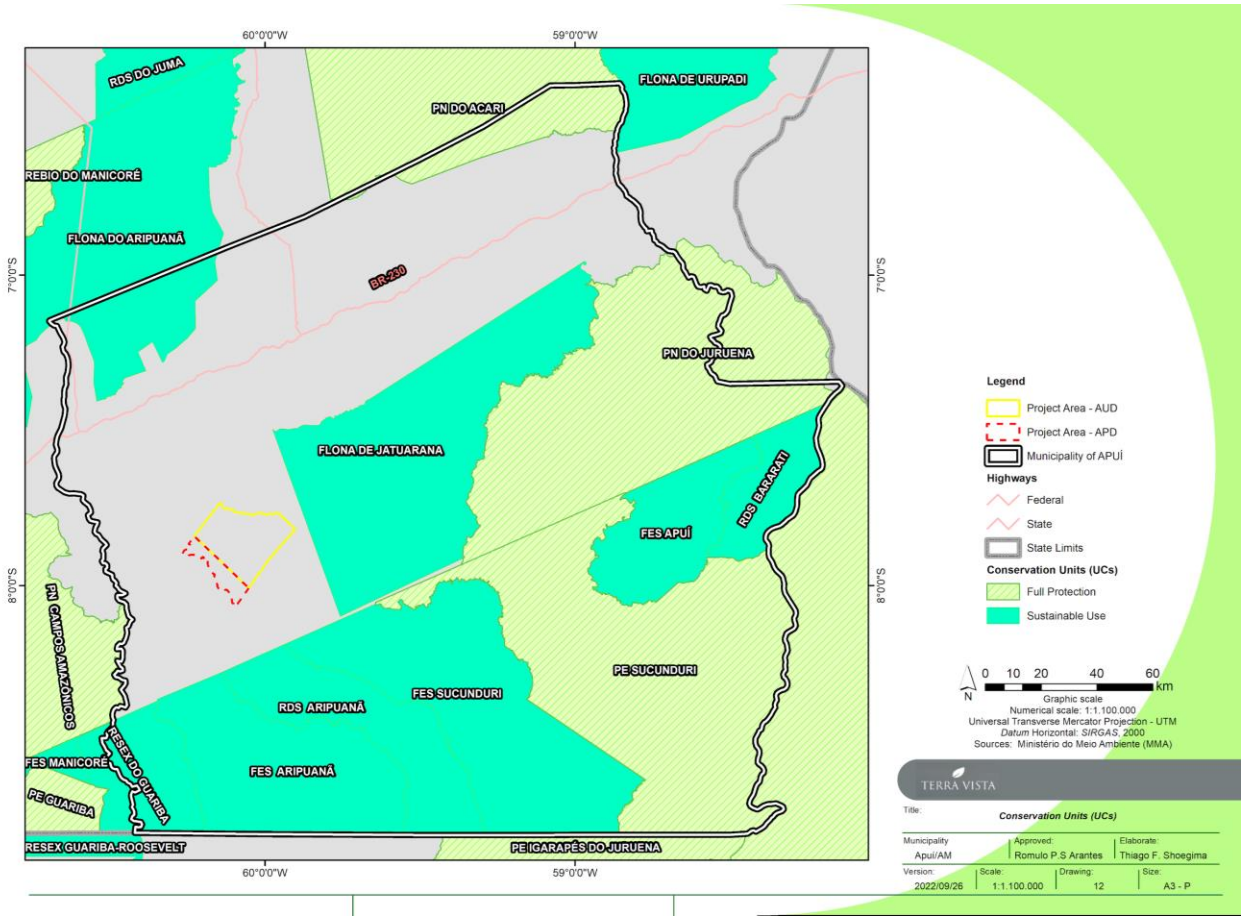


Figure 10. Conservation Units (or Protected Areas) in the region where the Samaúma project is located.

[24] WWF. 2010. Management Plan for the Mosaic of Conservation Units of Apuí. Available at: https://documentacao.socioambiental.org/ato_normativo/UC/2367_20160901_114249.pdf?_ga=2.253530953.1734345866.1658001805-1514520224.1658001805. Accessed on: 07/12/2022.

The Priority Areas for conservation, established by Decree Nº 5.092/2004[25], are considered a public policy instrument, which aims to help in decision-making in an objective and participatory manner, in addition to supporting the planning and implementation of actions for the conservation of Brazilian biodiversity[26].

As provided in MMA Ordinance Nº 463/2018[27], the areas selected for conservation are subject to the formulation and implementation of public policies, programs, projects and activities under the responsibility of the Federal Government aimed at: *In situ* conservation of biodiversity; Sustainable use of biodiversity components; Sharing of benefits derived from access to genetic resources and associated traditional knowledge; Biodiversity research and inventories; Recovery of degraded areas and overexploited or endangered species; and Economic valuation of biodiversity.

Also, according to the aforementioned Ordinance, the actions will be implemented considering two classes of biological importance and prioritization of action: Classes of Biological Importance (extremely high, very high, high, and insufficiently known) and Classes of Priority for Action (extremely high, very high, and high).

The Samaúma project area, according to MMA (2018), is located within two zones considered of "Very High" relevance for conservation and protection (AMZ-523 and AMZ-021). The main action recommendations are the creation of Sustainable Use Conservation Units, research, integrated and participatory management of protected areas and ecological corridors and territories of traditional peoples and communities, highlighting the biological relevance of the project's region (Figure 11).

[25] http://www.planalto.gov.br/ccivil_03/_ato2004-2006/2004/decreto/d5092.htm

[26] 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.

[27] Available at: https://www.in.gov.br/materia/-/asset_publisher/Kujrw0TZC2Mb/content/id/55881195/do1-2018-12-19-portaria-n-463-de-18-de-dezembro-de-2018-55880954

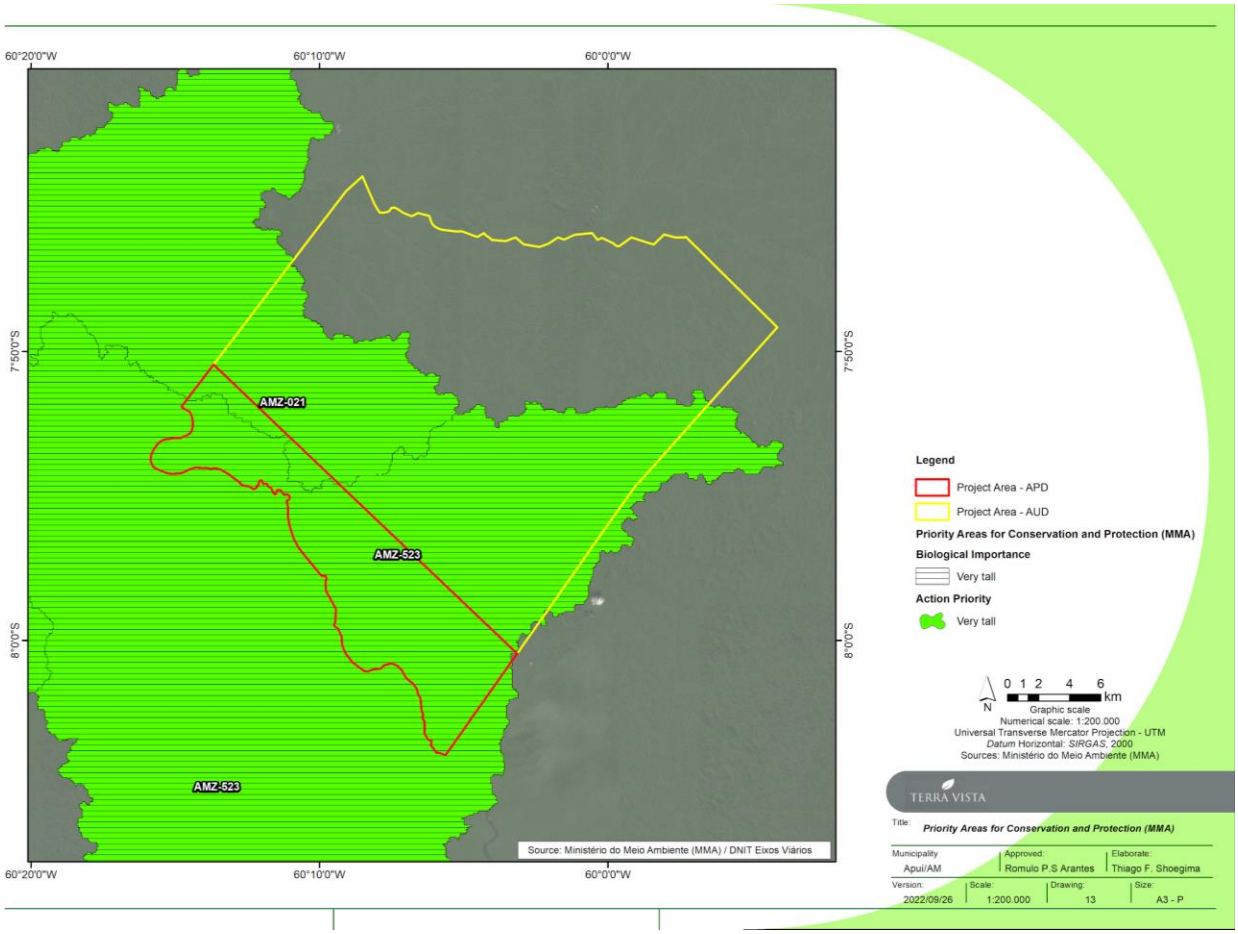


Figure 11. Priority Areas for Conservation in the region where the Samaúma project is located.

2.1.6 Social Parameters (G1.3)

For the analysis of secondary data on the municipality of Apuí three main indexes were selected: Firjan Municipal Development Index (IFDM), the Firjan Fiscal Management Index (IFGF) and the Social Progress Index (SPI). The use of these indexes is justified because they present more recent and customized data at the municipal level at a time when the Census of the Brazilian Institute of Geography and Statistics[28], prepared in 2010, is too outdated. Another advantage is to group official data around themes, facilitating the capture of the current conditions of the municipality in the areas of business, health, quality 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, to address issues that are not sufficiently covered by the indices, data from official research institutions were

[28] 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.

also mobilized, such as the Brazilian Institute of Geography and Statistics (IBGE)[29], Ministry of Health[30], National Institute of Educational Studies and Research Anísio Teixeira (INEP)[31], Institute of National Artistic Heritage (Iphan)[32] and two projects developed on the initiative of the Climate Observatory, Mapbiomas[33], and the System of Estimates of Emissions and Removals of Greenhouse Gases (SEEG)[34].

The IFDM is an index created from the monitoring of three main sectors: employment and income, education, and health. 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 general and in each of its aspects. The components of each sector are shown in Table 8 below.

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

Employment and Income	Education	Health
Generation of formal employment	Attending to early childhood education	Proportion of adequate prenatal care
Labor market formalization rate	Elementary school dropout	Deaths from ill-defined causes

[29] IBGE - Instituto Brasileiro de Geografia e Estatística. IBGE – Cidades. Available at: https://cidades.ibge.gov.br/brasil/panorama

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

IBGE - Instituto Brasileiro de Geografia e Estatística 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

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

[31] 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

[32] 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

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

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

[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

Income Generation	Age/grade distortion in elementary school	Child deaths from preventable causes
Real wage in the formal labor market	Elementary school teachers with higher education	
	Average number of daily class hours in elementary school	Primary Care Sensitive Hospitalization (PCSH)
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 efficiency of fiscal management at the municipal level. 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)[36].

Finally, the Social Progress Index (IPS) was created from the perception that the most famous indexes 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 to include not only income, but also to measure the social and environmental performance of territories. Social progress is understood as "the ability of a society to satisfy the basic human needs of its citizens, to establish the essential elements for the improvement and maintenance of 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 carried out at country level, to a subnational 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

[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

[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

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].

For characterization at the community level, the Sustainable Livelihoods (Sustainable Livelihoods (MVS)) methodology[39] was adopted with auxiliary tools of Rapid Participatory Rural Diagnosis (DRP)[40]. The Sustainable Livelihoods (MVS) was consolidated in Brazil under the leadership of the support agency for sustainable development in the United Kingdom (DFID)[41] 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 the most vulnerable communities, combating the causes of poverty and promoting sustainable local development).

In impact assessments of socio-environmental strengthening projects in resident communities and users of areas that provide environmental services, among which stand out non-timber forest products or those with a high potential for carbon sequestration, it is necessary to adopt a methodology capable of describing and measuring local community ways of life and their relationship with environmental conservation in the territory. This methodology integrates the indicators that make it possible to understand what is expected to be achieved in carbon credit projects that must be defined in a participatory manner and have a positive impact on the conservation of forest fragments and on the livelihood of residents who contribute to forest conservation. In accordance with the certification standards for carbon credit projects such as the CCB, the Sustainable Livelihoods (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 with it a theoretical construct that helps to organize the categories of 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

[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] DFID BRASIL. Manual de treinamento em desenvolvimento social. Brasília: DFID, 2005 [2002].

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

[41] 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 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.

and that drive and are driven by their aspirations and dreams. Assets are distributed in five dimensions that can be in balance or imbalance in direct relation with 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.

Types of assets / dimensions	Information to be obtained for baseline description
Human Dimension	Family food safety
	Use and appreciation of traditional/local ecological knowledge
	Access to new knowledge
	Satisfaction and motivation with work and life in the territory
	Workplace 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
Natural Dimension (or Environmental 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
	Conservation and use of wild fauna
Physical Dimension	Individual production infrastructure
	Collective production infrastructure
	Individual/family infrastructure for housing, transportation and well-being
Economic Dimension	Income
	Price of products and working capital, when applicable

	Commercialization
	Access to lines of credit and other financial aid policies

Source: DFID BRASIL. Manual de treinamento em desenvolvimento social. Brasília: DFID, 2005 [2002]. Adapted by Terra Vista.

Capturing the dimensions of community ways of life serves as a baseline for creating indicators and subsequent monitoring over the years of the project. The application of the Sustainable Livelihoods (MVS) was planned in two ways in order to cover 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 (natural/environmental, social, human, financial and material), 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[42] applications through which general and dimension-specific registration and characterization questions were elaborated. The use of tables with selected indicators for each dimension of the Sustainable Livelihoods (MVS) would help to consolidate a baseline assessment in a way that will facilitate future data collection to monitor the positive and negative impacts of carbon credit projects in each territory. Some Rapid Participatory Rural Diagnosis (DRP) tools were also used according to the need to obtain information in contacts with communities, aiming to complete the characterization of ways of life and consolidate the description of use of areas of carbon credit projects. The main ones used were: transverse walk, seasonal calendar, maps and sketches of areas of use and distances, and Venn diagram[43].

Population dynamics

According to the Brazilian Institute of Geography and Statistics (IBGE)[44], the population of the municipality of Apuí is estimated at 22,739 people for the year 2021. When considering the 2010 census, which counted 18,007 people[45], the municipality presents a picture of positive population growth. Still, the

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

[43] 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.

[44] 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/apui/panorama >. Accessed on: 20/09/2022

[45] IBGE - Instituto Brasileiro de Geografia e Estatística, Censo Demográfico 2010. População no último censo. Available at: < https://cidades.ibge.gov.br/brasil/am/apui/panorama>. Accessed on: 20/09/2022

census indicated that the population of the municipality was mostly adult, where the largest number of people is between the age groups of 30 to 49 years old, and, according to the narrowing of the age pyramid, follows an aging trend (Figure 12). As for gender, the largest portion of residents are men, 9,551 men or 53% of the total population. Finally, its population is concentrated in the urban region, where, in 2010[46], about 10,595 people, or 59% of the population, resided.

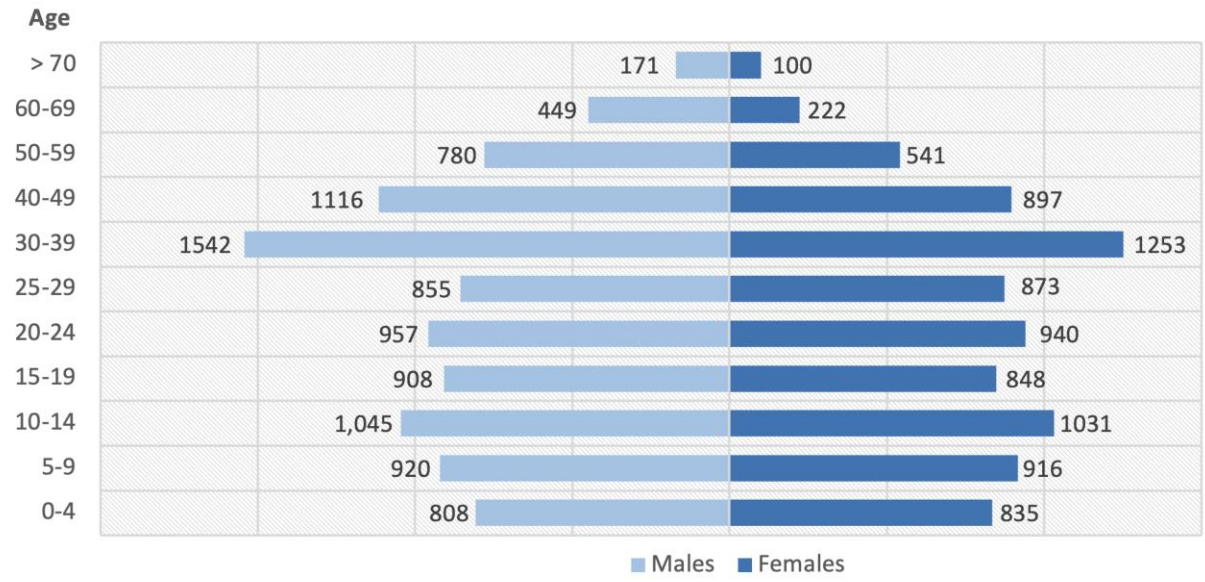


Figure 12. Population Pyramid (age-sex pyramid) showing the distribution by age groups and sex of the population of Apuí, Amazonas State, Brazil[47].

Although in 2010 about 70% of its residents came from the northern region[48], as shown by the municipality's history, the municipality's growth and occupation is associated with migrations from the southern region of the country. According to the IBGE, in 2010 about 10% of the population came from the southern region of the country, 7% from the northeastern region, and 6% from the central-western and southeastern regions[49]. In Apuí, migration from the south is significant and can be seen through the

[46] 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: 20/09/2022

[47] IBGE - Instituto Brasileiro de Geografia e Estatística. População residente, por sexo, situação e grupos de idade - Amostra - Características Gerais da População. Available at: <https://sidra.ibge.gov.br/pesquisa/censo-demografico/demografico-2010/amostra-caracteristicas-gerais-da-populacao-religiao-e-deficiencia>. Accessed on: 20/09/2022.

[48] 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: 20/09/2022.

[49] 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: 20/09/2022.

insertion of these migrants in the local economy, mainly as entrepreneurs who work in the restaurant and farming sector, or self-employed professionals.

The 2010 Census showed that the resident population of Apuí identified themselves, in terms of color or race, mostly as brown/mixed race ("pardo")[50]. In that same survey, a significant percentage of people who declared themselves white and black, and a small proportion of indigenous people, were also registered. Regarding the small fraction of the indigenous population in Apuí, according to the field data collection, in Apuí, there are indigenous peoples who live on the banks of the Sucunduri River and near the Aripuanã River, in the village of Mata Mata. According to information collected in the field, there are also reports of the presence of isolated indigenous peoples in the south of the municipality, in the Mosaico do Apuí, and between the Juma and Aripuanã rivers.

With a total area of 54,240.55 km² [51], the municipality presented in 2010[52], a population density of 0.33 inhab/km², one of the lowest rates in the Amazonas State in Brazil, indicating a population sparsely distributed throughout the territory of the municipality[53]. Despite the sparse population distribution, Apuí ranks 55th among the 62 Amazonian municipalities in terms of population density[54].

Health

In 2009, the municipality of Apuí had 6 health facilities of the Unified Health System[55]. Of these facilities, the reference is the Apuí Hospital Unit, which provides urgent and emergency care, performing simple surgeries. In cases where the use of Intensive Care Units (ICU) and more complex surgeries, patients need to be transferred to Manaus-AM, which is approximately 1,000 km away. Interlocutors at the site reported that an ICU unit has recently arrived in the municipality, but there is a lack of a qualified health team to put it into operation.

[50] 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: 20/09/2022

[51] 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/apui/panorama>. Acessed on: 20/09/2022

[52] 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/apui/panorama>. Acessed on: 20/09/2022

[53] Estimated population: IBGE, Directorate of Surveys, Coordination of Population and Social Indicators, Estimates of the resident population with reference date July 1, 2021. Available at: <https://cidades.ibge.gov.br/brasil/am/apui/panorama>. Accessed on: 05/30/2022.

[54] 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/apui/panorama. Accessed on: 20/09/2022

[55] IBGE - Instituto Brasileiro de Geografia e Estatística. Estabelecimentos de Saúde SUS: IBGE, Assistência Médica Sanitária 2009. Available at: <https://cidades.ibge.gov.br/brasil/am/apui/panorama>. Accessed on: 20/09/2022

According to the IPS (2020)[56], the infant mortality rate was 11.32 deaths per 1000 live births. Data from the Ministry of Health (2016) also pointed out 4.87 hospitalizations for diarrhea per 1000 inhabitants[57]. In comparison with the other municipalities in Amazonas, the municipality ranked 47 out of 62 with respect to deaths for live births, and 4 out of 62, for hospitalizations due to diarrhea. In the national comparison, the positions were 2478 of 5570 and 715 of 5570, respectively.

As can be seen in Figure 13, the municipality's IFDM for Health reached a score of 0.643 points for the year 2016[58], which is considered a regular development. In Figure 13, Apuí is in an intermediate position: below the national average (0.765) and above the state average (0.546). Despite presenting an IFDM for health considered regular, the municipality occupied the 4,605th position in the national ranking out of a total of 5,417, indicating that, in this aspect, it is among those with the worst performance. Analyzing the historical series from 2005 onwards, it can be seen that the current position is the result of a sharp drop that occurred between the years 2013 and 2015. In 2016, the year that coincided with the election for mayors and councilors, there was a recovery trial, when the municipality recovered the index close to what it had in 2013.

[56] 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: 20/09/2022.

[57] IBGE - Instituto Brasileiro de Geografia e Estatística. Internações por diarreia: Ministério da Saúde, DATASUS - Departamento de Informática do SUS, IBGE, Estimativas de população residente 2016. Available at: <https://cidades.ibge.gov.br/brasil/am/apui/panorama>. Accessed on: 30/09/2022

[58] 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: 30/09/2022

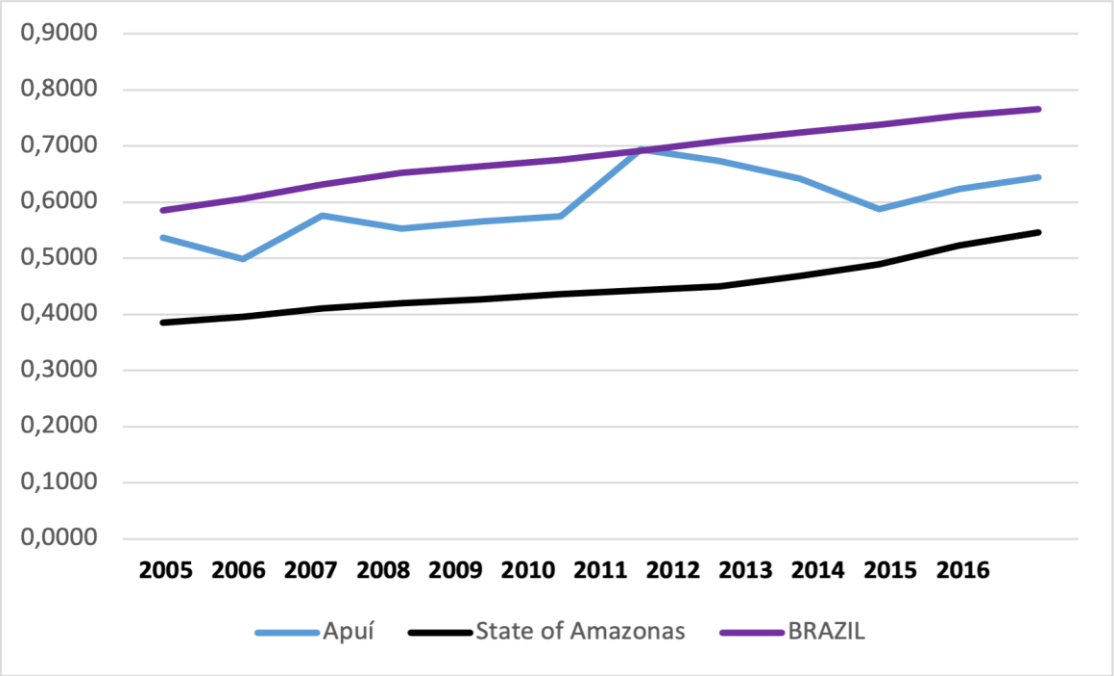


Figure 13. Historical line of the IFDM for health in the municipality of Apuí, Amazonas State, Brazil[59].

According the IPS (2021)[60], the indicator for infant mortality up to 5 years-old in 2019 was 25.10 deaths for every 1,000 live births. The Nutrition component of basic medical care of the IPS also pointed out that, in 2019, the maternal mortality rate was 9.10 deaths per 100,000 live births, while mortality due to malnutrition was 4.55 deaths per 100,000 live births and the malnutrition rate reached 4.87% of the population[61].

For the Health and Wellness component of the IPS (2021)[62], the death rate from diabetes mellitus in 2019 was 31.86 per 100,000 population. Cancer mortality in the same year was 40.96 deaths per 100,000 population. According to this component, the mortality from cancer in the same year was 40.96 deaths per

[59] 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: 30/09/2022.

[60] 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

[61] 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. Acessado em 20/09/2022

[62] 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. Acessado em: 20/09/2022.

100,000 inhabitants, circulatory diseases totaled 45.5 deaths per 100,000, and to a lesser extent, deaths from respiratory diseases and suicide accounted for 4.5 deaths per 100,000 each[63].

Thus, although the municipality's IFDM - Health was considered regular, Apuí has a precarious infrastructure to serve its citizens. The limitations in the local health care network are due both to the lack of qualified professionals to provide more sophisticated care, and to the lack of equipment, services that can only be found in the state capital. In terms of the basic network, extractivist residents living closest to the project area reported that the services provided by community health agents and health posts are very precarious or absent. This implies that the residents can only get basic care when they go to the municipality headquarters. An ASAGA extractivist member, who lives near Mata-matá, and with whom contact was made, was undergoing health treatment in Porto Velho, the capital of another nearby state (Rondônia). Some other extractivists take advantage of relatives in districts or other municipal headquarters to facilitate the search for medical treatment with family visits. The extractivists residing in the headquarters of Apuí have a UBS, but as the secondary data itself points out, the system in this municipality is below the average line for the state of Amazonas.

Education

In terms of education, in 2010, Apuí had a literacy rate of 93.4% for 6 to 14 years old [64]. According to the 2021 School Census, the municipality of Apuí had 2,295 enrollments in elementary school and 537 enrollments in high school[65]. Data from the National Institute of Educational Studies and Research Anísio Teixeira (Inep) showed that the 9 elementary schools had 105 teachers, while the 2 high schools had 28 teachers[66]. The residents of the Aripuanã River are served by the Piuntuba Municipal School, which offers

[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. Acessado em20/09/2022.

[64] 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.

[65] 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: 24/09/2022.

[66] INEP - Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira. Docentes 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: 24/09/2022.

INEP - Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira. Docentes no ensino médio. 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: 24/09/2022.

INEP - Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira. Número de estabelecimentos de 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: 24/09/2022.

only elementary school education. In this way, to complete their studies, young people need to move to locations far from where they live, either to other rural locations or even to the municipality's headquarters. This situation gets worse in the high school stage, where the only two schools in the municipality that offer this education are located in the municipality's headquarters and in the Vicinais district.

The municipality's IFDM for Education achieved a score of 0.700 points for the year 2016, which is considered moderate development[67]. With this score, Apuí occupies the 4,005th position in the national ranking, which, as pointed out for the health issue, places the municipality among the worst performers at the national level. Analyzing the historical line shown in Figure 14, from 2005 onwards, it is noted that, after the drop registered between 2005 and 2007, the municipality follows a trend of improvement in the indicator. The municipality is in an intermediate position: below the national level, but above the regional level.

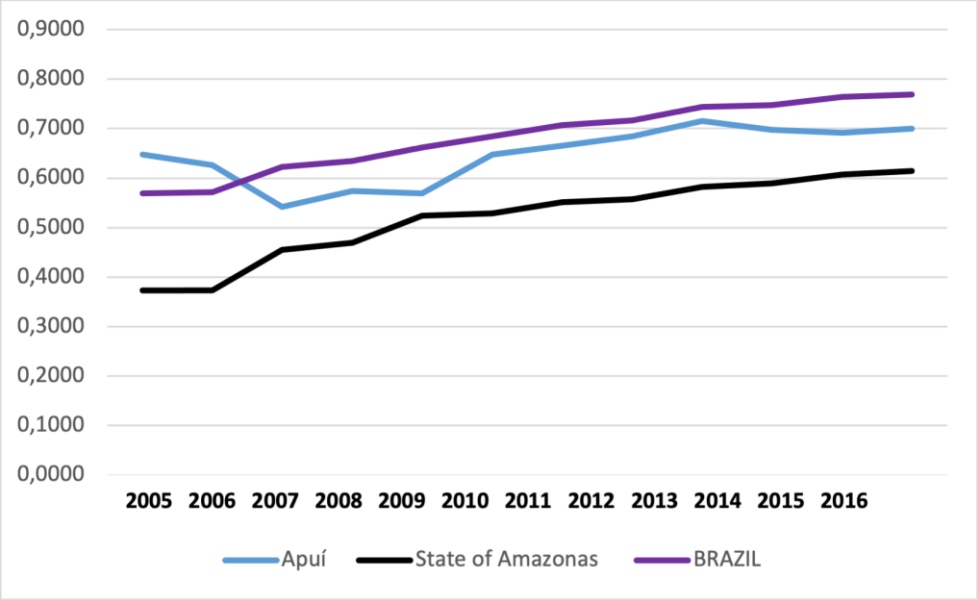


Figure 14. Historical trend of the IFDM for education in the municipality of Apuí, Amazonas State, Brazil[68].

INEP - Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira. Número de estabelecimentos de ensino médio. 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: 24/09/2022.

[67] 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: 24/09/2022

[68] 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: 24/09/2022

For the municipality of Apuí, the Access to basic knowledge component of the 2021 IPS was 62.42 points, below the national average, but higher when compared to the other Amazon municipalities[69]. According to the SPI, in 2019, School Dropout and School Failure in elementary school were 2.9% and 8.5% respectively, and the age-grade gap in elementary school was 23.7% and in high school 38.8%[70].

Thus, according to the information gathered here, the municipality deals with basic difficulties in the field of education, such as guaranteeing the continuity of studies for its residents, mainly in the rural area. The closest school to these communities is the one being built in Vila do Carmo (Mata-Matá Community) (see Figure 16), 22 km in a straight line from the furthest houses and almost 30 km along the river. The lack of access to this basic right can contribute, among other things, to the migration of people towards the municipality's headquarters or to other locations where they have relatives who can help. The evaluation of the human dimension, given by the extractivists, is emphasized in Figure 17.

Figure 15. Construction works for the school and health center in Vila do Carmo (Mata-matá), Municipality of Apuí-AM. Photo: Terra Vista, 2022.

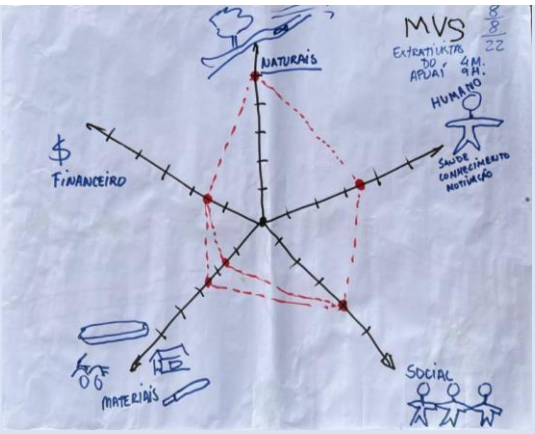


Figure 16. Scheme of the median score given to the community dimension, which included the perception of the extractivists from Apuí-AM. Photo: Terra Vista, 2022.

[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: 24/09/2022.

[70] 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: 24/09/2022.

Income and public management

In this regard, Apuí's IFDM for Employment and Income in 2016 was 0.386 points, being considered a low performance[71]. With this score the municipality ranked 4,089th in the national ranking, and, in line with the education and health aspects, it is among the municipalities with a poor performance. The historical series presented in Figure 17 shows a downward trend in the period from 2005 to 2016, with a large oscillation in 2006, 2013, and 2014.

According to the Central Register of Companies, consulted through the Cities portal of the IBGE, in 2020 the average monthly wage of formalized workers in Apuí was 1.9 minimum wages[72]. However, given the monthly income of up to half a minimum wage per person, Apuí had 47.5% of its population in this condition[73]. This indicates a situation of wide wage inequality and a labor market characterized by high informality. When comparing this situation with the average of the state of Amazonas and that of Brazil, Apuí also occupies the worst positions 54th of 62nd and 1,806th of 5,570th, respectively. According to data from the IPS Opportunities 2021, when considering the proportion of jobs with higher education in relation to totals, only 17.9% are held by people with higher education[74]. Women represent the majority of employees with higher education, totaling 10.03%[75]. Thus, the local economy besides being largely unequal and informal, the existing formal jobs do not require higher education, which, as shown by Rocha et al. (2017)[76] tend to pay lower wages.

[71] 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: 24/09/2022

[72] 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/apui/panorama> Accessed on: 30/08/2022.

[73] 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/apui/panorama. Accessed on: 30/08/2022.

[74] 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: 24/09/2022.

[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: 24/09/2022.

[76] ROCHA, R.; FILHO, N.; OLIVEIRA, A.; KOMATSU, B. The relationship between public and private higher education and income and employment in Brazilian municipalities. PPE Journal, v. 47, n. 3, 2017, p. 39-69.

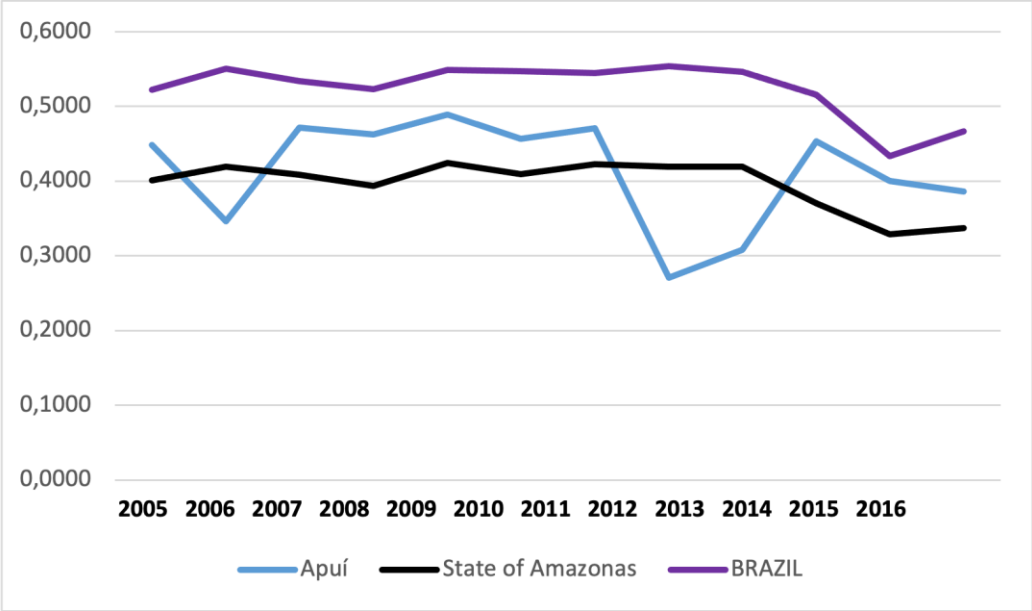


Figure 17. Historical trend of the IFDM for employment and income in the municipality of Apuí, Amazonas State, Brazil[77].

In terms of public administration, the municipality of Apuí in 2020 scored 0.744 in the Firjan Fiscal Management Index (IFGF), being classified as a "good management"[78]. In Figure 18, when considering the period from 2013 to 2020, Apuí followed an improving trend in fiscal management, remaining above the national and state average. According to the foundation, the liquidity and personnel expenses components were the main responsible for the good score, both were classified as "excellent" for the year 2021[79]. This performance means that there is a low commitment of the municipal budget with the payroll of municipal employees and that there has been no postponement of payments by the municipal power.

[77] 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: 24/09/2022.

[78] Firjan: Federação das Indústrias do Estado do Rio de Janeiro FIRJAN. 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: 24/09/2022

[79] Firjan: Federação das Indústrias do Estado do Rio de Janeiro FIRJAN. 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: 24/09/2022

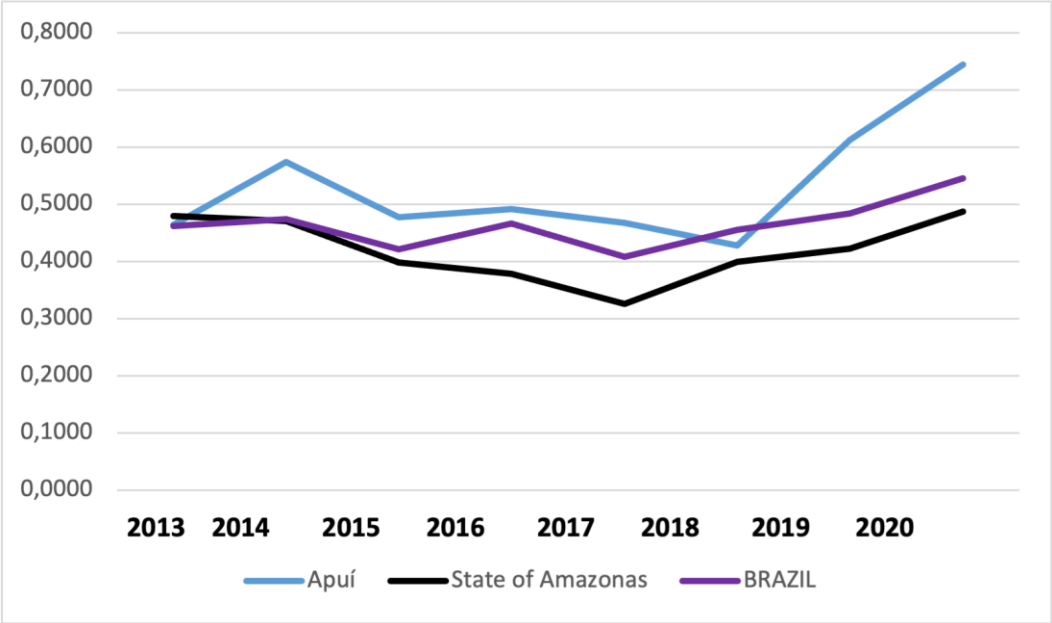


Figure 18. Historical trend of the General IFGF of the municipality of Apuí, Amazonas State, Brazil[80].

Despite the good overall rating, in the autonomy component of the IFGF, the municipality's situation is considered critical. As shown in Figure 19, despite an improving trend, in 2020 the municipality scored 0.213. This indicates that Apuí has a low capacity to generate local revenues to bear the costs of its administrative structure. According to IBGE in 2010, 93.3% of its revenues came from external sources, a trend that has perpetuated over the years[81].

[80] FIRJAN. IFGF 2021: Firjan Fiscal Management Index. Rio de Janeiro: Firjan, 2021.

[81] IBGE - Instituto Brasileiro de Geografia e Estatística. Percentual das receitas oriundas de fontes externas. Percentual das receitas oriundas de fontes externas: Secretaria do Tesouro Nacional (STN) - Balanço do Setor Público Nacional (BSPN) 2015.Rio de Janeiro: IBGE, 2022. Available at: https://cidades.ibge.gov.br/brasil/am/apui/panorama. Accessed on: 30/09/2022

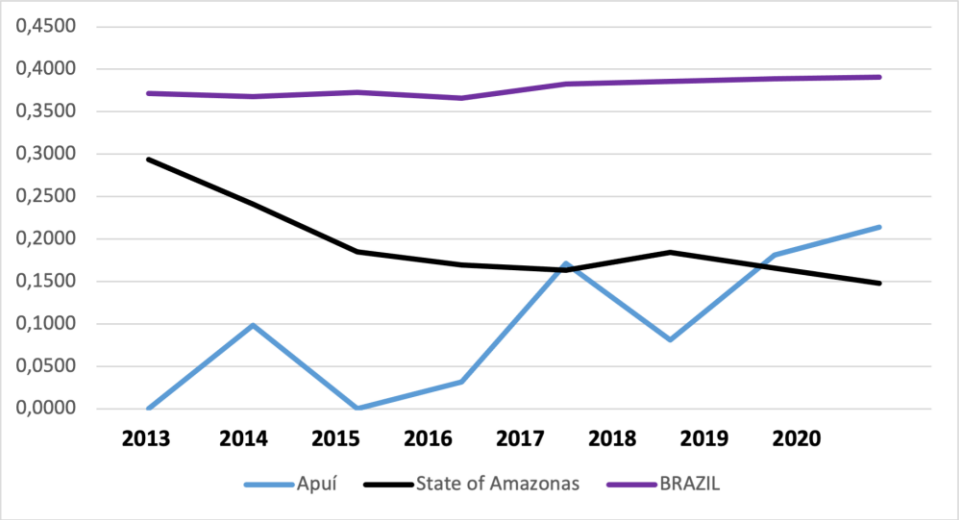


Figure 19. Historical trend of the IFGF Autonomy for the municipality of Apuí, Amazonas State, Brazil[82].

In terms of Municipal Gross Domestic Product, an IBGE survey in partnership with 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 public sector contribution totaled 64.2%, with 20.3% from public services and 43.9% from public administration[83]. Agriculture and cattle-raising contributed 26.7% of the Gross National Product (GNP) and industry 9%. This indicates that much of the local economy depends on jobs generated by the public service, while other productive sectors are stunted.

The income of extractivists is composed of several different sources, characterizing as pluriactivity. A part of those who are members of the Aripuanã-Guariba Agroextractive Association (ASAGA) (14 members) declare themselves extractive of copaíba oil, Brazil nuts, and açaí, in addition to fishing to make up their income, with agriculture only for consumption. They reach an average monthly income of R$1,550.00, consisting of financial allowance and 'defeso' for the fishermen. The 'defeso' allowance is a service that allows artisanal professional fishermen to request the INSS to pay the Artisanal Fishermen Unemployment Insurance benefit during the closed season, that is, when they are prevented from fishing due to the need to preserve the species. Another part of the associates (24 members) make up their income by working as guides or caretakers in sport fishing lodges in the region, reaching an average income of R$1,600.00 in the lodges (not including tips) and close to R$1,500.00 in the season months of extractivism from December to April. The extractivists who live in the city have more discrepant situations among themselves, those who do pluriactivity have an average monthly income close to R$1,200.00, made up of

[82] FIRJAN. IFGF 2021: Firjan Fiscal Management Index. Rio de Janeiro: Firjan, 2021.

[83] 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, 2019. Available at: <https://cidades.ibge.gov.br/brasil/am/apui/pesquisa/38/46996>. Accessed on: 30/09/2022

some by extractivism and fishing, agriculture and odd jobs. Two in the group of 14 interviewees declared an average monthly income of R$1,500.00, seeming to be more successful in extractivism.

Land use and cover

According to the Environmental Quality dimension of the SPI, 67.3% of the total area of the municipality of Apuí are protected areas (National parks, Indigenous Lands and others)[84]. In 2017, agricultural establishments in the municipality were a total of 1091 and occupied an area of 338,777 hectares, which corresponds to 6.25% of total area of Apuí[85]. According to the Agricultural Census, in 2017, about 87.2% of these areas occupied by agricultural activity were used for livestock and raising other animals, of which 41% were occupied by pastures[86]. In comparison with other cities in the state, Apuí is among the municipalities with the largest area occupied by farming activities and among those with the largest areas of pasture. As most of the city is composed of protected areas, it presents great potential for the development of sustainability projects. However, these forest areas are under deforestation and degradation pressure.

According to a 2020 survey conducted by MapBiomas[87] for annual area affected by fire and land use burned, Apuí was one of the three Amazonas municipalities with the largest burned area per year. According to the data, the municipality of Lábrea had the largest burned area in 2020, followed by Apuí and Manicoré.

According to MapBiomas, in 2020 Apuí had an area of 106,478 hectares burned by anthropogenic fire. Analyzing the data from other years, it can be seen that in 2020, the burned area doubled compared to the year 2018[88]. Analyzing the historical series of burned areas between the years 1985 and 2020, Apuí shows an upward evolution with more intense peaks. Between the years 2018 and 2020, there is an increase in the growth of the burned area above the historical average. Figure 20 shows the historical line of burned area per year in the municipality of Apuí.

[84] 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: 24/09/2022.

[85] 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: 24/09/2022

[86] 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: 24/09/2022

[87] MapBiomas Project - Mapping Fire Scars in Brazil - Collection 1. Accessed on: 20/09/2022. Available at: https://mapbiomas.org/estatisticas.

[88] Projeto MapBiomas – Mapeamento de cicatrizes de fogo no Brasil – Coleção 1. Acessed on: 20/09/2022. Available at: https://mapbiomas.org/estatisticas. Acessado em: 20/09/2022

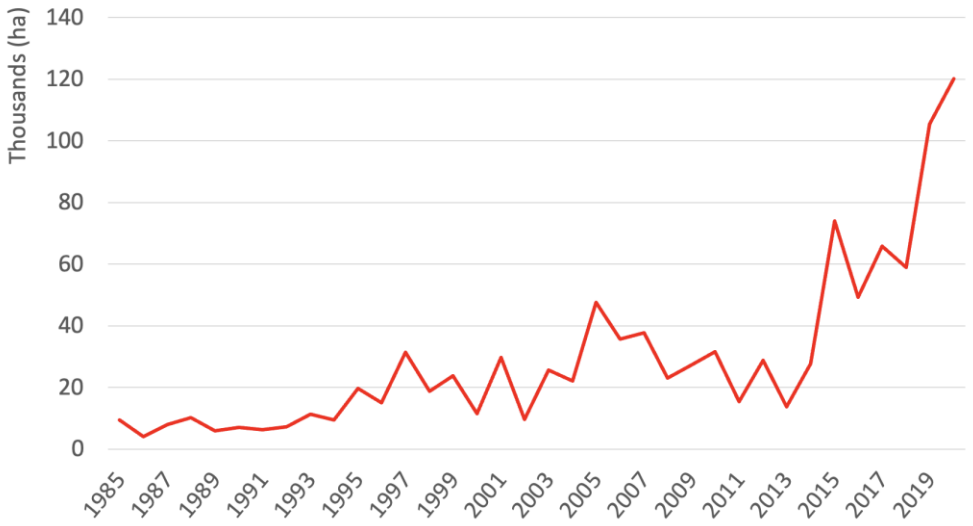


Figure 20. Historical trend of burned area (hectares) per year in the municipality of Apuí, Amazonas State, Brazil [89].

When flying over the project area, it was possible to visually verify in its western and northwestern surroundings an estimated 50 thousand hectares with signs of burning or open fire (Figure 21 and Figure 22**)**.

Figure 21. Overflying the project area with pressure from deforestation and slash and burn on its western and northwestern flanks - Apuí-AM. Photo: Terra Vista Gestora de Recursos Ltd., 2022.

Figure 22. Flight over the two banks of the Aripuanã river in areas of traditional extractivism areas, highlighting the smoke caused by the fires. Southern flank of the Sumaúma project. Photo: Terra Vista Gestora de Recursos Ltd., 2022.

[89] MapBiomas Project - Mapping Fire Scars in Brazil - Collection 1. Accessed on: 20/09/2022. Available at: https://mapbiomas.org/estatisticas.

According to the Quality of the Environment dimension of the IPS, although Apuí has the protection and legal preservation of 67.3% of the total area of the municipality through Protected Areas[90], the municipality has high rates of burning and emission of Greenhouse Gases (GHG). As already mentioned, the municipality is located on the Amazonian agricultural frontier, a huge strip that extends between the borders of the states of Acre, Rondônia, Amazonas, Pará and Mato Grosso, whose intense predatory agricultural activity on the forest has formed an Arc of Deforestation. The intense transformation of the soil resulting from the deforestation of the Amazon biome by economic activities focused on agribusiness, especially livestock, results in high levels of GHG emissions. 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%[91]. 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 Apuí, 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 97% of total GHG emissions[92]. In the ranking of GHG emissions of Brazilian municipalities, Apuí occupied the 10th place and in comparison with other Brazilian municipalities, with the volume of GHG emissions higher than those found in capitals or municipalities that are mostly urban and with a large population. The gross value of the total emitted by the municipality was 12,495,893 tons of CO_2 and (GWP-AR5)[93].

Data from IPS on the Quality of Environment dimension corroborates the above data. As can be seen in Figure 24, the municipality had 66.54 points in the year 2021[94]. This rate in Apuí is lower in comparison with the neighboring municipalities and is below the state average. The total cumulative deforestation rate in 2020, on the other hand, corresponded to 5.8% of the county area, and recent deforestation in 2019 and 2020 was 22.4% of the total cumulative deforestation[95]. In 2020, total hotspots were 135.47 per 1000

[90] 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.

[91] 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

[92] 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-apui/card?year=2019&cities=true>. Accessed on: 13/10/2022.

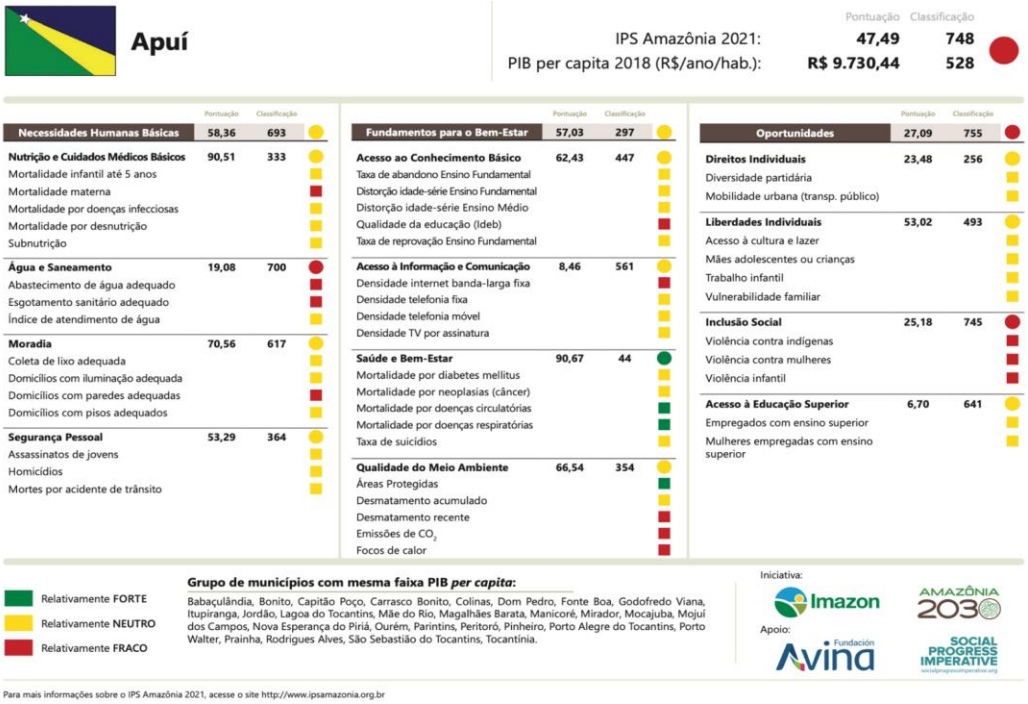
[93] Plataforma SEEG - Sistema de Estimativa de Emissões de Gases de Efeito Estufa. Perfil das Emissões nos municípios. Available at: https://plataforma.seeg.eco.br/cities/statistics. Accessed on: 13/10/2022

[94] 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.

[95] MOSANER, M.; SANTOS, D.; SEIFER, P. Índice de Progresso Social na Amazônia Brasileira - IPS Amazônia 2021. Banco de dados exportados. Available at:

inhabitants and CO_2 emissions were 432.61 tons per inhabitant[96]. Both the rates of heat fires and CO_2 emissions are above the regional and state average. In addition to the fires that compromise ecosystems on which local populations depend for subsistence and income generation, the IBGE registered 619 people who were exposed to the risk area by floods, mudslides and mudslides[97].

In a general overview, the municipality of Apuí presents a weak GST. As shown in Figure 23, the Opportunities dimension shows the worst performance, scoring only 27.02[98]. In this dimension, the social inclusion component is the most critical, indicating high rates of violence against children, indigenous people, and women. As already mentioned, within the Foundations for Well-Being dimension, the Quality of the Environment component presents the worst performance, especially in relation to recent deforestation, CO_2 emissions, and hotspots. In the Basic Human Needs dimension, the water and sanitation components present a critical situation.



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.

[96] 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.

[97] Population exposed to risk: Population in Risk Areas in Brazil - 2010. IBGE, 2018. 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 Accessed on: 30/08/022

[98] MOSANER, M.; SANTOS, D.; SEIFER, P. Índice de Progresso Social na Amazônia Brasileira - IPS Amazônia 2021. Scorecards do estado do Amazonas. Belém: Imazon, 2021. Accessed on: 13/10/2022

Figure 23. Scorecard of the municipality of Apuí according to the dimensions of the IPS Amazon[99].

Put into perspective, Apuí has shown a worsening trend in its social progress indicators. As can be seen from Figure 24, it is below the average for the state of Amazonas and for Brazil. As shown above, issues concerning the environment, discrimination against vulnerable populations, and sanitation are their reasons. In this scope, carbon projects have the potential to help curb the momentum of deforestation and wildfires in the region and, simultaneously, stimulate more sustainable production chains. Actions of this kind in conjunction with more vulnerable social groups, such as the families of extractivists, can contribute to an improvement in the Quality of the Environment component.

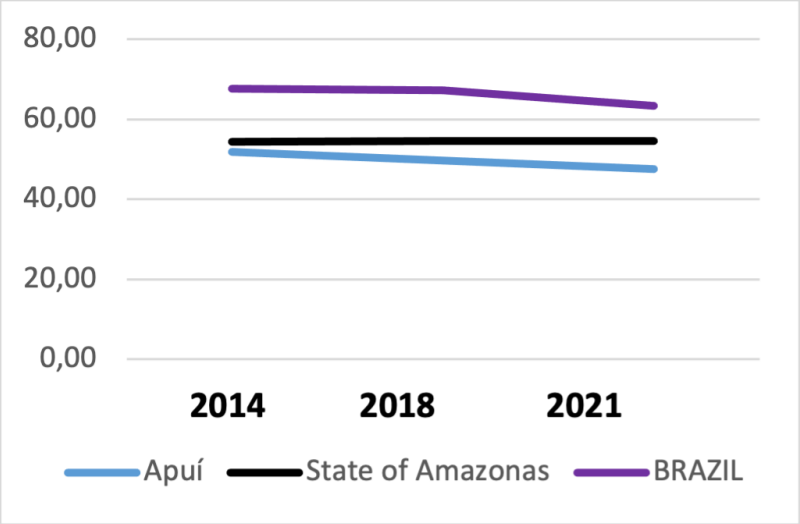


Figure 24. Historical trend of the Social Progress Index in the municipality of Apuí, Amazonas State, Brazil[100].

Cultural and Archaeological Heritage

Within the scope of Cultural Heritage, the municipality of Apuí presents some cultural manifestations and practices of the intangible sphere recognized and registered by the Institute for National Artistic Heritage (IPHAN). As it is located in the North Region, Apuí is in the cultural region stipulated by IPHAN for the occurrence of the craft of Tacacazeira in the North Region. Nationwide, the Knowledge and Practices of the Traditional Midwives of Brazil are also recognized by IPHAN as a cultural heritage and present

[99] MOSANER, M.; SANTOS, D.; SEIFER, P. Índice de Progresso Social na Amazônia Brasileira - IPS Amazônia 2021. Scorecards do estado do Amazonas. Belém: Imazon, 2021. Accessed on: 13/10/2022

[100] MOSANER, M.; SANTOS, D.; SEIFER, P. Index of Social Progress in the Brazilian Amazon - IPS Amazônia 2021. Executive Summary. Belém: Imazon, 2021a.

throughout the interior of Brazil. Both the Ofício of Tacacazeiras in the North Region and the Knowledge and Practices of Traditional Midwives in Brazil are in the process of registration by the federal agency[101].

The Roda de Capoeira and the Ofício of Capoeira Masters are intangible assets registered by IPHAN and are distributed throughout the national territory and are present in the municipality of Apuí. The Roda de Capoeira and the Ofício of Capoeira Masters are registered in the IPHAN's Record Book of Forms of Expression and in the IPHAN's Record Book of Knowledge, respectively. It is also important to highlight that Roda de Capoeira is on the Representative list of Intangible Cultural Heritage in Brazil recognized by UNESCO[102].

The Ofício of the Baianas de Acarajé, registered in the IPHAN's Record Book of Knowledge, is also an intangible cultural asset that is distributed throughout the state of Amazonas. Due to the migration of northeasterners to the northern region, this knowledge and practices, which was almost exclusively women's domain, has spread to all the states of the northern region (Iphan)[103].

At the state level, the Apuí Rodeo Festival was also declared Cultural Heritage of Intangible Nature of the State of Amazonas by the Amazonian government[104].

According to the records of the National Center of Archaeology (CNSA) and Iphan consulted through the SICG[105] and CNIGP, no archaeological sites were located in the territory belonging to the municipality of Apuí, as shown in Figure 25.

[101] IPHAN – Instituto do Patrimônio Histórico Artístico Nacional. Patrimônio cultural imaterial em processo de registro. Available at: <http://portal.iphan.gov.br/>. Accessed on: 25/09/2022.

[102] IPHAN – Instituto do Patrimônio Histórico Artístico Nacional. Patrimônio cultural imaterial em processo de registro. Available at: <http://portal.iphan.gov.br/>. Accessed on: 25/09/2022.

[103] IPHAN – Instituto do Patrimônio Histórico Artístico Nacional. Patrimônio cultural imaterial em processo de registro. Available at: <http://portal.iphan.gov.br/>. Accessed on: 25/09/2022.

[104] Imprensa Oficial, Governo do Estado do Amazonas. Leis Ordinárias, 2019, Novembro. Available at: https://legisla.imprensaoficial.am.gov.br/diario_am/12/2019/11/164. Acesso: 30/08/2022

[105] Archaeological Sites. Available at: https://sicg.iphan.gov.br/sicg/pesquisarBem. Accessed on: 30/08/022.

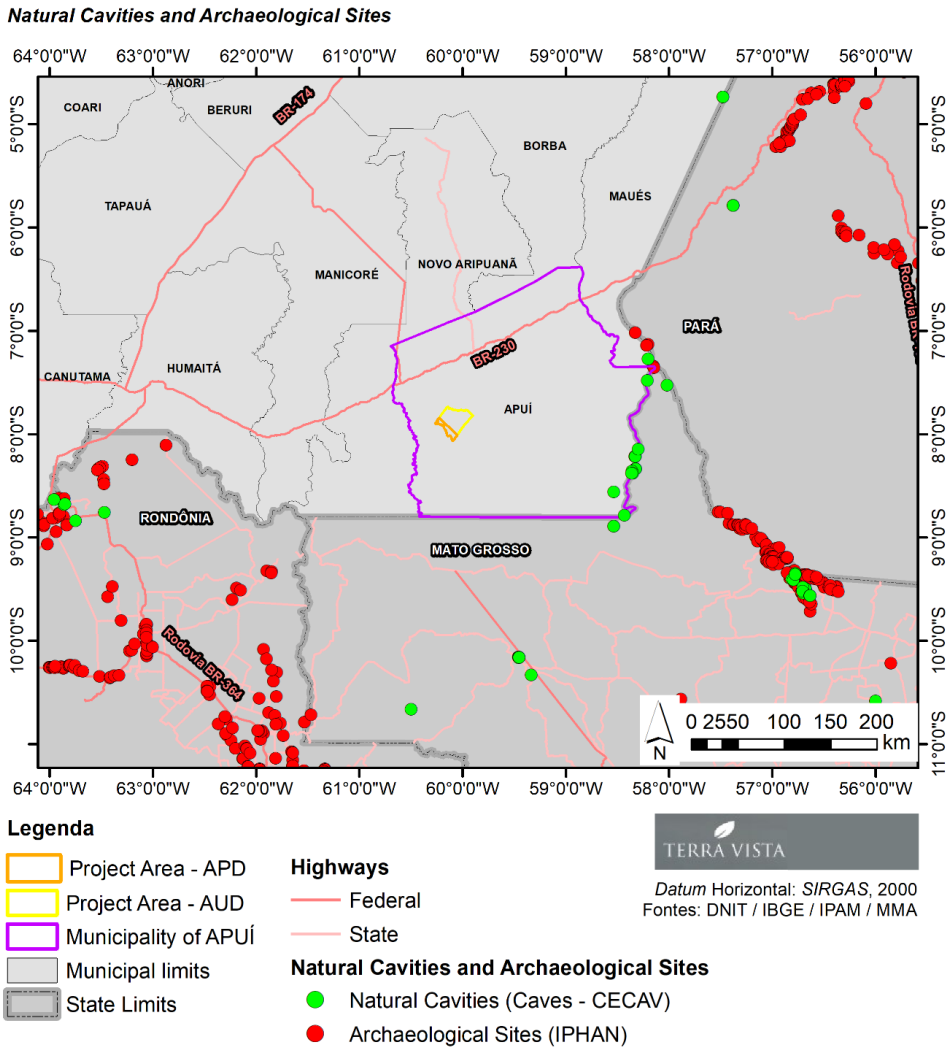


Figure 25. Archeological sites and natural cavities in the region where the Samaúma project is located.

However, when accessing such information, it was found that there are several archaeological sites in the gutters of the Madeira and Tapajós rivers. Although there are no archaeological sites registered in the municipality, as it is located between two large indigenous cultural mosaic areas in the Amazon, and close to the Madeira, Aripuanã and Tapajós Rivers, the region presents a great archaeological potential. The lack of identified archaeological sites is conditioned, above all, by the lack of research and studies. Thus, it is assumed that the probability of the existence of archaeological sites in Apuí is high.

Despite the non-verification of the existence of archaeological sites on the platform of the SICG (Integrated System of Knowledge and Management), an article published by the Revista Verde de Agroecologia e Desenvolvimento Sustentável points out the existence of areas of Terras Pretas

Arqueológicas in Apuí[106]. The TPA's are also known as Terras Pretas de Índio (TPI) and are soil units with anthropic A horizons, high natural fertility, dark coloration and presence of ceramic fragments in the soil matrix. As indicators of association with anthropic origin, studies and research on TPA's use evidence of overlapping with old settlements, presence of cultural artifacts, dark coloring from decomposed organic material, partly in the form of charcoal, resulting from the residue of domestic bonfires and fires for agricultural land use. According to the study by Revista Verde, in Apuí, six areas with TPA's were identified on the banks of the Juma River and its tributaries[107].

It is still possible to draw a parallel and correlate the preservation of forests with the preservation and protection of archaeological sites. In this relationship, the forest, once preserved, protects the soil and consequently the remains and archaeological sites. In this way, in addition to maintaining and protecting its biodiversity, climate and traditional communities, it also acts to preserve archaeological remains and sites.

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

The Samaúma Grouped Project Zone encompasses the geographic limit of the Amazon biome, the project area (initial instance) which is located in the municipality of Apuí - AM, at Sumaúma Farm - new instances may be included - and a supplementary area where activities will be carried out project additions (Figure 26). Thus, the Project Zone includes the communities of Vila Batista, Projo, Aruanã, Japiim and Bela Vista do Guariba, identified in sections 2.1.8 and 2.1.9, whose population will benefit from the project activities. In addition, areas of High Conservation Value (HCV) are also found in the project area.

No negative impacts on biodiversity or negative climate impacts resulting from the implementation of project activities are expected. There are also no direct impacts to other stakeholders from project activities.

[106] Revista Verde de Agroecologia e Desenvolvimento Sustentável Grupo Verde de Agricultura Alternativa (GVAA) ISSN 1981-8203 Artigo Científico Revista Verde (Mossoró – RN – Brasil) v.6, n.4, p. 167-174 outubro/dezembro de 201. Site: http://revista.gvaa.com.br. Available at: https://dialnet.unirioja.es/servlet/articulo?codigo=7440137.Acesso Accessed on: 13/10/2022.

[107] Revista Verde de Agroecologia e Desenvolvimento Sustentável Grupo Verde de Agricultura Alternativa (GVAA) ISSN 1981-8203 Artigo Científico Revista Verde (Mossoró – RN – Brasil) v.6, n.4, p. 167-174 outubro/dezembro de 201. Site: http://revista.gvaa.com.br. Available at: https://dialnet.unirioja.es/servlet/articulo?codigo=7440137.Acesso Accessed on: 13/10/2022.

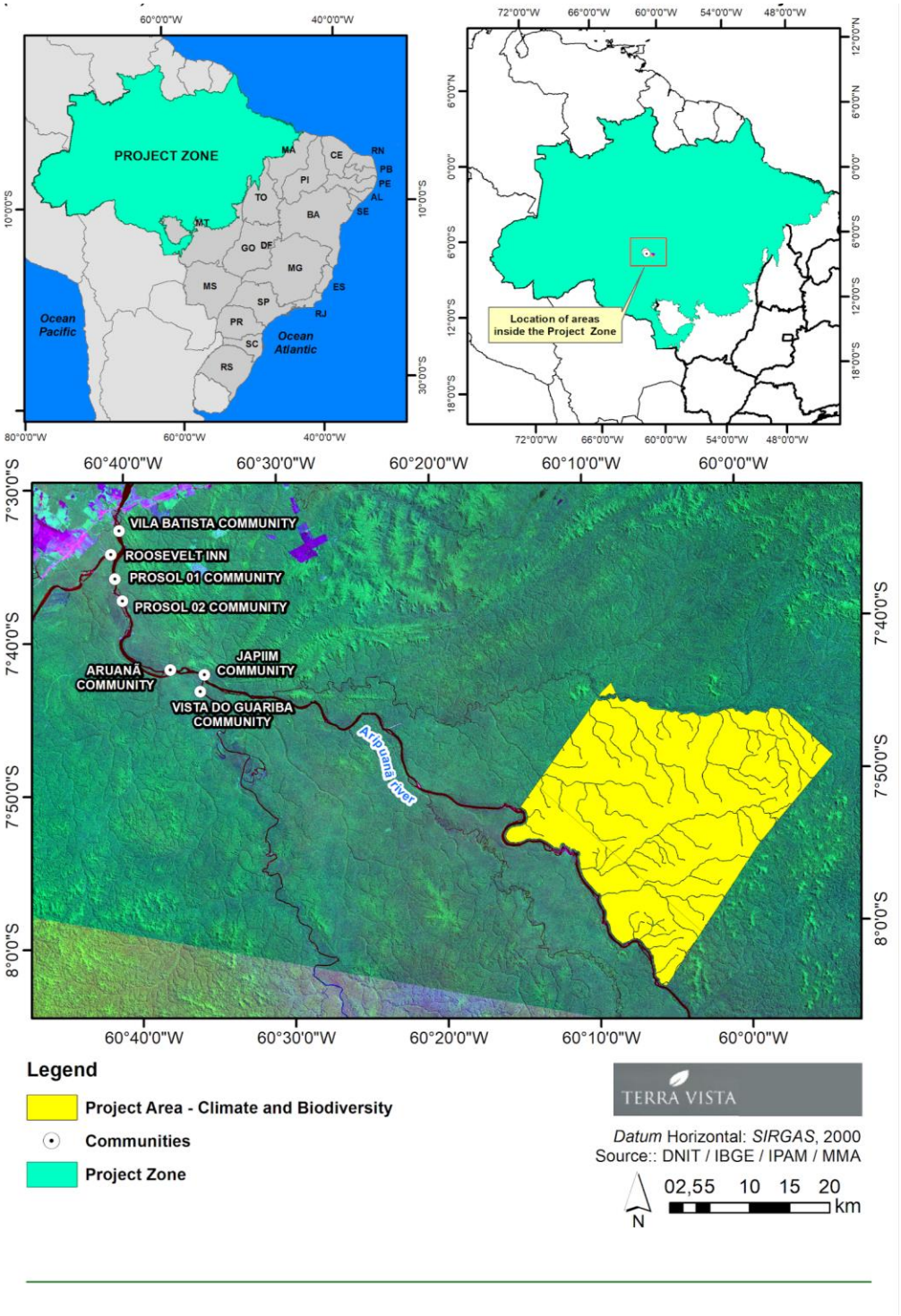


Figure 26. Samaúma project Zone, in the Municipality of Apuí, Amazonas State, Brazil.

2.1.8 Stakeholder Identification (G1.5)

According to the Social and Biodiversity Impact Assessment (SBIA), the identification of stakeholders is part of the first stage for the development of carbon projects[108]. It is developed from remote stages, such as reading bibliographic references about the municipality and region, consulting the owner of the area, contacting local interlocutors, and face-to-face stages, with the application of rapid-participative diagnostic methods, questionnaires on sustainable lifestyles, and semi-structured interviews. Although the identification is oriented to the territory of the project area, it is not limited to it, as its ultimate goal is to map stakeholders that maintain a connection with the territory. In this way, we seek to detect organizations or actors that, even not living on the property or close to the project area, can make use of it or help in the creation of a network aimed at favoring conservation actions and strengthening sustainable economic chains.

In the first step of the stakeholder identification process, a secondary data survey was carried out. To do so, search engines were consulted, combining the keywords name of the municipality with the categories of organizations in interest, as in the following example, "Apuí", "NGO" or "company", "association". This survey was complemented by consulting more specific websites aimed at registering companies[109], official websites of public authorities[110], of transparency agencies[111], and NGOs[112]. 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 related to the handling of timber and non-timber forest products. As a result, a list of 72 institutions, organizations, and/or local agents from various active sectors in the municipality of Apuí - AM was generated. This list provides an overview of the organizations present in the municipality and serves as a basis to guide the fieldwork of the technical team.

At the same time, satellite images were used to identify possible buildings and, thus, residents within the property and in the surrounding area so that they can be integrated in the stakeholder identification stages. In accordance with the AFOLU Non-Permanence Risk Tool v4.0[113], this scan covered a 20 km area of the project development area. As pointed out in Figure 27 and Figure 28, only one occupation with buildings was identified and characterized as Pousada Piraçu, which receives guests by air transport, as it

[108] RICHARDS, M., 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. 89 pgs.

[109] Companies in Brazil. Available at: <https://empresasdobrasil.com>. Accessed on: 01/09/22.

[110] City Hall of Apuí - AM. Available at: < http://apui.am.gov.br>. Accessed on: 01/09/22.

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

[111] 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.

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

[113] Available at: <https://verra.org/wp-content/uploads/2019/09/AFOLU_Non-Permanence_Risk-Tool_v4.0.pdf>. Accessed on: 09/23/22.

has a landing strip for small aircraft. In this grouping of facilities there are rooms for the local manager of the guesthouse, born in the region, and accommodation for guides who are also native and descendants of traditional extractivists.

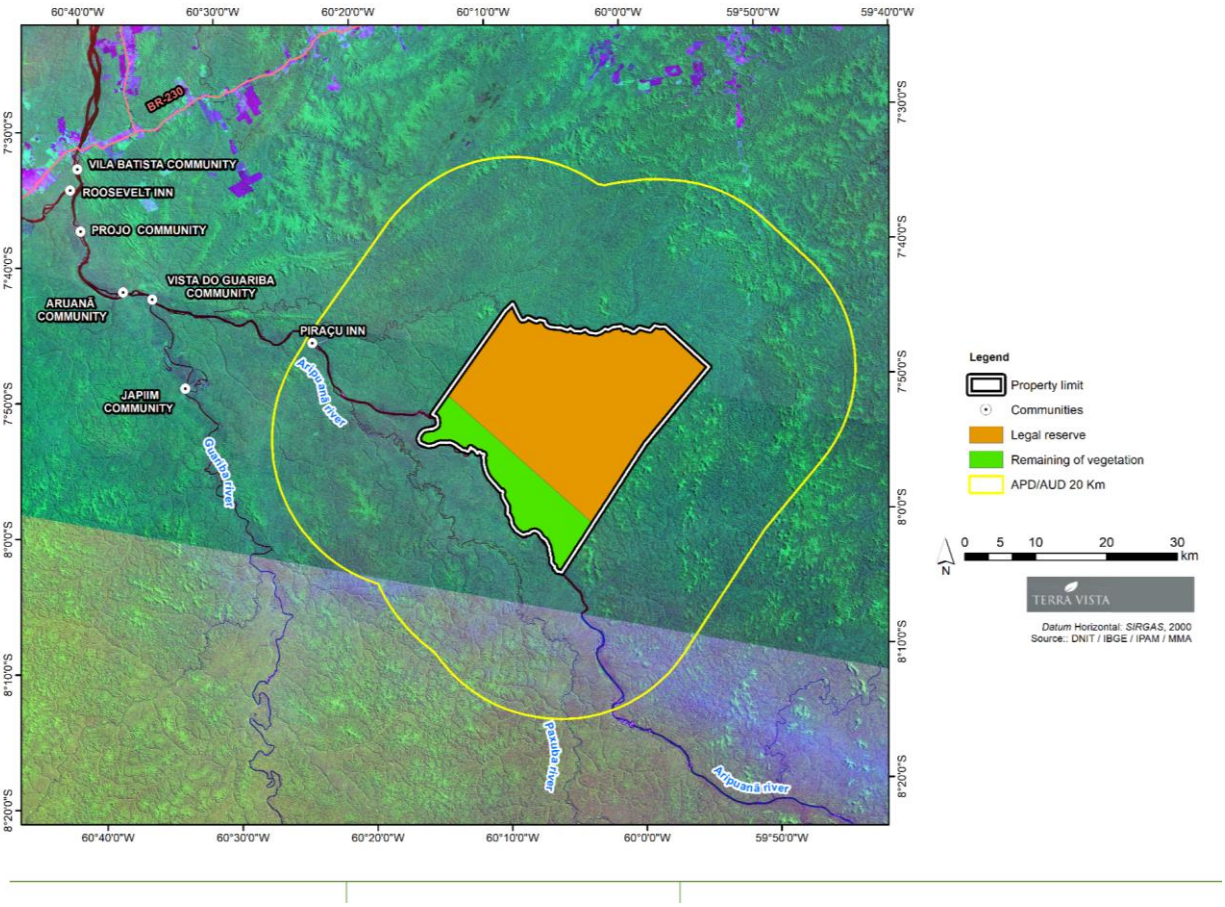


Figure 27. Limits of the property, the project, and occupations within a 20 km radius buffer.

Figure 28. Occupations found by satellite within a 20 km radius buffer of the project area.

The information produced in the first stage of stakeholder survey subsidized the field work conducted by the social technical team of Terra Vista Gestora de Recursos Ltd., which took place between the 6th and 11th of September 2022. The objective of this work was to identify the communities and present the Samaúma project.

Five communities that use the Samaúma project area to extract copaiba oil and collect nuts were identified: Vila Batista (12 people), Projo (ten people), Aruanã (21 people), Bela Vista do Guariba (12 people) and Japiim (5 people).

There was a group of 17 extractivists residing in the seat of the municipality of Apuí who expressed interest in using the project area to collect nuts and extract copaiba oil.

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

Based on the current data, the stakeholders were grouped into the following groups: project proponent, public authorities, communities, and the third sector. The description of the stakeholders

according to their right, interest and relevance in participating in the project is summarized in Table 10 below.

Table 10. Description of Stakeholders of the Samaúma project.

Group of Stakeholders Involved in the Project	Rights Regarding the Project	Interests in Participation in the Project	Relevance in Participation
Landowner and Project Proponent - Ituxi Administração e Participação Ltd.	Owns the farm where the Samaúma project will be developed, is co-owner of the carbon credits and responsible for meeting the legal conditions for the development and permanence of the project.	Ensure support to the technical team to develop the studies for generating carbon credits in the project area, ensure access to community members that 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 – The engagement of this project proponent is an essential condition for the development of actions related to the CCB certification.
Public Authorities - Apuí Municipality; Apuí Municipal Environment Department; Secretary of State for the Environment – Amazonas State (SEMA); Agricultural and Forestry Defense Agency of the Amazonas State (ADAF); Department of Climate Change and Management of Conservation Units (DEMUC); Amazon Sustainable Development Agency (ADS)	Partners for the implementation or improvement of public policies with local stakeholders.	Strengthen the relationship between the communities benefited by the Project's activities and the public power, making them aware of their benefits, especially in the scope of the communities, climate, and biodiversity.	High - Organizations are responsible for developing and enforcing social and environmental policies, as well as monitoring them.

Communities - Group 01 - Riverside (Riparian): Vila Batista (12 people); Projo (ten people); Aruanã (21 people); Bela Vista do Guariba (12 people); Japiim (5 people). Group 02 - Extractivists: Residents of Apuí (15 people).	Beneficiaries of projects related to the CCB certification and users of the property authorized by the owner. Legitimate and legal utilities and occupants of the project area.	Continue to access and use areas in which they can extract non-timber products and access projects for improving the production chain, associativism, and improving 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 - Union of Rural Workers, Farmers and Family Farmers of Apuí; Rural Union of the South of Amazonas Sindisul; Associations/Cooperatives - Apuí Pro-Forest Management and Sustainable Development Association (APROFAP); Apuí Family Forestry Extractive Cooperative (CEFFAP); Women's Cooperative (COOPERAR); Apuí School Workshop Association; Association of Agroecological Producers of Apuí (ASPOAGRO); Aripuanã/Guariba Agroextractive Association; Impact Accelerator - Impact Business Accelerator in the Amazon (AMAZ); Institute for Conservation and Sustainable Development of Amazonas (IDESAM); Muraki Institutional Support Foundation	Stakeholders Partners in the defense of social rights and facilitation of integration into higher value production chains.	Raise awareness of the project's beneficiary stakeholders about their rights, strengthen associative relationships, provide access to the productive chain of non-timber forest products of greater value.	Medium - They are not executors of public policies, but can help improve production chains, offer training to add value to products, and strengthen the associations of communities benefited by the project. Eventually, they can act as a representative instance of community members.

2.1.10 Sectoral Scope and Project Type

- Scope of Sector: AFOLU (Scope 14): Agriculture, Forestry, and Other Land Uses;
- Project Category: REDD (Reducing Emissions from Deforestation and Forest Degradation);
- Project Activity: APD (Planned Avoided Deforestation) and AUD (Unplanned Avoided Deforestation);

The Samaúma project is a nested project.

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

The main objective of the Samaúma project is to promote actions aimed at reducing greenhouse gasses (GHG) emissions from planned and unplanned 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, as well as activities with the community to intensify their engagement and promote a closer relationship between communities and forest resources, aimed at their sustainable use.

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 Samaúma project (see Appendix 2) is presented below:

Maintenance of forest cover:

Maintenance of 71,508.24 ha of forest coverage and reduction of 23,452,633.10 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, Samaúma 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 getting to know 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 life for the communities.

With regard to community infrastructure, the project will facilitate technology transfer through: a) Acquisition and implementation of a community photovoltaic system; b) Implementation of a water collection and distribution system; c) Acquisition of transport for health care and emergencies; d) Logistical alternatives to ensure community access to public services (health and education) and disposal of non-timber forest products; e) Acquisition of equipment to strengthen subsistence agriculture and production of puba flour; f) Acquisition of equipment for processing products extracted from the forest

The communities involved will also benefit from training and courses aimed at: a) Strengthening the productive chain of Brazil nuts and copaiba oil, 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 Copaíba and Chestnut. As a result, the project activity will have a positive impact by strengthening the autonomy of families, 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 Samaúma project is to promote sustainable development in the region, with the joint actions of all stakeholders being the drivers of net benefits for the climate, local communities 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 production practices, sustainable extraction of non-timber forest products, education on hunting, fishing, and preservation of endangered species. For 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, low-impact extractivism and forest management; according to the demand and profile of local communities. In this sense, the project works to disseminate knowledge, instructions, and experiences focused on the efficient use of natural resources and environmental preservation; focusing on sustainable business chains through greater integration between 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 actions 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. Heritage surveillance within the Fazenda Samaúma, 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 23,452,633.10 tCO_2e of GHG emissions in 30 years, contributing 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 The Fazenda Samaúma is located near protected areas that are part of the Southern Amazon Mosaic and Apuí Mosaic. This region is considered extremely relevant for biodiversity conservation, creating ecological corridors in a region that is under great deforestation pressure, which gives the project high impact on biodiversity. Thus, the project focuses efforts on long-term monitoring of ecological indicators associated with practices arising from conservation activities on populations and ecosystems both inside and outside the property's boundaries. 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, which eventually circulate around 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.

2.1.13 Implementation Schedule (G1.9)

The summary schedule of activities related to the development and implementation of the Samaúma project are presented in Table 11 below.

Table 11. Detailed implementation schedule of the main activities related to the Samaúma project.

Date	Milestone(s) in the project's development and implementation
December 2020	Start date.
August 2022	Consolidation of the project's design and action plan.
September 2022	First field visit to the project area in the municipality of Apuí - Amazonas, with identification of residents and validation of socio-environmental characterization (forest cover, biodiversity and communities) and presentation of information on the Samaúma project.
October 2022	Submission of the draft Samaúma project Description (PD) in the VERRA registry system.

	Free, prior and informed consent by the owner of Fazenda Samaúma.
	Meeting with stakeholders, mapping priority demands to communities and presentation of project scope and activities.
November 2022	Feedback of the social baseline diagnosis to the communities.
	Selection and contracting of the Validation/Verification body and Credit Registry platform.
	Public consultation.
December 2022	Forest biomass inventory in the project area.
	Fauna survey.
	Floristic and phytosociological survey.
	Selection and contracting of the verification body.
February 2023 to June 2023	Validation and Verification: Production of monitoring reports for validation and verification, site visit, Credit registry.
January 2023 to December 2050	Development of socio-environmental and governance programs, annual validations, monitoring of forest cover, biodiversity and project emissions.

2.1.14 Project Start Date

The start date of the Samaúma project was set at December 20, 2020, as it represents the moment of formalization of the partnership proposal between Terra Vista Gestora de Recursos Ltd. and the landowner for the development of the project.

2.1.15 Benefits Assessment and Crediting Period (G1.9)

The crediting period of the Samaúma project will be from December 20, 2020 (start date) to December 20, 2050, contemplating a 30-year period.

Benefits to climate, communities and biodiversity will be continuously monitored and submitted to the CCB for verification throughout the project lifetime.

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

The project's crediting period is marked by the formalization of the partnership proposal between Terra Vista Gestora de Recursos Ltd. and the landowner for project development, as mentioned in section 2.1.14. After the formalization of the partnership, the project begins and, consequently, the first major investments for the development of baseline technical studies and socioeconomic and environmental diagnoses.

The development of activities related to the scope of climate, community, and biodiversity, 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 begins soon after the start of the project's crediting period.

2.1.17 Estimated GHG Emission Reductions or Removals

Annual estimates of GHG emission reductions or removals over the duration of the Samaúma project are presented in Table 12 below.

Table 12. Estimated reductions or removals of GHG emissions for the Samaúma project.

Year	AUD estimated GHG emissions (tCO_2e)	APD estimated GHG emissions (tCO_2e)
2021	12,580.5	393,990.4
2022	38,358.8	410,066.4
2023	64,280.0	410,066.4
2024	90,073.4	410,066.4
2025	115,678.7	410,066.4
2026	141,232.3	410,066.4
2027	167,520.0	410,066.4
2028	193,324.0	410,066.4
2029	218,336.8	412,312.1
2030	243,338.1	561,444.1
2031	269,696.7	568,766.7
2032	296,053.7	568,766.7
2033	322,587.8	568,766.7
2034	349,273.5	568,766.7
2035	376,122.0	568,766.7
2036	403,146.8	568,766.7
2037	430,363.8	568,766.7
2038	457,792.5	568,766.7
2039	485,457.2	568,766.7

2040	513,387.8	568,766.7
2041	541,622.6	568,766.7
2042	570,210.9	182,932.6
2043	599,218.9	-
2044	628,736.8	-
2045	658,893.8	-
2046	689,883.9	-
2047	722,019.2	-
2048	755,851.9	-
2049	792,513.7	-
2050	834,984.4	-
2051	792,515.4	-
Estimated Total Emission Reductions (ERs)	12,775,055.9	10,677,577.2
Total crediting period (years)	30	21
Annual average (ERs)	425,835.2	508,456.06

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2.1.18 Risks to the Project (G1.10)

An analysis of possible internal, external and natural risks of non-permanence of the Samaúma project was carried out, based on the guidelines established by the “AFOLU Non-Permanence Risk Tool, version 4.0” (Table 13). Detailed information can be found in Appendix 3.

Table 13. Summary of the Risk Analysis of Non-Permanence of the Samaúma project.

Category	Score
Internal Risk	10
External Risk	0
Natural Risk	0
Overall score	**10**

Other potential risks to the expected climate, community and biodiversity benefits as well as mitigation measures were also identified (see Table 14).

Table 14. Potential risks to the benefits of climate, community and biodiversity and their mitigation measures.

Identify 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 increase the climatic, social and biodiversity benefits in the scenario with the project, a set of actions organized in basic socio-environmental programs will be carried out. Terra Vista Gestora de Recursos Ltd. and its investors have the necessary financial resources to maintain 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

Project activities focused on climate benefits aim to reduce deforestation and, consequently, GHG emissions. To this end, systematic monitoring will be implemented in the project area, including river and land patrolling, as well as satellite image surveillance with updated images of the project area. As an exceptional benefit, the maintenance of forest cover protects the hydrographic network of the project area and contributes to water regulation in the hydrographic basin 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, making it possible to improve the quality of life in the community. To this end, structuring

actions will be implemented to provide water security, basic sanitation, electricity and internet access. Ongoing communication and consultation will be maintained throughout the life of the project to ensure that activities are having the expected positive impacts.

Biodiversity

For biodiversity activities and benefits, a fauna diagnosis and forest inventory will be carried out. Threatened species will be subject to specific monitoring programs to ensure the conservation status of the area. Areas will be systematically monitored with permanent plots to assess vegetation dynamics and fauna survey campaigns to assess biodiversity conservation.

2.1.20 Financial Sustainability (G1.12)

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

2.1.21 Grouped Projects

This is a grouped project of Avoided Planned Deforestation (APD) and Avoided Unplanned Deforestation (AUD), developed through the application of methodology VM0007 v1.6. As such, project activities are designed to include more than one “project activity instance”, such as new communities or landowners joining the project throughout its lifetime. Thus, this grouped project is thought to allow the expansion of the project activity, after its validation.

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

The incorporation of new areas, called "new instances", to the project must follow the following applicability conditions:

- The project activities described in this PD must be the same ones that will be implemented in future areas of the project.
- New instances must comply with the applicability conditions established by the VM0007 methodology.
- New instances must be located within the same sectoral scope which belongs to the reference region of the Samaúma Project, within the Amazon biome.
- If, exceptionally, a new instance is located outside the Reference Region, it will be guaranteed that all premises will respect the same conditions of similarity of historical deforestation rates applied in the Reference Region to the initial instances of the project.

- Deforestation agents in future instances must act with the same conduct adopted in current instances.
- A single baseline scenario is determined for the entire designated geographic area (Reference Region), according to the VM0007 methodology, based on the initial instances of the project activity (geodetic polygons of the Samaúma and Samaúma Remaining areas), which are presented in this PD CCB.
- New instances must have similar characteristics to the initial instance in terms of additionality.
- New instances are subject to the same non-project community and biodiversity scenarios determined for the project.
- New instances are subject to the same stakeholder engagement processes (see section 2.3) and respect for rights to lands, territories and resources, including free, prior and informed consent (see section 2.5).
- New instances must have sufficient information to implement the proposed monitoring plans for each of the project components, i.e. climate, community and biodiversity (see sections 3.3, 4.4 and 5.4).

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

The scalability of the project is limited by the geographic area, which in this project is defined as the reference region. New project instances can be included, based on meeting the similarity criteria.

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

The risks of non-permanence of the project's benefits are reduced since the project activities proposed for the new instances will be developed by the multidisciplinary technical team of the proponent Terra Vista Gestora de Recursos Ltd., which has the competence to define the project's strategies and activities in addition to being responsible for the proper execution of socio-environmental programs and the monitoring of indicators. Thus, the technical and scientific follow-up of the proponent guarantees a work of excellence and constant improvement.

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)[114] was used.

The analysis referring to the agents of deforestation and the probable scenarios of land use 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 existing conditions before the start of the project, the present 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 Samaúma project is the conversion of land use and occupation from forests to areas intended for livestock, either legally (APD) or illegally through invasion, logging and illegal mining (AUD). Unplanned deforestation is expected to occur on the property in the absence of the Samaúma project.

The municipality of Apuí was the center of livestock expansion in the southern region of the state of Amazonas, with the second largest cattle herd in the state, second only to Boca do Acre. Livestock represented 51% of the municipal GDP at the time of the most recent government agricultural census[115]. This agricultural production is strongly linked to the levels of legal and illegal deforestation. This agricultural production is strongly linked to the levels of legal and illegal deforestation, with a positive correlation being observed between the growth of livestock and the deforestation curve in the municipality[116]. In connection with the local cattle ranchers' union, which represents about 80% of Apuí cattle ranchers, the institute IDESAM (2011)[117] notes that if their Legal Reserves had only 40% of their required areas, it would be enough to make cattle ranching unfeasible.

The incidence of mining requirements for mining in the project area was verified, according to the basis of the National Mining Agency (ANM, 2022)[118] (Table 15) below:

[114] Available at: https://verra.org/methodologies/vt0001-tool-for-the-demonstration-and-assessment-of-additionality-in-vcs-agriculture-forestry-and-other-land-use-afolu-project-activities-v3-0/

[115] Censo Agro 2017. Available at: https://censoagro2017.ibge.gov.br/ . Acessed on: 14/12/2022.

[116] Sistema extensivo versus sistema silvipastoril intensivo para pecuária de leite na Amazônia Brasileira: produtividade, benefícios socioeconômicos e ecossistêmicos para mitigação e adaptação às mudanças climáticas. Available at: < https://www.researchgate.net/publication/344548254_Sistema_extensivo_versus_sistema_silvipastoril_intensivo_para_pecuaria_de_leite_na_Amazonia_Brasileira_produtividade_beneficios_socioeconomicos_e_ecossistemicos_para_mitigacao_e_adaptacao_as_mudancas_ > Acessed on: 14/12/2022.

[117] Relatório Institucional Idesam 2011. Available at: https://www.idesam.org.br/wp-content/uploads/2013/04/Relatorio_IDESAM_2011.pdf . Acessed on: 14/12/2022.

[118] Agência Nacional de Mineração. Available at: https://www.gov.br/anm/pt-br. Acessed on: 14/12/2022.

Table 15. Processes inserted in the geospatial database of the National Department of Mineral Production - DNPM.

Process	Year	Area (ha)	Phase	SUBS Activity
880065/2014	2014	9363.09	Fit for availability	Gold ore
880153/2014	2014	9902.52	Fit for availability	Gold ore
880155/2014	2014	8047.55	Fit for availability	Gold ore
880068/2014	2014	9627.41	Fit for availability	Gold ore
880067/2014	2014	9743.37	Fit for availability	Gold ore
880154/2014	2014	7566.39	Fit for availability	Gold ore
880066/2014	2014	6500.19	Fit for availability	Gold ore
880069/2014	2014	5037.89	Fit for availability	Gold ore
880087/2016	2016	9885.25	Gold mining requirement	Gold ore
880212/2020	2020	9354.8	Gold mining requirement	Gold ore
880108/2020	2020	9218.06	Research authorization	Copper ore
880226/2020	2020	0.02	Gold mining requirement	Gold ore
880226/2020	2020	8906.95	Gold mining requirement	Gold ore
880234/2020	2020	1560.37	Gold mining requirement	Gold ore
880234/2020	2020	2406.06	Gold mining requirement	Gold ore
880213/2020	2020	9505.7	Gold mining requirement	Gold ore
880214/2020	2020	9236.16	Gold mining requirement	Gold ore
880208/2020	2020	9493.9	Gold mining requirement	Gold ore
880209/2020	2020	9314.33	Gold mining requirement	Gold ore

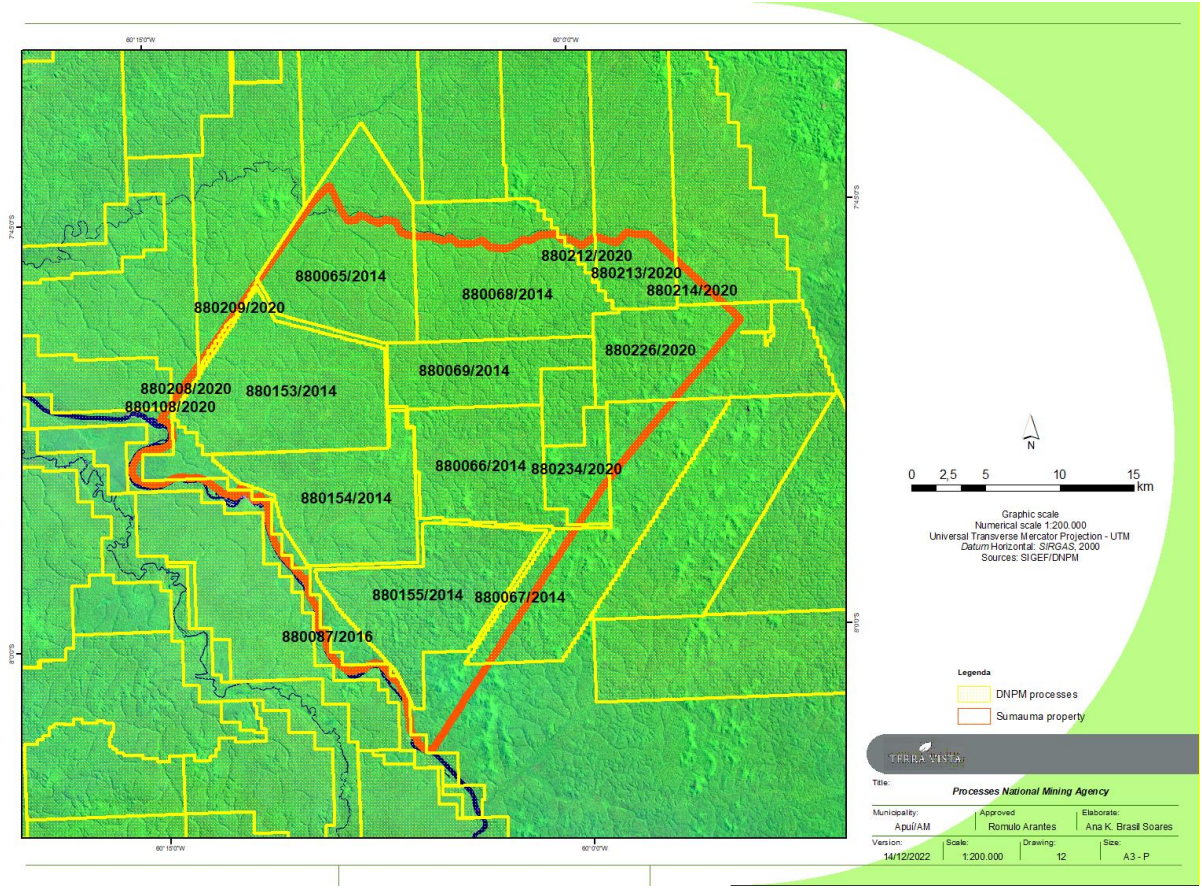

Figure 29. Limits of the processes inserted in the cartographic base of the National Mining Agency - ANM.

2.2.3 Community and Biodiversity Additionality (G2.2)

The Samaúma project has as its main objective the conservation of 71,508.24 ha of native Amazon Forest in a region with a history of high deforestation rates. In the absence of the project, the expected scenario would be the advance of deforestation and the degradation of the area, considering the planned deforestation, recommended in Law nº 12.651/12, in which the owner of land in the Amazon has the legal right to deforest 20% of the area ownership, and unplanned deforestation, in which properties would be invaded and forest areas illegally converted into mining areas and pastures.

Due to the high maintenance costs of activities that guarantee the monitoring and security of forest areas, it would be unfeasible for landowners to bear such costs and efforts in the long term and on a large scale, making it impossible to prevent unplanned deforestation and uncontrolled invasions. Therefore, the scenario with the presence of the Samaúma 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.

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, and promotes the conservation of fauna and flora and areas of high conservation value. 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 lifetime.

With regard to communities, strategies will be implemented with the objective of improving the quality of life of local communities, which would not occur in the absence of the project, such as the implementation of a community photovoltaic system, implementation of a system for capturing and distributing water, acquisition of transport for health care and emergencies, logistical alternatives to ensure community access to public services (health and education), disposal of non-timber forest products, and improvement in infrastructure for the production of cassava flour and for the processing of non-timber products extracted from the forest. Communities will benefit from training and courses aimed at strengthening the productive chain of Brazil nuts and copaiba oil, with training in sustainable forest management, diversifying the economy, adding value to forest products, providing more job opportunities and improving family income.

By preserving the forest area used in extractivism and subsistence and which is at 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 Samaúma project does not intend to use any community and biodiversity benefits as compensation.

2.3 Stakeholder Engagement

2.3.1 Stakeholder Access to Project Documents (G3.1)

The wider dissemination of a profound perception of socio-environmental challenges and contemporary solutions, such as carbon credit projects, aimed at society in general, does not easily reach the same connotation in the face of the different social classes and stakeholders involved. This is due to different levels of power, economic circulation and schooling and, mainly, to the different access people have to information and cultural opportunities.

The installation of a private carbon credit project with the potential to generate positive impacts and socio-environmental solutions is associated with a detailed process of accreditation and control of variables and indicators that must measure and demonstrate its deliveries, achievements and concrete achievements for conservation forestry and the improvement of the living conditions of the populations associated with it.

Thus, with a view to enabling and establishing efficient and assertive communication with the different stakeholders, the project will focus, over time, on training local multipliers, through the dissemination of knowledge and information about the project in all its phases. This will demonstrate a maturation of society itself by appropriating the consequences of the presence of the local and territorial commitment to carbon credits, reversing the logic of deforestation as the only alternative.

Project information will be available in appropriate and public language for broad knowledge of all stakeholders. Free access to the documentation will be made available via meetings between the community and the project's technical staff, in written form through printed versions of the descriptive project, follow-up report, validation and verification report, and virtual, through the websites of 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 Samaúma 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 means and communication channels that favor **dialogue**.
- Adopt communication languages that consider the different levels of **schooling**.
- Adopt means of communication that are **simple** 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 **targeted communication**, transmitting information in a targeted and frequent manner to specific segments of the population, according to the definitions of stakeholders in this plan, not prioritizing only mass media and low-access digital media due to the precarious situation of the digital infrastructure.
- Always seek to assume a position that takes into account the **perspectives and points of view of each stakeholder**, seeking to facilitate, on the side of the proponents, the understanding of territory issues and those related to forest conservation and biodiversity as a means of generating carbon credit.

2.3.2 Dissemination of Summary Project Documents (G3.1)

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

2.3.3 Informational Meetings with Stakeholders (G3.1)

Meetings were held with extractive communities from September 6 to 11, 2022 with the technical team from Terra Vista Gestora de Recursos Ltd. The meetings were held to inform people about the implementation of the carbon project, clarify doubts and obtain a perception of the communities about the project. During the meetings, the Samaúma project was presented to the community and a Participatory Rural Assessment workshop was held with the preparation of mental maps of the area and impact diagrams. It is important to point out that the presentation of the project used appropriate language for the participating public.

Between November 30 and December 2, 2022, new meetings and interviews were held. During the activities, there was the dissemination of information about the Samaúma Project, Participatory Rural Assessment workshops and the application of questionnaires. In the two cycles of meetings, questions and community positions were raised that shaped the project's design decisions. The results and updates of the Samaúma project will be publicly available on the internet and will be communicated to local communities and stakeholders.

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

During meetings held with riverside and extractive communities in the project region, information on costs x risks x benefits was collected using the Participatory Rural Diagnosis methodology. 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 a specialist social group, who communicated in a way that everyone present could understand. Thus, from the participatory dialogue, the technical team 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 use of productive, spiritual or leisure time.

Risks:

- Be threatened by invaders (external agents), when they take a position to protect the forest fragments of the project.

Benefits:

- Improvement of housing, education, health, production and marketing infrastructure.

- New learning that can be applied both in knowledge of the forest, in the collection and processing of extractive products, as well as in skills for negotiating better values for their production.

During the community consultations, information about the benefits of the project was provided to community members. No financial cost will be passed on to the communities, as all project activities will be funded by the project proponents. The activities are planned to improve the quality of life and have a positive impact. In addition, 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 (G3.3)

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 September 2022 with the holding of meetings between the riverside communities and the community residents in the headquarters of the municipality of Apuí who use the project area for extractivism, and the technical staff of Terra Vista Gestora de Recursos Ltd. The meetings were held based on the principles of the Participatory Rural Diagnosis (DRP), in which

mental maps and experience diagrams were prepared based on information about the project, for the development of a work proposal that would meet the needs of the communities.

Figure 30: Public meeting with the families of Vila Batista, Apuí - AM. Photo: Terra Vista, 2022.

Figure 31: Public meeting with the families residing at the Apuí headquarters - AM. Photo: Terra Vista, 2022.

In December 2022, public meetings were held with communities to consult stakeholders who traditionally use the project area. In the public meetings held, issues related to possible impacts related to the implementation of the project were addressed, as well as expectations regarding benefits, as well as community consent for participation.

To ensure the right to traditional use of the project area, continuity of free community access to the area was established for carrying out the extraction of non-timber forest products.

During the period of September and December, interviews were also carried out with the community members in order to establish a baseline that reflected the people's way of life and needs. This information, based on the human, social, natural/environmental, physical and financial dimensions of the Sustainable Livelihoods (MVS), provides a quantitative and qualitative overview of the socioeconomic and cultural indicators of the location.

Based on the results obtained, a work plan was prepared with activities aimed at reducing the impacts caused by climate change and providing better adaptation of communities to climate change. The activities to be implemented to cause exceptional benefits were prepared following criteria of additionality, having as a parameter the real needs listed by the participatory discussions of the meetings with community members and by the analysis of the data obtained from the questionnaires.

Figure 32: Territoriality map elaboration workshop. Aruanã Community, Apuí - AM. Photo: Terra Vista, 2022.

Figure 33: Interview with the community members of Vila Aruanã. Aruanã Community, Apuí - AM. Photo: Terra Vista, 2022.

The results obtained were discussed and consolidated with the communities in December 2022 at public meetings, one in Vila Batista and the other in Bela Vista do Guariba. The meetings were recorded in minutes and approved in consultation with the communities. These meetings were attended by family groups and members of the Aripuanã Guariba Agro-extractivist Association (ASAGA).

From the referrals regarding the discussion and consolidation of the results obtained, the benefits appropriate to the local reality as well as community participation in the project were established and agreed.

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 samauma@terravista.eco.br, establishing a communication channel open to dialogue.

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

Activities that encourage meaningful learning for all parties involved will be valued, 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.

Based on the mapping of stakeholders, the contacts made, the registration of people and the applied questionnaires, a specific mobilization was carried out through telephone contact with community leaders, in order to participate in the public hearing, in which the current status of the project was presented. For this audience, there was also mobilization via a face-to-face invitation through the visit of technicians from Terra Vista Gestora de Recursos Ltd. in the residences of the communities participating in the project.

In order to strengthen the process of social dialogue with the communities directly involved with the project, residents of riverside communities were invited to participate in a deliberative public hearing on the projects of their interests.

The articulation of the public hearing provided the presence of local communities and enabled a meeting with active participation of community groups. In the meetings, the community is 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's email (samauma@terravista.eco.br), which is managed by the Terra Vista Gestora de Recursos Ltd., 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.

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 (whistleblowing 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 capacity 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 Samaúma project intends to integrate social technologies in the communities of the Aripuanã river and share the knowledge produced with the 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. 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.

2.3.15 Community Employment Opportunities (G3.10)

The job vacancies 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 Samaúma 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.

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

Employees of the Samaúma 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 safety at work among employees, the Samaúma project must follow all official norms established by the federal and state governments. In addition to respecting labor legislation and

International Labor Organization conventions, 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 Samaúma project.

2.4 Management Capacity

2.4.1 Project Governance Structures (G4.1)

The Project is managed by Terra Vista Gestora de Recursos Ltd. together with Ituxi Administração e Participação Ltd. The responsibilities of each party are described below:

Ituxi Administração e Participação Ltd.: implementation of heritage surveillance, being responsible for conducting operations in the field and providing logistical support for on-site technical visits.

Terra Vista Gestora de Recursos Ltd.: coordination and execution of socioeconomic and environmental diagnoses; baseline study and carbon stock; preparation of the project design document (PD); monitoring and implementation of proposed activities; assistance in conducting field audits for validation and future verification; and commercialization of generated credits.

Terra Vista Gestora de Recursos Ltd. has nine departments that are jointly responsible for project management (Figure 34). The Carbon Project Origination department is responsible for the development and implementation of projects, its technical team is subdivided into five interconnected teams (Figure 35) and relies mainly on the support of the legal, technological, strategic planning and financial departments.

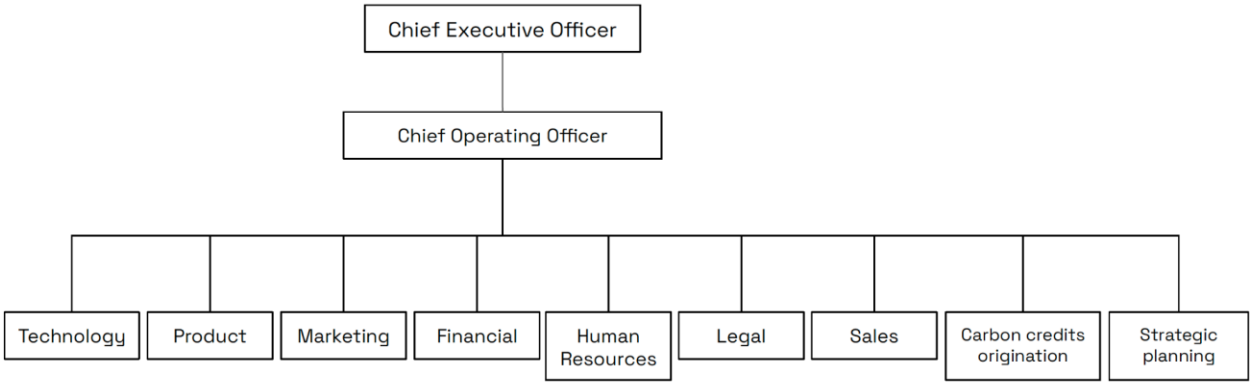

Figure 34. Executive Governance Structure of Terra Vista Gestora de Recursos Ltd.

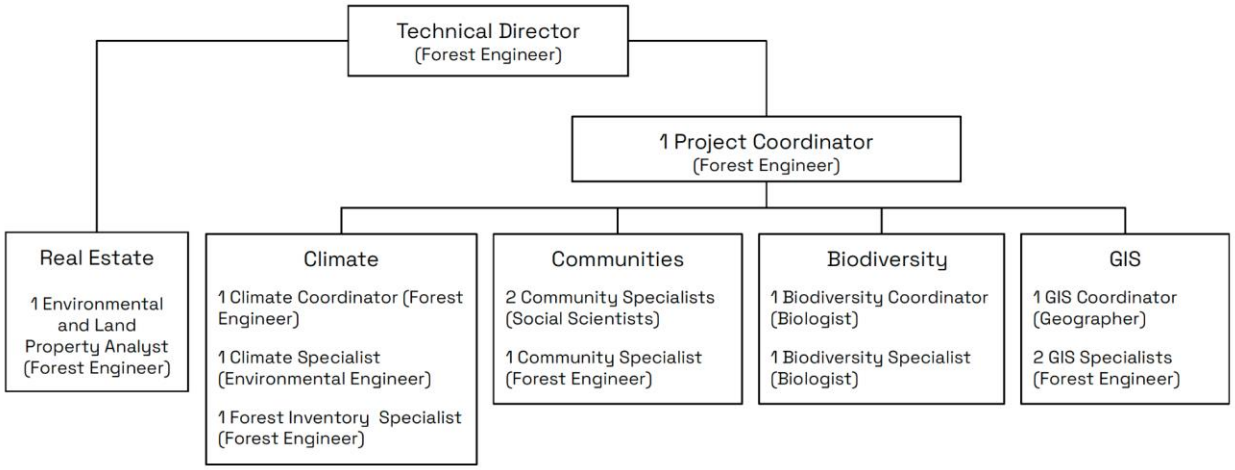

Figure 35. Technical governance structure of the Carbon Project Origination department.

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.

2.4.2 Required Technical Skills (G4.2)

In order to implement the Samaúma 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 (Tables 16 and 17) who have the necessary technical skills for the implementation and execution of the project.

Terra Vista Gestora de Recursos Ltd.

Table 16. Members of Terra Vista Gestora de Recursos Ltd. who are part of the Samaúma project management team, their respective positions and qualifications.

Name	Position and Role in the Project	Technical Qualification and Professional Experience
Rômulo Pereira da Silva Arantes	Technical Director	Forestry Engineer, postgraduate in Environmental Management, MBA in Project Management and Master's student in Ecology and Geotechnologies. He has experience in Reduction of Emissions from Deforestation and forest Degradation (REDD) projects. He worked on the first project that originated forest carbon credits in Brazil and has more than 15 years of experience in baseline diagnostics for assessing environmental impacts on climate, communities and biodiversity.

Alan de Brito	Forest Engineer, Projects Coordinator	Forest Engineer and Master in Management of Production Forests from the Federal University of Lavras (UFLA). Doctor in Earth System Science from the National Institute for Space Research (INPE) and Humboldt-Universität zu Berlin (HU). He has experience in monitoring native vegetation and deforestation projects, as well as accounting for Greenhouse Gas (GHG) emissions. He was a member of the Technical Working Group on Reduction of Greenhouse Gas Emissions from Deforestation and Forest Degradation (GTT REDD+) of the Ministry of the Environment (MMA). He works 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 PhD student in Forest Sciences with emphasis in Silviculture at Universidade Federal de Viçosa (UFV).
Leandro Silva Rodrigues	Forest Engineer, Specialist in Forest Inventory	Forest Engineer from the Federal University of 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	Sustainability Analyst, responsible for the climate part, application of the AFOLU Non-permanence Risk Tool	Environmental Engineer, Master's in Environmental Technology and Water Resources. One year of professional experience as a Climate Change consultant.
Vivian Fernanda Carneiro Martins	Forest Engineer, responsible for articulation, logistics and mobilization of local actors	Forest Engineer, postgraduate in Sustainable Regional Development and in Quality, Environment and Safety Management, with 15 years of experience in the elaboration and coordination of socio-environmental projects in the Amazon.

Arthur Augusto Santos	Communities Specialist	Bachelor of Social Sciences from Universidade Federal do Espírito Santo (UFES). Master's student in Social Sciences with a focus on Socio-environmental Studies, Cultures and Identities - PGCSO/UFES. He has experience with 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.
Gustavo Fernandes Moura	Social analyst	Bachelor in Social Sciences and postgraduate in Data Science at the University of São Paulo, with over 10 years of experience with research and development of socio-economy, culture, cultural heritage and archaeological heritage projects with traditional communities.
Gabriela Magalhães	Biodiversity Specialist	Biologist, specialist in Environment from COPPE/UFRJ, Master in Botany and MBA in Business Management from USP. More than 8 years of experience in the development and coordination of socio-environmental projects, biodiversity analysis and environmental licensing.
Nathália Vieira Hissa Safar	Sustainability Analyst, Specialist in Biodiversity	Biologist, Master in Botany and PhD (in progress) in Botany with emphasis in Forest Ecology at Universidade Federal de Viçosa, with more than seven 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/GIS Coordinator	Geographer graduated from USP, Master in Physical Geography from USP, PhD (in progress) in Environmental and Territorial Analysis from UNICAMP, specialist in Environmental Management from SENAC/SP and Graphic Design from Anhembi Morumbi. He has more than 15 years of experience in Spatial Analysis, Licensing and Environmental Impact Assessment projects.

Ana Karoline Brasil Soares	Forest Engineer specialist in Environmental Licensing and Geoprocessing	Forest Engineer from the Federal University of Amazonas UFAM Post-Graduate in Socio-Environmental Business from ESCAS IPÊ 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.
Neuro Salvador da Silva Junior	Forest Engineer, Specialist in Geoprocessing	Forest Engineer, postgraduate in Precision Forest Management - UFPR. Experience in monitoring land use and occupation, using remote sensing and geoprocessing in the Google Earth Engine platform, ArcgisPro, Jupyter notebook/Google Colab, and python language.

Ituxi Administração e Participação Ltd.

Table 17. Members of Ituxi who are part of the Samaúma project management team, their respective positions and qualifications.

Name	Position and Role in the Project	Technical Qualification and Professional Experience
Ricardo Stoppe Júnior	Landowner	Owner of the Fortaleza Ituxi REDD Project (ID: 1654), Evergreen REDD+ Project (ID: 2539) and Unitor REDD+ Project (ID:2508), all developed in the state of Amazonas, Brazil.

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

Not applicable

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 x 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, and created a Society for Specific Purposes (SPE), a legal structure controlled by Terra Vista to better manage 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 Ituxi Administração e Participação Ltd., holder of all ownership, access and use rights. The ownership chain of real estate, from their detachment from the Public Power domain and receipt by a private individual, until the present date, containing all the successive acts of alienation and dismemberment of the areas are available to the project auditors.

The project area consists of two rural properties, under registration n°s 288 (Fazenda Samaúma) and 289 (Fazenda Samaúma Remanescente), which were certified by the National Institute of Colonization and Agrarian Reform (INCRA), the Brazilian federal agency whose objective is the maintenance of the

national registry of rural properties. The properties are registered under separate registries before INCRA (CCIR) and the Federal Revenue Service of Brazil (NIRF/CIB) (Figure 36 e Figure 37).

Public databases state the existence of a Rural Settlement Project under the authority of the federal agency, INCRA, called the Extractive Settlement Project (PAE) Aripuanã-Guariba, which overlaps with the project area. However, this is an undue overlap between the traverses of the PAE Aripuanã-Guariba and the respective property, which would require its exclusion from such traverse and respect for the boundaries of the private property.

Certificada - Com Registro em Cartório Confirmado
Parcela certificada pelo SIGEF de acordo com a Lei 6.015/73 e com informação de registro em cartório confirmada através de requerimento de registro

MINISTÉRIO DA AGRICULTURA, PECUÁRIA E ABASTECIMENTO
INSTITUTO NACIONAL DE COLONIZAÇÃO E REFORMA AGRÁRIA

Denominação: SAMAÚMA	**Natureza da Área:** Particular
Proprietário(a): XXXXXXRTICIPAÇÕXXXXXX — **CNPJ:** **.*68.992/0001**	**Responsável Técnico(a):** ALEXSANDRO CARLOS DE OLIVEIRA
Matrícula do imóvel: 288 — **Cartório de Registro de Imóveis:** (00.488-7) Apuí - AM	**Formação:** Técnico(a) de Nível Superior ou Tecnólogo(a) — **Conselho Profissional:** 10079 D RO/RO
Código INCRA/SNCR: 9999030848675 — **Município:** Apuí-AM	**Cód. Credenciado(a):** RIRD — **Documento de RT:** 20170096150 - AM

Área (Sistema Geodésico Local):	Perímetro:	Sistema Geodésico:	Sistema de Coordenadas:	Escala:	Formato:
50948,7637 ha	104.119,10 m	SIRGAS 2000	Lat./Long. - não projetado	1:229648	A4

Vértice tipo M, Vértice tipo P, Vértice tipo V, Vértice tipo O, Muro, Estrada, Vala, Canal
Linha ideal, Limite artificial não tipificado, Corpo d'água ou curso d'água, Linha de cumeada, Grota, Crista de encosta, Pé de encosta, Limite natural não tipificado
Cerca
Imóvel em estudo, Imóveis confrontantes

CERTIFICAÇÃO: 8bf64ade-151d-45c3-9faa-c12d5a6d0200

Em atendimento ao § 5° do art. 176 da Lei 6.015/73, certificamos que a poligonal objeto deste memorial descritivo não se sobrepõe, nesta data, a nenhuma outra poligonal constante do cadastro georreferenciado do INCRA.

Data Certificação: 24/01/2019 15:51
Data da Geração: 10/11/2022 18:38

Esta planta foi gerada automaticamente pelo Sigef com base nas informações transmitidas e assinadas digitalmente pelo(a) Responsável Técnico(a)
A autenticidade desde documento pode ser verificada pelo endereço eletrônico http://sigef.incra.gov.br/autenticidade/8bf64ade-151d-45c3-9faa-c12d5a6d0200/

Figure 36. Samaúma property certified by the Land Management System - SIGEF.

Certificada - Com Registro em Cartório Confirmado
Parcela certificada pelo SIGEF de acordo com a Lei 6.015/73 e com informação de registro em cartório confirmada através de requerimento de registro

MINISTÉRIO DA AGRICULTURA, PECUÁRIA E ABASTECIMENTO
INSTITUTO NACIONAL DE COLONIZAÇÃO E REFORMA AGRÁRIA

Denominação: SAMAUMA REMANESCENTE
Proprietário(a): XXXXXXRTICIPAÇÕXXXXXX
CNPJ: **.*68.992/0001**
Matrícula do imóvel: 289
Cartório de Registro de Imóveis: (00.488-7) Apuí - AM
Código INCRA/SNCR: 9999469989909
Município: Apuí-AM

Natureza da Área: Particular
Responsável Técnico(a): EULER VASCONCELOS DE AZEVEDO
Formação:
Conselho Profissional: 7654-TD/AM
Cód. Credenciado(a): FM3
Documento de RT: AM20220329663 - AM

Área (Sistema Geodesico Local):	Perímetro:	Sistema Geodésico:	Sistema de Coordenadas:	Escala:	Formato:
20873,8475 ha	73.563,66 m	SIRGAS 2000	Lat./Long. - não projetado	1:176076	A4

Vértice tipo M, Vértice tipo P, Vértice tipo V, Vértice tipo O, Muro, Estrada, Vala, Canal
Linha ideal, Limite artificial não tipificado, Corpo d'água ou curso d'água, Linha de cumeada, Grota, Crista de encosta, Pé de encosta, Limite natural não tipificado
Cerca
Imóvel em estudo, Imóveis confrontantes

CERTIFICAÇÃO: de52ae5b-a8cc-402d-9283-5a9abba0241d
Em atendimento ao § 5° do art. 176 da Lei 6.015/73, certificamos que a poligonal objeto deste memorial descritivo não se sobrepõe, nesta data, a nenhuma outra poligonal constante do cadastro georreferenciado do INCRA.
Data Certificação: 22/09/2022 21:55
Data da Geração: 11/11/2022 14:04

Esta planta foi gerada automaticamente pelo Sigef com base nas informações transmitidas e assinadas digitalmente pelo(a) Responsável Técnico(a)
A autenticidade desde documento pode ser verificada pelo endereço eletrônico http://sigef.incra.gov.br/autenticidade/de52ae5b-a8cc-402d-9283-5a9abba0241d/

Figure 37. Samaúma Remanescente property certified by the Land Management System - SIGEF.

The PAE Aripuanã-Guariba, created in 2005, had its area acquired via state collection of vacant lands, in 1982 pursuant to art. 28 of Federal Law No. 6,383/1976. According to the legal grounds for the collection, this depends, among others, on an act by the president of INCRA, which must contain the eventual name, characteristics and confrontations of the property object of the collection, and the respective process must be instructed with a negative certificate proof of the lack of private domain, issued by the Real Estate Registry Office, certificates from the Union Heritage Service and from the competent state body that prove that there is no contestation or administrative claim filed by third parties, regarding the ownership and possession of the property.

The original area of the project has had a private nature since 1933, when it was detached from the domain of the Government of the State of Amazonas, which granted the first predecessor owner of the area a “definitive title”, taken to registration. Therefore, the property documents predate the creation of the PAE by more than 50 years, which was on December 28, 2005, as attested by the Federal Government Official Act.

A consultation with the INCRA Land Management System (SIGEF) confirmed, through an official INCRA Concession Decision document, that properties with title deeds prior to the creation of the PAE are excluded from their area, and all rights to ownership are duly granted to their owners. The Judgment includes Law 6,383/7638 and specific tax lawsuits. Properly documented proof of all of the above has been provided at validation.

There is no mention in Registration No. 288 (Fazenda Samaúma) and No. 289 (Fazenda Samaúma Remanescente) of INCRA's settlement project. Also, the properties are georeferenced, with certification by

INCRA (Land Management System - SIGEF) since 2016. On that occasion (and in the subsequent georeferenced descriptions certified under the SIGEF), the respective registration acts stated that **there was no overlapping of their polygons with others equally subject to certification by the same body** (e.g.: “the polygonal object of the descriptive memorial does not overlap, on June 6, 2016, with any other polygonal constant in the register georeferenced by INCRA and that the rights were respected of the opponents”).

The request for overlapping with INCRA is underway, on the grounds that: (i) there would be proof of private ownership of the area since 1933, including with the same origin as the Samaúma Remanescente land; and (ii) the PAE Aripuanã-Guariba would have been created based on a procedure for collecting vacant lands, which should have checked the existence of private domain over such perimeter, without the possibility of implementing a settlement project over a private area.

Adaptations to the Brazilian Forest Code

The following definitions of the Brazilian Forest Code stand out as relevant:

“III – Legal Reserve: area located within a rural property, excluding the Permanent Preservation Area, necessary for the sustainable use of natural resources, conservation and recovery of ecological processes for the conservation of biodiversity and shelter and protection of fauna and flora native.

VI - Legal Amazon: States of Acre, Pará, Amazonas, Roraima, Rondônia, Amapá and Mato Grosso, and the regions located north of the 13th parallel S, in the states of Tocantins and Goiás, and west of the 44th meridian, in the State of Maranhão .”

The Legal Reserve (LR) must be registered in a property deed at the Real Estate Registry Office: its location must be officially known, and future owners must know where it is located, its limits and borders. The LR can be located anywhere within the rural property. The Brazilian Forest Code determines that, once allocated, the LR cannot be changed even in cases of real estate transfer, land subdivision or area changes.

According to Provisional Measure No. 2.166-67 of August 24, 2001:

“Art. 16. Forests and other types of native vegetation, except those located in Permanent Preservation Areas, as well as those not subject to the restricted use policy or subject to specific legislation, are subject to suppression, provided that the vegetation is preserved, as a Reserve Legal, at a minimum:

I - 80% (eighty percent), on rural properties located in forest areas located in the Legal Amazon."

The adaptations to the Brazilian Forest Code are demonstrated in Figure 38 below.

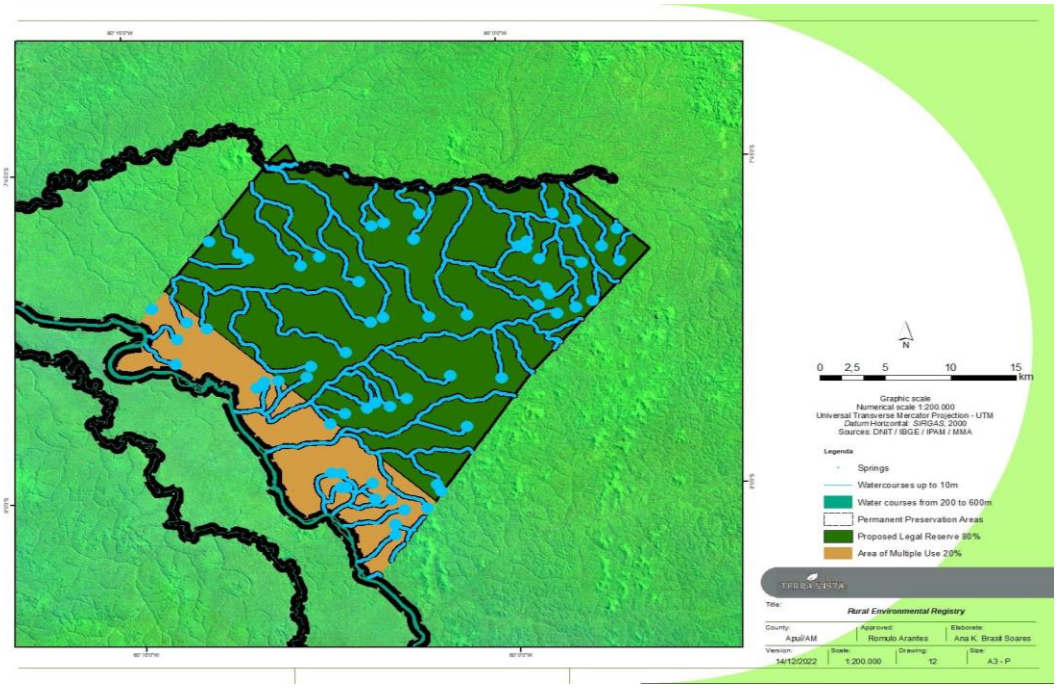

Figure 38. Delimitation of the Legal Reserve (RL), Remnant Vegetation, Permanent Preservation Areas (APP).

2.5.2 Recognition of Property Rights (G5.1)

The project area is the private property of the proponent Ituxi Administração e Participação Ltd. and their property rights are recognized, respected and supported by Brazilian law. The property's land documentation will be made available to the validation and verification body.

Table 18. Proof of land regularization of the benefited property.

Property	Property Area	Project Area	Landowner	INCRA	CCIR
Fazenda Samaúma	50,948.75	50,760.73	Ituxi Administração e Participação Ltd.	9999030848675	40105011214
Fazenda Samaúma Remanescente	20,873.85	20,747.51	Ituxi Administração e Participação Ltd.	9999469989909	40102626218

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

As demonstrated, the Samaúma project area will not invade any private property, community or government property. There are no human occupations or residents in the project area.

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.

Riverside communities that use the project area for extractivism of non-timber forest products expressed their consent to be part of the project in public consultations that were conducted after the prior disclosure of the project and the clarification of all doubts of the community.

In order to carry out the public consultations, the project was concerned with meeting four established stages with the aim of making the consultation process more participatory and open to the communities.

Pre-mobilization

Firstly, after the first contact and identification of the communities, prior contact was made 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, the field team visited the communities, articulating with the residents the ideal date for carrying out the consultation. It was established by common agreement with the project development team that, in order to better serve the community, two public meetings were held, one in Vila Batista, and the other in Bela Vista do Guariba.

Figure 39: Mobilization in the Vila Batista community. Photo: Terra Vista, 2022. Apuí, Amazonas.

Figure 40: Mobilization in the Aruanã community for public consultation. Photo: Terra Vista, 2022. Apuí, Amazonas.

Execution

In the case of the Samaúma Project, since there are no properties or human occupations inside, the public meetings tried to agree on the traditional use of the project area, receive and respond to community manifestations and finally establish a participatory pact.

In December 2022, two public consultations were held in a meeting with community groups to formalize consent for the Samaúma project. Information about the project's development stages was passed on at the meeting.

Community members expressed their expectations regarding the project, the impacts they perceived and their considerations regarding participation. 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 Ltd. and made available digitally to people with internet access and a smartphone.

The minutes and attendance lists of the consultations held in Vila Batista and Bela Vista do Guariba will be made available for consultation by the validation and verification body.

Figure 41: Public consultation with the families of Aruanã and Bela Vista do Guariba. Photo: Terra Vista, 2022. Apuí, Amazonas.

Figure 42: Public consultation with the families of Vila Batista. Photo: Terra Vista, 2022. Apuí, Amazonas.

Publicization

The results of the consultation, in addition to being duly clarified during execution, were recorded and published in different means of communication with appropriate language for all interested parties.

The guarantee of the continuity of the traditional use of the Samaúma project area by the communities was established. In this pact, community members are guaranteed access to the project area for extracting copaiba and Brazil nuts, as well as subsistence fishing and hunting during the collection period.

Figure 43: Workshop to identify areas of cultural importance for subsistence. Photo: Terra Vista, 01/12/2022. Apuí, Amazonas.

Figure 44: Workshop to identify positive and negative impacts. Photo: Terra Vista, 01/12/2022. Apuí, Amazonas.

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)

Illegal deforestation affects areas close to the Buiuçu River and covers a large area of the Paxiúba River. In this region, there are reports of deforestation to remove wood and burning to convert the soil into pasture for cattle. These areas correspond to what was observed and photographed in the flyover made by Terra Vista Gestora de Recursos Ltd. and which reaches areas close to the northwest of the Samaúma project. These deforested areas can also be confirmed by satellite images.

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 Samaúma project area are described in Table 19 below.

Table 19. Actions and methods of operation for measures against illegal activities in the Samaúma 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 and around the project area
	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 the Aripuanã river community that use the area for subsistence extractivism
	Support to State police and inspection authorities
	Surveillance via fluvial patrol along rivers and streams with flying boats and motorized canoes
	Surveillance by aerial monitoring by planes and 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)

In the last 20 years there have not been or are any conflicts or legal disputes over land rights or resources.

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. 1071 of the Civil Code No. 13105/15;

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 legal action related to ownership or possession of the properties has been identified and would not even be possible, as mentioned earlier, there are no communities inhabiting the project area.

2.5.7 National and Local Laws (G5.6)

Proponents of the Samaúma 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;
- Cartagena Protocol on Biosafety to the Convention on Biological Diversity, 2000;
- International Tropical Timber Agreement (ITTA), 1994;
- Convention on Biological Diversity (CBD), 1992;
- United Nations Framework Convention on Climate Change (UNFCC), 1992;
- United Nations Declaration on the Rights of Indigenous Peoples, 2007;
- Kyoto Protocol, 1997;
- Paris Agreement, 2015;

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, item 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.

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 comprises two rural properties, under registration n° 288 (Fazenda Samaúma) and n° 289 (Fazenda Samaúma Remanescente). The properties rightfully belong to Ituxi Administração e Participação Ltd. Documentation proving ownership was made available for audit.

2.5.10 Management of Double Counting Risk (G5.9)

The project is not intended to generate or receive any form of environmental or social credit, including any tradable climate, community or biodiversity unit.

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) standards with the intent to reduce CO_2 emissions from unplanned (AUD) and planned (APD) deforestation compared to baseline levels. As required by VM0007[119], the project area consists of contiguous and discrete areas covered by forests that meet the definition of eligible forest, which would be an area that has been forested for at least 10 years prior to the project start date.

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

Approved VCS Methodology:

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

Carbon pool modules:

- VMD0001 “Estimation of carbon stocks in the above and belowground biomass in live tree and non tree pools” (CP AB), v1.1”.
- VMD0005 “Estimation of carbon stocks in the long term wood products pool” (CP W), v1.1”.

Baseline module:

- VMD0006 “Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation/forest degradation and planned wetland degradation (BL PL), v1.3”.
- VMD0007 “Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation and unplanned wetland degradation” (BL UP), v3.3”.

Leakage modules:

- VMD0009 “Estimation of emissions from activity shifting for avoided planned deforestation/forest degradation and avoided planned wetland degradation (LK ASP), v1.3”.

[119] VM0007 “Estrutura Metodológica de REDD+ (REDD+ MF)”, v1.6. Available at: https://verra.org/methodologies/vm0007-redd-methodology-framework-redd-mf-v1-6/. Aceso em: 14/12/2022.

- VMD0010 “Estimation of emissions from activity shifting for avoiding unplanned deforestation and avoiding unplanned wetland degradation (LK ASU), v1.2”.
- VMD0011 “Estimation of emissions from market effects” (LK ME), v1.1”.

Miscellaneous Modules:

- VMD0013 “Estimation of greenhouse gas emissions from biomass and peat burning (E BPB), v1.2”.
- VMD0016 “Methods for stratification of the project area (X STR), v1.2”.
- VMD0017 “Estimation of uncertainty for REDD project activities (X UNC), v2.2”.

Tools:

- “Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities (T ADD), Version 01”.
- CDM “Executive Board “Tool for testing significance of GHG emissions in A/R CDM project activities (Version 01)” EB 31.
- AFOLU “Non Permanence Risk Tool”, Procedural Document, VCS, v4.0.[120]

3.1.2 Applicability of Methodology

The applicability conditions of the VM0007 methodology and its associated modules are detailed in the Table 20 below.

Table 20. Applicability criteria for the Samaúma project.

Applicability criteria	Description
All project activities	
All land areas registered under the CDM or any other GHG program (whether voluntary or compliance-oriented) must be transparently reported and excluded from the project area. Exclusion of land in the project area from any other GHG program must be monitored over time and reported in monitoring reports.	The Samaúma project is not registered in any carbon trading system or program.
All types of REDD activities	
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 into the categories of unplanned deforestation (VCS	Land in the Samaúma project area has been qualified as forest (following the definition used by VCS and the definition of forest by the National Agency of Brazil - 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

[120] AFOLU “Ferramenta de Risco de Não Permanência” VCS Versão 4, Documento Processual. Available at: http://www.vcs.org/programdocuments. Acessed on: 19/04/2022.

AUD category) and planned deforestation/degradation (VCS APD category); ● Leakage prevention activities do not include: i) Agricultural land that is flooded to increase production (eg rice paddies); ii) Intensification of livestock production through the use of feedlots and/or manure ponds.	deforestation (VCS category AUD) and Planned deforestation/degradation (VCS category APD). Activities to prevent leaks do not include: i) Agricultural land that is flooded to increase production (eg paddy rice); ii) Intensify animal production through the use of feed and/or manure reservoirs.
Avoided Unplanned Deforestation	
Unplanned deforestation prevention activities are applicable under the following conditions: ● The primary drivers of deforestation must: (i) clear land for tree harvesting, settlement, agricultural (farmer) production or livestock or aquaculture, where such deforestation for agricultural or livestock production or aquaculture does not represent large-scale industrial agriculture or aquaculture; (ii) have no documented and uncontested legal right to clear land for these purposes; and (iii) be residents of the deforestation reference region or be immigrants. Under any other condition, this methodology should not be used. ● If, in the baseline scenario to avoid unplanned deforestation project activities, the post-deforestation land use constitutes reforestation, this methodology cannot be used. ● Where, prior to the project, unsustainable firewood collection is occurring within project boundaries, the BL-DFW and LK-DFW modules should be used to determine possible leakages	The activity to prevent unplanned deforestation is applicable. Deforestation agents in the baseline scenario clear land for livestock as the final land use. These agents do not have the legal right to use or deforest the land. These deforestation agents are from nearby communities or immigrants in search of land for illegal logging and conversion of land to pasture. In the baseline scenario of this activity land use after deforestation does not constitute reforestation (i.e. pasture is the final land use) No logging is carried out within the Samaúma project area.
Avoided planned Deforestation	
Avoidance of planned deforestation/degradation activities are applicable under the following conditions: ● Where conversion of forest land to a deforested condition must be legally permitted. ● Where, prior to the project, unsustainable firewood collection is occurring within project boundaries, the BL-DFW and LK-DFW modules should be used to determine possible leakage.	The activity to prevent deforestation and planned degradation is applicable, considering that the conversion of forest lands to a deforested condition is legally permitted up to the limit of 20% in relation to the total area of the property, as described in section 2.5.7 National laws and locations (G5.6). No logging is carried out within the Samaúma project area.

VMD0001 "Estimation of carbon stocks in the above-and belowground biomass in live tree and non-tree pools" (CP-AB), v1.1.	
The module allows the ex-ante estimation of carbon stocks in tree and non-tree biomass above and below ground in the baseline scenario (both for pre- and post-deforestation stocks) and in the project case and for the ex-ante estimation. post the change in aboveground and belowground tree biomass carbon stocks in the project case.	This module is applicable to all forest phytophysiognomies and age groups. The inclusion of the aboveground tree biomass reservoir 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 ex-ante estimation of carbon stocks in the long-term wood products pool in the baseline scenario. The carbon stocks treated here are those remaining in wood products after 100 years; most emissions associated with harvesting, processing and wasting wood and eventual withdrawal of products occur within this time frame, 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 wood is harvested for conversion into wood 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 boundaries, as per applicability criteria in the REDD-MF structural module, specifically: ● Timber extraction takes place 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 SIG).
VMD0006 Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation/forest degradation and planned wetland degradation (BL-PL), v1.3.	
The module allows estimating 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 forested land (generally privately owned or government owned) that is legally authorized and documented to be converted to non-forested land. Where, pre-project, unsustainable firewood collection is taking place within project boundaries, the BL-DFW and LK-DFW modules should be used to determine potential leaks.
VMD0007 "Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation and unplanned wetland degradation" (BL-UP), v3.3.	
This module allows you to estimate changes in carbon stock and GHG emissions related to unplanned deforestation and unplanned degradation of wetlands in the baseline scenario. Forest degradation is not considered.	The applicability conditions of this module are met in this module: ● the landscape conFiguretion is transitional, as discussed in section 3.2.1;

The following conditions must be met to apply this module. The forest landscape conFiguretion can be mosaic, transition or border. The module should be applied to all project activities where baseline drivers of deforestation: (i) "clearing land for settlement, agricultural (farmer) production, livestock or aquaculture, where such deforestation for agricultural, livestock or aquaculture production does not represent large-scale industrial agro/aquaculture activities;" (ii) "have no documented and uncontested legal right to clear land for these purposes; and" (iii) "residents in the region (reference region) or immigrants".	• grassroots agents of deforestation clear land for livestock (see item 3.1.4 Baseline Scenario); • their practices are predominantly illegal and not within their legal rights, as argued in section 3.1.5 Additionality, in Scenario 3.
VMD0009 Estimation of emissions from activity shifting for avoided planned deforestation/forest degradation and avoided planned wetland degradation (LK-ASP), v1.3.	
The module allows estimating GHG emissions caused by activity change leakage from planned carbon deforestation projects. The module is applicable for estimating leakage emissions due to activity change from legally authorized and documented forest land to be converted to non-forest land, including activity change to drained or degraded forest wetlands due to project implementation. The module is also applicable for estimating leakage emissions due to change in activity from non-forested wetlands that are legally authorized and documented to be converted and degraded. In these situations, displacement from 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 takes place 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 baseline, and the applicability conditions in the BL-PL Module must be fulfilled in full.
VMD0010 Estimation of emissions from activity shifting for avoiding unplanned deforestation and avoiding unplanned wetland degradation (LK-ASU), v1.2.	
This module provides methods for estimating displacement emissions from unplanned deforestation and unplanned wetland degradation (leakage due to activity change).	The module is mandatory if the BL-UP Module is used to baseline, and the applicability conditions in the BL-UP Module must be fulfilled in full.

Activities subject to potential displacement are the conversion of forest areas to pasture, crops and other land uses, or the conversion of intact or partially degraded wetlands to drained or degraded wetlands.	
VMD0011 "Estimation of emissions from market-effects" (LK-ME), v1.1.	
The module allows estimating GHG emissions caused by leakage of market effects related to the extraction of wood for wood, fuelwood or charcoal at the baseline for carbon projects. It is applicable to calculate the leakage of market effects from REDD projects that are expected to substantially and permanently reduce levels of logging. When REDD project activities result in reductions in wood harvesting, 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 required where: ● The deforestation process involves harvesting wood for commercial markets. ● Baseline is calculated using BL-DFW AND firewood or charcoal is harvested for commercial markets. In all other circumstances, the module must not be used.	The module is mandatory when the deforestation process involves extracting wood for commercial markets.
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 burning biomass and REDD-WRC project activities with emissions from biomass and/or burning peat. 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 CO_2, N_2O and CH_4 emissions. When used in the baseline, accounting shall 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 the project area" (X-STR), v1.2.	
This module provides guidance on how to stratify the project area into discrete, relatively homogeneous	The strata are only used for forest classes under deforestation pressure and are the

units to improve the accuracy and precision of carbon stock and estimates of changes in carbon stock.	same in the baseline case and in the project scenario. The post-deforestation (conversion) scenario is not stratified, instead the average of carbon stock values referring to land uses after deforestation 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 sequestration, emissions and leakage estimates. The module focuses on the following sources of uncertainty: ● Determining 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 design must justify that it is using an arguably conservative number and an uncertainty of 0% can be used for this component.	This module is mandatory when using the REDD+ MF methodology.
VT0001 "Tool for the Demonstration and Assessment of Additionality in VCS 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 ground within the proposed project boundary, executed with or without registration as a VCS AFOLU project, will not lead to the violation of any applicable law, even if the law is not applied. 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 must 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 complies with all relevant laws, statutes and regulatory frameworks. The approach to baseline using this tool was described in section 3.1.4.

3.1.3 Project Boundary

The methodology VM0007 includes the six carbon pools listed in Table 21 below, indicating whether they were included or excluded within the proposed AUD and APD project activity, as well as their respective justifications.

Table 21. GHG sources, sinks and reservoirs included or not within the Samaúma Projects boundaries.

Source		Gas	Included?	Justification/Explanation
Baseline	Biomass burning	CO_2	Excluded	Excluded as recommended by the applied methodology. 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.
		N_2O	Included	Included as non-CO_2 emissions from biomass burning in the baseline scenario, according to the methodology.
		Other	Excluded	No other GHG gasses were considered in this project activity.
	Livestock emissions	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 biomass burning increase is predicted to occur in the project scenario compared to the baseline case. Therefore, it is considered insignificant.
		CH_4	Included	Included as non-CO2 emissions from biomass burning in the project scenario, according to the methodology.
		N_2O	Included	Included as non-CO2 emissions from biomass burning in the project scenario, according to the methodology.
		Other	Excluded	No other GHG gasses were considered in this project activity.
		CO_2	Excluded	Not a significant source.

	Livestock emissions	CH_4	Excluded	No livestock increase is predicted to occur in the project scenario compared to the baseline case. Therefore, it is considered insignificant.
		N_2O	Excluded	No livestock increase is predicted to occur in the project scenario compared to the baseline case. Therefore, it is considered insignificant.
		Other	Excluded	No other GHG gasses were considered in this project activity.

The carbon stocks included in the Project, as well as their justification, are shown in Table 22 below, considering the proposed scope of APD and AUD activities.

Table 22. Carbon stock compartments included or not in the Samaúma project.

Carbon stock	Included/Excluded	Justification
Aboveground Biomass	Tree: included	Changing the carbon stock in this stock is always significant and mandatory according to VM0007
	Non-tree: included	Stock included in the forestry 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 woody biomass of trees, 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 into agricultural crop areas. Not to be measured in conversion to pastures and crops
Long term wood products	Excluded	Project activities do not include logging for commercial purposes

3.1.4 Baseline Scenario

For the Samaúma Project, the conversion of forested lands into non-forested land in the baseline scenario is considered from the perspective of two components: Avoided Unplanned Deforestation (AUD) and Avoided Planned Deforestation (APD). The landowner is not able to afford the efforts and costs to maintain long-term surveillance of the project boundaries to prevent unplanned deforestation and eventual encroachments.

The Samaúma project assumes a planned deforestation plan, whose land use conversion activity is limited to 20% of the property area. According to this plan, the area equivalent to 20% of the property would be subjected to clear cutting, followed by conversion to pasture.

Thus, the project fits into the AFOLU REDD categories for the Avoided Unplanned Deforestation (AUD) and Avoided Planned Deforestation (APD) categories.

Selection of the most likely baseline scenario for the project - AUD

Regarding the baseline of the AUD component, studies indicate that the municipality of Apuí was the center of livestock expansion in the southern region of the State of Amazonas.

The municipality of Apuí has the second largest cattle herd in the Amazonas State, second only to Boca do Acre, and cattle ranching represents 51% of the municipal GDP at the time of the most recent government agricultural census[121]. This agricultural production is strongly linked to the levels of legal and illegal deforestation, with a positive correlation being observed between the growth of livestock and the deforestation curve in the municipality[122]. In connection with the local cattle ranchers' union, which represents about 80% of Apuí cattle ranchers, the institute IDESAM (2011)[123] notes that if their Legal Reserves had only 40% of their required areas, it would be enough to make cattle ranching unfeasible.

Unplanned deforestation is expected to occur in the project area in the absence of the REDD+ Project. In line with the prevailing characteristics of the region, the baseline scenario is cattle ranching leading to illegal levels of deforestation.

Selection of the most likely baseline scenario for the project - (APD)

[121] Censo Agro 2017. Available at: https://censoagro2017.ibge.gov.br/ . Acessed on: 14/12/2022.

[122] Sistema extensivo versus sistema silvipastoril intensivo para pecuária de leite na Amazônia Brasileira: produtividade, benefícios socioeconômicos e ecossistêmicos para mitigação e adaptação às mudanças climáticas. Available at: < https://www.researchgate.net/publication/344548254_Sistema_extensivo_versus_sistema_silvipastoril_intensivo_para_pecuaria_de_leite_na_Amazonia_Brasileira_produtividade_beneficios_socioeconomicos_e_ecossistemicos_para_mitigacao_e_adaptacao_as_mudancas_ > Acessed on: 14/12/2022.

[123] Relatório Institucional Idesam 2011. Available at: https://www.idesam.org.br/wp-content/uploads/2013/04/Relatorio_IDESAM_2011.pdf . Acessed on: 14/12/2022.

The APD component of the Samaúma project avoids the deforestation of 14,158.28 ha of planned deforestation from 2021 to 2042.

This component concerns forest land that may legally receive authorization to be converted into non-forest land by the project proponents, which will not occur due to the Samaúma project activity. According to the Brazilian Forestry Code, proponents can suppress up to the prescribed legal limit of 20% of the property. The agent of deforestation in the APD component is the landowner.

3.1.5 Additionality

In accordance with 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 to assess alternatives and proposed design scenarios, and to demonstrate the additionality of the project: "Combined tool to identify baseline scenario and demonstrate additionality in A/R CDM project activities (T-ADD) (Version 01)".[124]

The additionality analysis, applying the T-ADD tool (Version 1), is presented below for AUD and APD activities.

Avoided Unplanned Deforestation (AUD)

STEP 0. Preliminary screening based on project start date VCS AFOLU Project

The project start date for AUD activities is set after December 31, 1999, specifically December 20, 2020. The project owner already had contractual intentions to conserve forests and REDD projects, as demonstrated by the purchase and sale agreement that demonstrate the acquisition of the Fazenda Samaúma and Fazenda Samaúma Remanescente properties, with the objective of generating carbon credits and preserving the forest cover. The agreement between Terra Vista Gestora de Recursos Ltd. and the owner of the project area reinforces that the sale of carbon credits, in this case VERs, was seriously considered in the decision to proceed with the project activity.

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

Sub-step 1a. Identify credible alternative land use scenarios for the proposed VCS AFOLU project activity

Scenario I: Continued pre-project land use

In the pre-project scenario there are no activities being carried out in the project area, and there are no costs or revenues for this scenario. Thus, Scenario I is considered the least plausible.

[124] https://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-02-v1.pdf

Scenario II: Project activity executed without being registered as VCS AFOLU project

In this scenario, the project activity is executed without registration as VCS AFOLU project. As there are no economic activities beyond the implementation of the REDD project, the scenario involves costs but not revenues. Thus, the activity of conservation and forest maintenance in Scenario II is not financially attractive without the revenue from carbon credits.

Scenario III: Conversion of forest land into other common land uses in the region – "business as Usual - BAU"

According to MAPBIOMAS[125], in the last two decades, the pasture area has grown by 40% in the Amazon. For the period 2011-2022, the increase in pasture areas in the municipality of Apuí was 51.48% and the growth trend of areas under livestock activity in the municipality is evidenced by the monitoring of land use and cover[126], highlighted in the figure below .

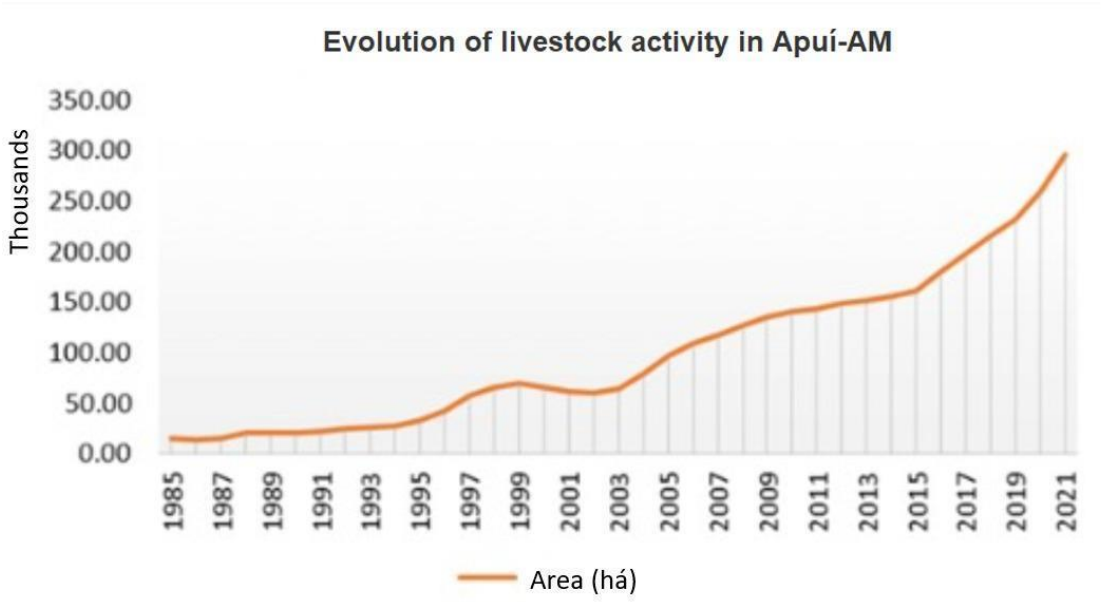

Figure 45. Evolution of livestock activity (occupied area in ha) in Apuí, Amazonas.

[125] Available at: https://mapbiomas-br-site.s3.amazonaws.com/MapBiomas_Pastagem_2022_30_11.pdf
[126] Available at: https://plataforma.brasil.mapbiomas.org/

The municipality of Apuí stands out with the 3rd largest effective herd of cattle, corresponding to 10.53% of cattle production in the state of Amazonas, according to the Municipal Livestock Survey – PPM/IBGE[127]. In 2021, the effective municipal herd was 168,000 head of cattle, surpassed only by the municipalities of Lábrea and Boca do Acre, respectively (Figure 46).

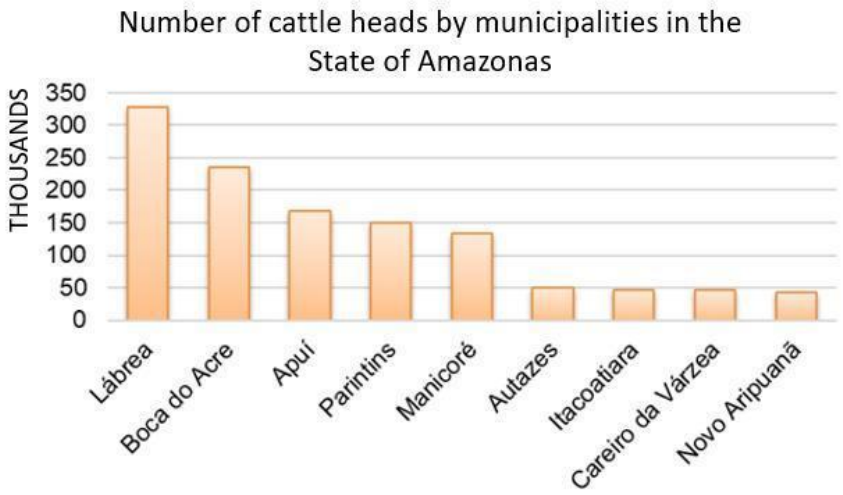

Figure 46. Cattle herd in the state of Amazonas.

For this scenario, the illegal conversion of forest cover applies, as a common activity in the region. Non-compliance with the Brazilian Forest Code (law nº 12,272/2012) is real when producers voluntarily decide not to comply with what the code provides for the conservation of Legal Reserve and Permanent Preservation areas, deforesting additional areas to increase the area explored on the property. This would be the likely scenario, in the absence of the project activity.

Scenario IV: Forest conversion and legal logging in the area

In addition to livestock as one of the main drivers of deforestation, logging activity is also concentrated in the municipality. Logging in Apuí affects economically important species such as cedar (*Cedrela odorata*) and ipê (*Tabebuia sp.*). Exploitation is carried out without forest management practices or conservationist measures to avoid environmental damage. Logging is also known as a driver of deforestation in the Amazon as it finances the removal of forest cover for other purposes such as livestock and agriculture[128]. In general

[127] Available at: https://sidra.ibge.gov.br/geratabela?name=Tabela%202.4%20-%20Amazonas.xlsx&format=xlsx&medidas=true&query=t/3939/g/13/v/all/p/2021/ c79/all/l/p%2Bv,c79,t

[128] RAZERA, A. Deforestation dynamics in a new frontier in southern Amazonas: analysis of beef cattle in the municipality of Apuí, (Master's Dissertation, National Institute of Research in the Amazon), Manaus, Amazonas - Brazil. 100p.2005. http://philip.inpa.gov.br/publ_livres/Teses%20e%20dissertacoes%20orientadas/Dissertacao_Allan%20Razera.pdf

terms, this scenario would generate income for the owner and is equivalent to the deforestation of up to 20% of the forest cover for conversion to other land uses, such as pasture, in parallel with the logging activity in the remaining forest cover.

Scenario V: Illegal deforestation caused by external agents

The costs of surveillance and monitoring of the property are a challenge for the owner, preventing the effective control of the property's borders and facilitating the invasion of external agents. Thus, the additional financial incentive is of paramount importance to ensure the monitoring and protection of the forest cover on the property.

All land use scenarios identified above can be considered realistic and credible as they currently exist and are technically feasible in the project region. For all land use scenarios, credibility is supported by current Business as Usual - BAU practices attested by literature and local observations.

Outcome of Sub-step 1a: The most credible alternative land use scenarios that could have occurred on the land within the project boundary are Scenarios III to V, described above.

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

i) Demonstration that the most credible land use scenarios identified in **Sub-step 1a** are in compliance with all applicable mandatory legal and regulatory requirements:

Scenario III: Conversion of forest land into other common land uses in the region – “business as Usual - BAU”

This scenario complies with the Brazilian Forest Code, as landowners in the project region can allocate 20% of agricultural land for livestock. This scenario would not be in compliance with the Law if landowners exceeded the threshold of 20% deforestation on a given property, which is not expected to occur in the project area during the life of the project, according to the deforestation projections. This scenario complies with legal and regulatory requirements.

Scenario IV: Forest conversion and legal logging of the area

Supported by the Brazilian Forest Code, the farm owner must officially allocate 80% of its total area as RL (“Reserva Legal”, or Legal Reserve) for conservation. The excess 20% of the land can be deforested by license. In the RL area, only the use of some resources is allowed, such as the extraction of forest

products (non-timber and timber) and beekeeping or activities that do not promote clear cutting of vegetation. Therefore, this scenario complies with legal and regulatory requirements.

ii) Demonstration that applicable mandatory legal requirements are systematically not complied with and that non-compliance with requirements is widespread:

Scenario V: Illegal deforestation caused by external agents

This scenario is not in compliance with all mandatory laws and regulations. In the project region, Apuí emerged as a critical municipality with devastated forest in the Amazon. According to INPE, 329.88 km2 were illegally deforested in 2021, surpassing the 2020 record (of 259.63 km2). The data at Mapbiomas.alerta[129] and INPE/DETER[130] was checked. In this context, land grabbing and invasion by squatters is a widespread practice. Therefore, it is demonstrated that SCENARIO 5 is valid.

Outcome of Sub-step 1b: It has been demonstrated that Scenarios III to V are plausible alternative land use scenarios for this VCS AFOLU project activity.

Sub-step 1c. Baseline Scenario Selection

For the baseline scenario selection, Step 2 (Barrier Analysis) was chosen.

STEP 2: Barrier Analysis

Sub-step 2a. Identification of barriers that would prevent the implementation of at least one alternative land use scenario

According to T-ADD "Combined tool to identify the baseline scenario and demonstrate additionality in CDM A/R project activities". Barriers that previously identified land use scenarios could potentially face are the following:

I. Investment barriers:
   - Debt finance is not available for land use scenarios;
   - There is no access to international capital markets;
   - Lack of access to credit.

II. Institutional Barriers:

[129] https://plataforma.alerta.mapbiomas.org/mapa?monthRange%5b0%5d=2020-01&monthRange%5b1%5d=2020-12&territoryType=city&territory=17041&territoryIds%5b0%5d=17041&authorization=false

[130] http://terrabrasilis.dpi.inpe.br/app/dashboard/deforestation/biomes/amazon/increments

- Risk related to changes in government policies or laws;
- Lack of application of forest legislation or related to land use.

III. Barriers due to social conditions and land use practices:

- Widespread illegal practices (eg illegal grazing, extraction of non-timber products and logging).

IV. Barriers related to land tenure, property, inheritance and property rights:

- Lack of adequate land tenure legislation and regulations to support tenure security;
- Possibilities of high price risk due to fluctuations in prices of products related to the project activity during the project period, in the absence of efficient markets.

Sub-step 2b. Elimination of land use scenarios that are prevented by the identified barriers

I. Investment barriers: this barrier does not prevent any of the scenarios identified in Sub-step 1b: Scenarios III to V. In Brazil, traditionally, landowners intend to implement agricultural activities, receive tax incentives, credit lines and production costs, making, for example, livestock activity accessible and attractive to landowners. Another common way of financing livestock activity in the region is the sale of wood after clear cutting of the forest.

II. Institutional barriers: Brazil has been experiencing, in recent years, one of the periods of greatest political turmoil ever seen in the country's history, which denotes uncertainties in the market scenario from the perspective of investors. Therefore, this barrier applies to Scenarios III to V, since the alternative land use (livestock) is subject to obstacles arising from the greater or lesser risk related to changes in government policies or laws and failures in the effective application of related legislation to land use in unison.

III. Barriers due to social conditions and land use practices: squatter invasion practices, widespread and historically reported throughout the state of Amazonas, characterize an obstacle for Scenarios III and IV, where alternative land use is legal. On the contrary, this barrier becomes an incentive for squatters and land grabbers for Scenario V, who use illegal methods to obtain land and implement illegal logging.

IV. Barriers relating to land tenure, ownership, inheritance and property rights: Inconsistencies over land tenure rights preclude any legally viable alternative land use scenario, applying to Scenarios III and IV and represents an incentive for untying current illegality in Scenario V.

Sub-step 2c. Determining the baseline scenario (if allowed by the barrier analysis)

Given the above, Scenario V is not precluded by any of the barriers identified above in Sub-Step 2a. Therefore, it can be considered as the most plausible alternative land use scenario.

Scenario II “Project activity executed without being registered as VCS AFOLU project” is not included in the list of land use scenarios that are not impeded by any barrier, being only one (01) scenario of land use free of impediments . Thus, it is necessary to continue with Step 04.

STEP 04. Common practice test

According to the T-ADD "Combined CDM tool to identify the baseline scenario and demonstrate additionality in CDM A/R project activities", the previous steps are complemented with an analysis of the extent to which similar activities have already spread in the geographic area of the proposed activity of the VCS AFOLU project. This test is a credibility check to demonstrate additionality that complements the barrier analysis (STEP 02).

For this analysis, similar activities were considered in the project region, private natural heritage reserves were analyzed, a land category known as “RPPN” in Brazil. This is because they are private conservation reserves, and in this sense are comparable to the Samaúma REDD+ area.

In the state of Amazonas there are only 14 areas of this type, with an average of 62.8 ha (ICMBio)[131]. The RPPN Peugeot-ONF Brasil is the closest to the Samaúma Project, has an area of 1,781.30 ha and is located 279 km away. Therefore, we can cite at least two essential differences: the private conservation areas are incomparably smaller in size and are very distant (279 km) from the project area, and are not located in the same jurisdictional area (municipality).

3.1.6 Methodology Deviations

The Samaúma project has no methodology deviation.

3.2 Quantification of GHG Emission Reductions and Removals

3.2.1 Baseline Emissions

In the Samaúma project area there are 3 strata, considering the AUD and APD components. The area stratification was based on module VMD0016 (“X-STR Methods for Stratification of the project area, version 1.1”), as shown in Table 23 below.

Table 23. Strata of the Samaúma project.

Strata	Description	Area (ha)
I	Submontane Open Ombrophylous Forest	28,598.92

[131] Available at: https://www.icmbio.gov.br/educacaoambiental/politicas/snuc.html. Accessed on: 12/14/2022.

Strata	Description	Area (ha)
II	Alluvial Dense Ombrophylous Forest	575.87
III	Submontane Dense Ombrophylous Forest	39,641.03

The project's net carbon stock changes and greenhouse gas emissions were calculated using two different modules of the VM0007 methodology. To estimate baseline emissions related to APD areas, module VMD0006 “Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation/forest degradation and planned wetland degradation (BL-PL)” was used. APD areas comprise forest lands on which proponents can apply for permission to clear forest areas (20% of the property in accordance with the legal limit prescribed in the Brazilian Forest Code). Regarding the estimation of baseline emissions from unplanned deforestation, AUD areas, where deforestation agents change land use from forest to livestock, module VMD0007 “Estimation of baseline carbon stock changes and greenhouse gas emissions'' was applied from unplanned deforestation and unplanned wetland degradation” (BL-UP)”.

Baseline net GHG emissions from planned deforestation (ODA) 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:

$\Delta C_{BSL,planned}$ = Baseline net GHG emissions from planned deforestation in the year t*; t CO2-e;

$\Delta C_{BSL,i,t}$ = Net carbon stock change in all stocks in strata i at baseline in year t; t CO2-e

$GHG_{BSL-E,i,t}$= GHG emissions as a result of deforestation activities at the project boundary in baseline stratum i in the year t: t CO2-e yr-1

i1,2,3, … stratum M

t1,2,3, … t* years elapsed since the planned start of the project activity

Net greenhouse gas emissions for unplanned deforestation (AUD) were determined by applying module VMD0007.

The X-UNC module “Estimation of uncertainty for REDD project activities (X-UNC) Sectoral Scope 14” focuses on the following sources of uncertainty applicable to this project: i) Determination of deforestation and degradation rates; ii) Uncertainty associated with estimating carbon stocks and changes in carbon stocks.

It is assumed that there is zero uncertainty in the baseline deforestation rate (item "i" above), as the numbers are equal to a long-term average, for both activities (AUD-BL-UP) which is the case of this project, where the deforestation rate was taken as the average of the reference period.

To estimate the baseline deforestation rate considering the APD component, an analysis of proxy areas was carried out to determine the parameter D% = 4.69. The uncertainty calculation was performed with a confidence level of 95% considering the standard deviation values and the number of sampled proxy areas. The observed uncertainty was 5.24%.

Regarding baseline and post-deforestation carbon stocks, baseline forest carbon stock data were obtained from peer-reviewed literature applied to the geographic region of the project, according to biome, and climate regime such as in the project area. project. All values were obtained from the National GHG Inventory (Ministry of Science, Technology and Innovation, 2020). Regarding the total carbon stock data for the project estimates, the values applied were as follows:

Table 24. Strata and total carbon stock (tCO_2/ha).

Stratum	Total Carbon Stock* (tCO_2/ha)
Submontane Open Ombrophylous Forest	394.42
Alluvial Dense Ombrophylous Forest	342.14
Submontane Dense Ombrophylous Forest	526.61

*Total = C stock in aboveground biomass + C stock in belowground biomass

For the post-deforestation carbon stock (i.e. pasture carbon stock), the value (27.5 tCO_2/ha) adopted by the authority responsible for the National GHG Inventory (Ministry of Science, Technology and Innovation, 2020) was used in the calculations. Thus, it can be considered that a conservative value indicated by the host country was used and the uncertainty in this case can be considered as zero.

Given that initial carbon stocks are the only source of uncertainty in estimating total net reductions in GHG emissions, the uncertainty was assumed to be zero for all forest types. No assumptions resulted in uncertainty, as the uncertainty allowed in this REDD+ MF methodology is +/- 15% at a 95% confidence level.

Location analysis

As the deforestation site analysis was not required as it is a transitional deforestation setting, the following conservative approach is defined as mandatory according to the methodology: "It is assumed that future deforestation will occur first in the strata with the lowest stocks of carbon (in all relevant carbon pools)". Specifically, the stratum with the lowest carbon stock of the three classes, where future deforestation is predicted to occur first, is the Alluvial Dense Ombrophylous Forest with emergent canopy.

Table 25 - Deforestation risk strata for the Samaúma project.

Submontane Open Ombrophilous Forest	Alluvial Dense Ombrophilous Forest	Submontane Dense Ombrophilous Forest
(ha)		
28.598,92	575,87	39.641,03

Estimation of annual areas of unplanned baseline deforestation in DRR

The Tables below present the baseline projections of annual unplanned deforestation for the project area in the three assessed strata.

Table 26 - Baseline projection of unplanned annual deforestation for the project area, over the lifetime of the Samaúma Project, in Stratum I - Submontane Open Ombrophylous Forest.

Stratum I		
Submontane Open Ombrophylous Forest		
Year	ha/year	ha (accumulated)
2021	22.78	22.78
2022	69.47	92.26
2023	116.42	208.68
2024	163.13	371.81
2025	209.51	581.32
2026	255.79	837.11
2027	303.40	1,140.51
2028	350.14	1,490.65
2029	395.44	1,886.08
2030	440.72	2,326.80
2031	488.46	2,815.26

2032	536.19	3,351.45
2033	584.25	3,935.70
2034	632.58	4,568.28
2035	681.21	5,249.48
2036	730.15	5,979.63
2037	779.45	6,759.08
2038	829.12	7,588.20
2039	879.23	8,467.43
2040	929.81	9,397.24
2041	980.95	10,378.19
2042	1,032.73	11,410.92
2043	1,085.26	12,496.18
2044	1,138.72	13,634.91
2045	1,193.34	14,828.25
2046	1,249.47	16,077.72
2047	1,307.67	17,385.39
2048	1,368.95	18,754.34
2049	1,435.35	20,189.68
2050	1,512.27	21,701.95
2051	1,359.03	23,060.98

Table 27 - Baseline projection of annual deforestation for the project area, over the lifetime of the Samaúma Project, in stratum II - Alluvial Dense Ombrophylous Forest.

Stratum II		
Alluvial Dense Ombrophylous Forest		
Year	ha/year	ha (accumulated)
2020	0.0	0.0
2021	0.0	0.0
2022	0.0	0.0
2023	0.0	0.0
2024	0.0	0.0
2025	0.0	0.0
2026	0.0	0.0
2027	0.0	0.0
2028	0.0	0.0

2029	0.0	0.0
2030	0.0	0.0
2031	0.0	0.0
2032	0.0	0.0
2033	0.0	0.0
2034	0.0	0.0
2035	0.0	0.0
2036	0.0	0.0
2037	0.0	0.0
2038	0.0	0.0
2039	0.0	0.0
2040	0.0	0.0
2041	0.0	0.0
2042	0.0	0.0
2043	0.0	0.0
2044	0.0	0.0
2045	0.0	0.0
2046	0.0	0.0
2047	0.0	0.0
2048	0.0	0.0
2049	0.0	0.0
2050	0.0	0.0

Table 28 - Baseline projection of annual deforestation for the project area, over the lifetime of the Samaúma Project, in stratum III - Submontane Dense Ombrophylous Forest.

Stratum III		
Submontane Dense Ombrophylous Forest		
Year	ha/year	ha (accumulated)
2021	0.0	0.0
2022	0.0	0.0
2023	0.0	0.0

2024	0.0	0.0
2025	0.0	0.0
2026	0.0	0.0
2027	0.0	0.0
2028	0.0	0.0
2029	0.0	0.0
2030	0.0	0.0
2031	0.0	0.0
2032	0.0	0.0
2033	0.0	0.0
2034	0.0	0.0
2035	0.0	0.0
2036	0.0	0.0
2037	0.0	0.0
2038	0.0	0.0
2039	0.0	0.0
2040	0.0	0.0
2041	0.0	0.0
2042	0.0	0.0
2043	0.0	0.0
2044	0.0	0.0
2045	0.0	0.0
2046	0.0	0.0
2047	0.0	0.0
2048	0.0	0.0
2049	0.0	0.0
2050	0.0	0.0
2051	0.0	0.0

As a result, the average annual deforestation rate in the Submontane Open Ombrophylous Forest stratum is 1.11%.

With respect to the baseline of planned deforestation (APD), the BL-PL module requires knowledge of the rate (area deforested per year) at which the planned areas will be deforested per stratum (*i*) per year (*t*) during the period of the project.

For this purpose, 12 proxy areas were defined, under the same class of deforestation agent of the project area and similarity between forest classes, soil classes, slope and elevation classes. The analysis of the proxy areas was carried out based on existing land use and change data generated from deforestation monitoring platforms (PRODES/DETER/INPE) and land use and land cover (MapBiomas). The aptitude for converting the project area into non-forest is pasture. The average annual deforestation rate of the proxy areas was calculated at 4.69%. The map in Figure 47 presents the geographic location of the project area and the 12 selected proxy areas.

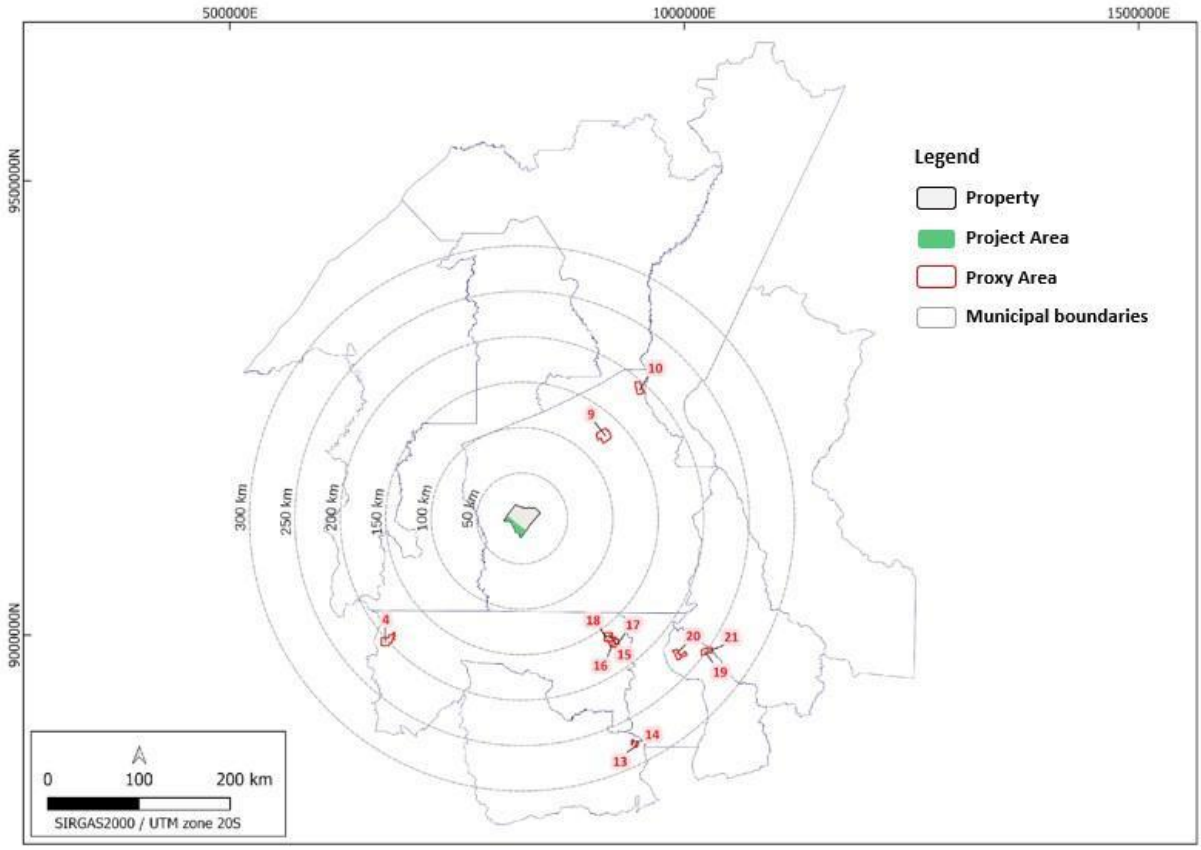

Figure 47. Geographic location of the project area and the 12 selected proxy areas.

Areas of planned deforestation at baseline are presented in the Table 29 below.

Table 29 - Baseline projection of planned annual deforestation for the project area, over the lifetime of the Samaúma Project, in stratum I - Submontane Open Ombrophylous Forest.

Stratum I		
Submontane Open Ombrophylous Forest		
Year	ha/year	ha (accumulated)
2021	664.02	664.02
2022	664.02	1,328.05
2023	664.02	1,992.07
2024	664.02	2,656.09
2025	664.02	3,320.12
2026	664.02	3,984.14
2027	664.02	4,648.16
2028	664.02	5,312.19
2029	225.75	5,537.94
2030	-	5,537.94
2031	-	5,537.94
2032	-	5,537.94
2033	-	5,537.94
2034	-	5,537.94
2035	-	5,537.94
2036	-	5,537.94
2037	-	5,537.94
2038	-	5,537.94
2039	-	5,537.94
2040	-	5,537.94
2041	-	5,537.94
2042	-	5,537.94
2043	-	5,537.94
2044	-	5,537.94
2045	-	5,537.94
2046	-	5,537.94
2047	-	5,537.94
2048	-	5,537.94

2049	-	5,537.94
2050	-	5,537.94
2051	-	5,537.94
2021	664.02	664.02
2022	664.02	1,328.05
2023	664.02	1,992.07

Table 30 - Baseline projection of planned annual deforestation for the project area, over the lifetime of the Samaúma Project, in stratum II - Alluvial Dense Ombrophylous Forest.

Stratum II		
Alluvial Dense Ombrophylous Forest		
Year	ha/year	ha (accumulated)
2021	-	-
2022	-	-
2023	-	-
2024	-	-
2025	-	-
2026	-	-
2027	-	-
2028	-	-
2029	438.27	438.27
2030	31.31	469.58
2031	-	469.58
2032	-	469.58
2033	-	469.58
2034	-	469.58
2035	-	469.58

2036	-	469.58
2037	-	469.58
2038	-	469.58
2039	-	469.58
2040	-	469.58
2041	-	469.58
2042	-	469.58
2043	-	469.58
2044	-	469.58
2045	-	469.58
2046	-	469.58
2047	-	469.58
2048	-	469.58
2049	-	469.58
2050	-	469.58
2051	-	469.58

Table 31 - Baseline projection of planned annual deforestation for the project area, over the lifetime of the Samaúma Project, in stratum III - Submontane Dense Ombrophylous Forest.

Stratum III		
Submontane Dense Ombrophylous Forest		
Year	ha/year	ha (accumulated)
2020	-	-
2021	-	-
2022	-	-
2023	-	-
2024	-	-
2025	-	-
2026	-	-
2027	-	-
2028	-	-

2029	632.71	632.71
2030	664.02	1,296.74
2031	664.02	1,960.76
2032	664.02	2,624.78
2033	664.02	3,288.81
2034	664.02	3,952.83
2035	664.02	4,616.85
2036	664.02	5,280.88
2037	664.02	5,944.90
2038	664.02	6,608.92
2039	664.02	7,272.95
2040	664.02	7,936.97
2041	213.57	8,150.54
2042	-	8,150.54
2043	-	8,150.54
2044	-	8,150.54
2045	-	8,150.54
2046	-	8,150.54
2047	-	8,150.54
2048	-	8,150.54
2049	-	8,150.54
2050	-	8,150.54

Carbon Stock

Three classes of forests were identified in the project area: Submontane Open Ombrophylous Forest (covering 41.6% of the total area); Alluvial Dense Ombrophylous Forest (0.84%); and Submontane Dense Ombrophylous Forest (57.6%). Carbon stock values for all forest types were obtained from the literature: Ministry of Science, Technology and Innovation (2020)[132], with values above ground ranging from 395 to 402.4 t/ha, as shown below. To calculate the carbon stocks (above and below ground) for each stratum, the carbon values (tC/ha) were multiplied by the conversion factor 44/12 (conversion factor from tC to tCO_2).

[132] https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/sirene/publicacoes/relatorios-de-referencia-setorial/pdf/invetario4/lulucf-jan21.zip

The aboveground and belowground carbon stocks in different strata in the project area are presented in Table 32.

Table 32. Aboveground and belowground carbon stocks in different strata in the Samaúma project area.

Parameter	Stratum			Total
	Submontane Open Ombrophylous Forest	Alluvial Dense Ombrophylous Forest	Submontane Dense Ombrophylous Forest	
Area (ha)	28,598.92	575.87	39,641.03	68,815.82
Proportion (%)	41.6	0.8	57.6	100
Aboveground C stock (tC/ha)	106.5	90.5	139.3	336.3
Belowground C stock (tC/ha)	10.7	28.1	43.2	82
Total aboveground C stock (t)	3,045,784.90	52,116.24	5,521,995.48	23,142,760.30
Total belowground C stock (t)	306,008.44	16,181.95	1,712,492.50	5,642,897.20
Aboveground C stock (tCO_2)	11,167,878.30	191,092.86	20,247,316.76	31,606,287.80
Belowground C stock (tCO_2)	1,122,030.90	59,333.81	6,279,139.15	7,460,503.90
CAB_tree	390.5	331.83	510.77	-
CBB_tree	39.23	103.03	158.4	-

Baseline emissions from unplanned deforestation - AUD

For the estimation of emissions from unplanned 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 aboveground and belowground carbon stocks in the forest for each stratum. The result is shown in the tables below. The tables (Table 33 to 35) below show the projection of baseline gross emissions from unplanned deforestation for each stratum present in the project area.

Table 33. Projected gross baseline emissions from emissions from unplanned deforestation in stratum I within the Samaúma project area.

Stratum I		
Submontane Open Ombrophylous Forest		
Year	(tCO_2/year)	tCO_2 (Accumulated)
2021	8,986.88	8,986.88
2022	27,401.66	36,388.54
2023	45,918.58	82,307.13
2024	64,344.17	146,651.30
2025	82,635.31	229,286.62
2026	100,889.57	330,176.19
2027	119,668.26	449,844.45
2028	138,101.44	587,945.89
2029	155,969.37	743,915.26
2030	173,829.14	917,744.41
2031	192,658.47	1,110,402.88
2032	211,486.61	1,321,889.49
2033	230,441.29	1,552,330.78
2034	249,504.30	1,801,835.07
2035	268,683.62	2,070,518.69
2036	287,988.80	2,358,507.49
2037	307,431.31	2,665,938.80
2038	327,025.13	2,992,963.92
2039	346,787.45	3,339,751.37
2040	366,739.74	3,706,491.12
2041	386,909.29	4,093,400.41
2042	407,331.47	4,500,731.88
2043	428,053.35	4,928,785.23
2044	449,139.53	5,377,924.76

2045	470,682.27	5,848,607.03
2046	492,820.13	6,341,427.16
2047	515,776.00	6,857,203.16
2048	539,944.50	7,397,147.65
2049	566,133.91	7,963,281.56
2050	596,473.01	8,559,754.58
2051	536,034.03	9,095,788.60

Table 34. Projected gross baseline emissions from emissions from unplanned deforestation in stratum II within the Samaúma project area.

Stratum II		
Alluvial Dense Ombrophylous Forest		
Year	(tCO_2/year)	tCO_2 (Accumulated)
2021	0.0	0.0
2022	0.0	0.0
2023	0.0	0.0
2024	0.0	0.0
2025	0.0	0.0
2026	0.0	0.0
2027	0.0	0.0
2028	0.0	0.0
2029	0.0	0.0
2030	0.0	0.0
2031	0.0	0.0
2032	0.0	0.0
2033	0.0	0.0
2034	0.0	0.0
2035	0.0	0.0
2036	0.0	0.0
2037	0.0	0.0
2038	0.0	0.0
2039	0.0	0.0

2040	0.0	0.0
2041	0.0	0.0
2042	0.0	0.0
2043	0.0	0.0
2044	0.0	0.0
2045	0.0	0.0
2046	0.0	0.0
2047	0.0	0.0
2048	0.0	0.0
2049	0.0	0.0
2050	0.0	0.0
2051	0.0	0.0

Table 35. Projected gross baseline emissions from emissions from unplanned deforestation in stratum III within the Samaúma project area.

Stratum III		
Submontane Dense Ombrophylous Forest		
Year	(tCO_2/year)	tCO_2 (Accumulated)
2021	0.0	0.0
2022	0.0	0.0
2023	0.0	0.0
2024	0.0	0.0
2025	0.0	0.0
2026	0.0	0.0
2027	0.0	0.0
2028	0.0	0.0
2029	0.0	0.0
2030	0.0	0.0
2031	0.0	0.0
2032	0.0	0.0
2033	0.0	0.0
2034	0.0	0.0
2035	0.0	0.0
2036	0.0	0.0

2037	0.0	0.0
2038	0.0	0.0
2039	0.0	0.0
2040	0.0	0.0
2041	0.0	0.0
2042	0.0	0.0
2043	0.0	0.0
2044	0.0	0.0
2045	0.0	0.0
2046	0.0	0.0
2047	0.0	0.0
2048	0.0	0.0
2049	0.0	0.0
2050	0.0	0.0
2051	0.0	0.0

Baseline emissions from planned deforestation - APD

For the estimation of 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 aboveground and belowground carbon stocks in the forest for each stratum. The results are shown in the tables (Table 36 to 39) below.

Table 36. Projected gross baseline emissions from planned deforestation in Stratum I within the Samaúma project area.

Stratum I		
Submontane Open Ombrophylous Forest		
Ano	tCO_2eq/year	tCO_2eq/Accumulated
2021	284,834.14	284,834.14
2022	284,834.14	569,668.27
2023	284,834.14	854,502.41
2024	284,834.14	1,139,336.55
2025	284,834.14	1,424,170.68

2026	284,834.14	1,709,004.82
2027	284,834.14	1,993,838.95
2028	284,834.14	2,278,673.09
2029	96,837.35	2,375,510.44
2030	-	2,375,510.44
2031	-	2,375,510.44
2032	-	2,375,510.44
2033	-	2,375,510.44
2034	-	2,375,510.44
2035	-	2,375,510.44
2036	-	2,375,510.44
2037	-	2,375,510.44
2038	-	2,375,510.44
2039	-	2,375,510.44
2040	-	2,375,510.44
2041	-	2,375,510.44
2042	-	2,375,510.44
2043	-	2,375,510.44
2044	-	2,375,510.44
2045	-	2,375,510.44
2046	-	2,375,510.44
2047	-	2,375,510.44
2048	-	2,375,510.44
2049	-	2,375,510.44
2050	-	2,375,510.44
2051	-	2,375,510.44

Table 37. Projected gross baseline emissions from planned deforestation in Stratum II within the Samaúma project area.

Stratum II		
Alluvial Dense Ombrophylous Forest		
Year	tCO_2eq/year	tCO_2eq/Accumulated
2021	-	-

2022	-	-
2023	-	-
2024	-	-
2025	-	-
2026	-	-
2027	-	-
2028	-	-
2029	190,242.48	190,242.48
2030	13,590.92	203,833.41
2031	-	203,833.41
2032	-	203,833.41
2033	-	203,833.41
2034	-	203,833.41
2035	-	203,833.41
2036	-	203,833.41
2037	-	203,833.41
2038	-	203,833.41
2039	-	203,833.41
2040	-	203,833.41
2041	-	203,833.41
2042	-	203,833.41
2043	-	203,833.41
2044	-	203,833.41
2045	-	203,833.41
2046	-	203,833.41
2047	-	203,833.41

2048	-	203,833.41
2049	-	203,833.41
2050	-	203,833.41
2051	-	203,833.41

Table 38. Projected baseline gross emissions from planned deforestation in Strata III within the Samaúma project area.

Stratum III		
Submontane Dense Ombrophylous Forest		
Year	tCO_2eq/year	tCO_2eq/Accumulated
2021	-	-
2022	-	-
2023	-	-
2024	-	-
2025	-	-
2026	-	-
2027	-	-
2028	-	-
2029	-	-
2030	422,620.86	422,620.86
2031	443,534.38	866,155.25
2032	443,534.38	1,309,689.63
2033	443,534.38	1,753,224.02
2034	443,534.38	2,196,758.40
2035	443,534.38	2,640,292.79
2036	443,534.38	3,083,827.17
2037	443,534.38	3,527,361.55

2038	443,534.38	3,970,895.94
2039	443,534.38	4,414,430.32
2040	443,534.38	4,857,964.71
2041	443,534.38	5,301,499.09
2042	142,654.10	5,444,153.19
2043	-	5,444,153.19
2044	-	5,444,153.19
2045	-	5,444,153.19
2046	-	5,444,153.19
2047	-	5,444,153.19
2048	-	5,444,153.19
2049	-	5,444,153.19
2050	-	5,444,153.19
2051	-	5,444,153.19

Table 39. Sum of projected baseline gross emissions from planned deforestation in Strata I, II and III within the Samaúma project area.

Sum of strata				
Gross baseline emissions from planned deforestation				
Year	ha/year	ha (Accumulated)	tCO_2eq/year	tCO_2eq/Accumulated
2021	664.02	664.02	284,834.14	284,834.14
2022	664.02	1,328.05	284,834.14	569,668.27
2023	664.02	1,992.07	284,834.14	854,502.41
2024	664.02	2,656.09	284,834.14	1,139,336.55
2025	664.02	3,320.12	284,834.14	1,424,170.68
2026	664.02	3,984.14	284,834.14	1,709,004.82
2027	664.02	4,648.16	284,834.14	1,993,838.95

2028	664.02	5,312.19	284,834.14	2,278,673.09
2029	664.02	5,976.21	287,079.83	2,565,752.92
2030	664.02	6,640.23	436,211.79	3,001,964.71
2031	664.02	7,304.26	443,534.38	3,445,499.09
2032	664.02	7,968.28	443,534.38	3,889,033.48
2033	664.02	8,632.30	443,534.38	4,332,567.86
2034	664.02	9,296.33	443,534.38	4,776,102.25
2035	664.02	9,960.35	443,534.38	5,219,636.63
2036	664.02	10,624.37	443,534.38	5,663,171.02
2037	664.02	11,288.40	443,534.38	6,106,705.40
2038	664.02	11,952.42	443,534.38	6,550,239.79
2039	664.02	12,616.44	443,534.38	6,993,774.17
2040	664.02	13,280.47	443,534.38	7,437,308.56
2041	664.02	13,944.49	443,534.38	7,880,842.94
2042	213.57	14,158.06	142,654.10	8,023,497.04
2043	-	14,158.06	-	8,023,497.04
2044	-	14,158.06	-	8,023,497.04
2045	-	14,158.06	-	8,023,497.04
2046	-	14,158.06	-	8,023,497.04
2047	-	14,158.06	-	8,023,497.04
2048	-	14,158.06	-	8,023,497.04
2049	-	14,158.06	-	8,023,497.04
2050	-	14,158.06	-	8,023,497.04
2051	-	14,158.06	-	8,023,497.04

Baseline biomass burning emissions

Greenhouse gas emissions from biomass burning were determined based on the IPCC 2006 Inventory Guidelines, for the AUD and APDcomponents of the project as follows:

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

Where:

$EBiomassBurn,i,t$ = Greenhouse gas emissions due to biomass burning as part of deforestation activities in stratum i in year t; tCO2-e of each GHG (CO2, CH4, N2O);

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

Bi,t = Average 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 IPCC Table 2.6, 2006);

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

$GWPg$ = Global warming potential of gas g; t CO2/t gas g (IPCC default values: CH4 = 28; N2O = 265);

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

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

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

The parameters used to calculate biomass burning for the AUD component baseline scenario are shown in Table 40. The results of CH_4 and N_2O emissions generated as a result of incomplete burning of non-commercial wood biomass after logging also in the AUD, over a period of 30 years are shown in Table 41.

Table 40. Parameters used to calculate biomass burning in the baseline scenario of the AUD component.

Components	Amount	Unit
COMF[133]	0.50	dimensionless
G_{CH4}[134]	4.8	g/kg dry matter burned
G_{N207}	0.2	g/kg dry matter burned

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

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

GWP^{135}_{CH4}	28	dimensionless
GWP_{N2O}	265	dimensionless

Table 41. Results of CH_4 and N_2O emissions generated as a consequence of incomplete burning of non-commercial wood biomass after logging.

Emissions from burning biomass			CH4		N2O	
			sum of strata		sum of strata	
Year	ha/year	ha (Accumulated)	tCO2eq/year	tCO2eq (Accumulated)	tCO2eq/year	tCO2eq (Accumulated)
2021	22.21	22.21	3,108.79	3,108.79	1,225.94	1,225.94
2022	67.72	89.93	9,478.93	12,587.72	3,737.98	4,963.92
2023	113.48	203.41	15,884.40	28,472.12	6,263.96	11,227.88
2024	159.01	362.42	22,258.28	50,730.40	8,777.47	20,005.35
2025	204.22	566.64	28,585.65	79,316.05	11,272.65	31,277.99
2026	249.33	815.97	34,900.26	114,216.31	13,762.79	45,040.78
2027	295.74	1,111.70	41,396.28	155,612.59	16,324.47	61,365.26
2028	341.29	1,452.99	47,772.79	203,385.38	18,839.02	80,204.28
2029	385.45	1,838.44	53,953.76	257,339.13	21,276.47	101,480.75
2030	429.58	2,268.03	60,131.90	317,471.04	23,712.80	125,193.55
2031	476.12	2,744.14	66,645.45	384,116.48	26,281.39	151,474.93
2032	522.65	3,266.79	73,158.57	457,275.06	28,849.82	180,324.75
2033	569.49	3,836.28	79,715.48	536,990.53	31,435.51	211,760.26
2034	616.6	4,452.88	86,309.86	623,300.39	34,035.98	245,796.24
2035	664	5,116.88	92,944.47	716,244.86	36,652.31	282,448.55
2036	711.71	5,828.59	99,622.62	815,867.48	39,285.82	321,734.36
2037	759.76	6,588.35	106,348.28	922,215.75	41,938.06	363,672.42
2038	808.18	7,396.52	113,126.27	1,035,342.03	44,610.93	408,283.35
2039	857.02	8,253.54	119,962.56	1,155,304.59	47,306.80	455,590.15
2040	906.33	9,159.87	126,864.57	1,282,169.16	50,028.58	505,618.73

[135] WG1AR5_Chapter08_FINAL.pdf (ipcc.ch)

2041	956.17	10,116.04	133,841.72	1,416,010.88	52,780.00	558,398.73
2042	1,006.64	11,122.68	140,906.27	1,556,917.16	55,565.87	613,964.60
2043	1,057.85	12,180.53	148,074.50	1,704,991.65	58,392.64	672,357.24
2044	1,109.96	13,290.49	155,368.74	1,860,360.39	61,269.10	733,626.34
2045	1,163.20	14,453.69	162,820.92	2,023,181.31	64,207.84	797,834.17
2046	1,217.91	15,671.59	170,478.96	2,193,660.27	67,227.76	865,061.93
2047	1,274.64	16,946.23	178,419.98	2,372,080.26	70,359.27	935,421.20
2048	1,334.37	18,280.60	186,780.48	2,558,860.73	73,656.20	1,009,077.40
2049	1,399.09	19,679.69	195,840.06	2,754,700.79	77,228.81	1,086,306.21
2050	1,474.07	21,153.76	206,335.12	2,961,035.92	81,367.50	1,167,673.72
2051	1,583.82	22,737.58	221,698.21	3,182,734.13	87,425.88	1,255,099.60

The parameters used to calculate biomass burning for the APD component baseline scenario are shown in Table 42. The results of CH_4 and N_2O emissions generated as a result of incomplete burning of non-commercial wood biomass after logging also in the AUD, over a period of 30 years are shown in Table 43.

Table 42. Biomass burning in the APD component baseline scenario.

Component	Amount	Unit
COMF[136]	0.50	dimensionless
G_{CH4}[137]	4.8	g/kg dry matter burned
G_{N207}	0.2	g/kg dry matter burned
GWP^{138}_{CH4}	28	dimensionless
GWP_{N2O}	265	dimensionless

Table 43. Results of CH_4 and N_2O emissions generated as a consequence of incomplete burning of non-commercial wood biomass after logging.

Emissions from burning biomass			CH_4		N_2O	
			Sum of strata		Sum of strata	
Year	ha/year	ha	tCO2eq/year	tCO2eq	tCO2eq/year	tCO2eq

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

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

[138] WG1AR5_Chapter08_FINAL.pdf (ipcc.ch)

		(Accumulated)		(Accumulated)		(Accumulated)
2021	664.02	664.02	92,947.89	92,947.89	36,653.66	36,653.66
2022	664.02	1,328.05	92,947.89	185,895.78	36,653.66	73,307.32
2023	664.02	1,992.07	92,947.89	278,843.67	36,653.66	109,960.98
2024	664.02	2,656.09	92,947.89	371,791.56	36,653.66	146,614.64
2025	664.02	3,320.12	92,947.89	464,739.45	36,653.66	183,268.31
2026	664.02	3,984.14	92,947.89	557,687.34	36,653.66	219,921.97
2027	664.02	4,648.16	92,947.89	650,635.23	36,653.66	256,575.63
2028	664.02	5,312.19	92,947.89	743,583.12	36,653.66	293,229.29
2029	664.02	5,976.21	92,947.89	836,531.00	36,653.66	329,882.95
2030	664.02	6,640.23	92,947.89	929,478.89	36,653.66	366,536.61
2031	664.02	7,304.26	92,947.89	1,022,426.78	36,653.66	403,190.27
2032	664.02	7,968.28	92,947.89	1,115,374.67	36,653.66	439,843.93
2033	664.02	8,632.30	92,947.89	1,208,322.56	36,653.66	476,497.60
2034	664.02	9,296.33	92,947.89	1,301,270.45	36,653.66	513,151.26
2035	664.02	9,960.35	92,947.89	1,394,218.34	36,653.66	549,804.92
2036	664.02	10,624.37	92,947.89	1,487,166.23	36,653.66	586,458.58
2037	664.02	11,288.40	92,947.89	1,580,114.12	36,653.66	623,112.24
2038	664.02	11,952.42	92,947.89	1,673,062.01	36,653.66	659,765.90
2039	664.02	12,616.44	92,947.89	1,766,009.90	36,653.66	696,419.56
2040	664.02	13,280.47	92,947.89	1,858,957.79	36,653.66	733,073.22
2041	664.02	13,944.49	92,947.89	1,951,905.68	36,653.66	769,726.89
2042	213.57	14,158.06	29,894.86	1,981,800.54	11,788.93	781,515.81
2043	-	14,158.06	-	1,981,800.54	-	781,515.81
2044	-	14,158.06	-	1,981,800.54	-	781,515.81
2045	-	14,158.06	-	1,981,800.54	-	781,515.81
2046	-	14,158.06	-	1,981,800.54	-	781,515.81
2047	-	14,158.06	-	1,981,800.54	-	781,515.81
2048	-	14,158.06	-	1,981,800.54	-	781,515.81

2049	-	14,158.06	-	1,981,800.54	-	781,515.81
2050	-	14,158.06	-	1,981,800.54	-	781,515.81
2051	-	14,158.06	-	1,981,800.54	-	781,515.81

Carbon stock of wood products at baseline

To estimate the biomass carbon of the commercial volume extracted in the deforestation process, the following equation was applied, applicable to both the APD and AUD components of Evergreen, according to "Option 2: Estimation of commercial inventory", as recommended in CP-C:

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

Where:

CXB,i = Average carbon stock of biomass extracted from the stratum i; tCO2-e ha-1;

$CABtree,i$ = Average carbon stock of aboveground biomass in the stratum i; tCO2-e ha-1;

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

i 1,2,3, … M strata.

Conservatively, the proportion of carbon present in the biomass extracted in long-term (100 years) wood products, it is assumed that all extracted 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 CO2-e ha-1;

CXB,ty,i = Average carbon stock of extracted biomass by wood product class ty of stratum i; t CO2-e ha-1;

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

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

$OFty$ = Fraction of wood products that will be emitted into the atmosphere between 5 and 100 years of wood extraction by class of wood product 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 in the calculation of the baseline wood product carbon pool, as well as the estimation results (sum of strata) for the entire project period are shown in the Tables below (Table 44 to 46).

Table 44. Parameters used in the calculation of the carbon pool of wood products in the baseline.

Stratum	CAB_tree (tCO2e/ha)	BCEF116	Pcom	CXB (tCO2e/ha)	CWP(tCO2e/ha)
Submontane Open Ombrophylous Forest	390.50	1.32	0.08155	27.03	3.29
Alluvial Dense Ombrophylous Forest	331.83	1.32	0.08235	27.03	3.29
Submontane Dense Ombrophylous Forest	510.77	1.32	0.08235	27.03	3.29

Table 45. Carbon stock in wood products at the AUD baseline.

Year	Sum of strata			
	ha/year	ha (Accumulated)	tCO2eq/year	tCO2eq (Accumulated)
2021	22.21	22.21	73.07	73.07
2022	67.72	89.93	222.79	295.86
2023	113.48	203.41	373.35	669.21
2024	159.01	362.42	523.16	1,192.36
2025	204.22	566.64	671.87	1,864.24
2026	249.33	815.97	820.29	2,684.53
2027	295.74	1,111.70	972.97	3,657.50
2028	341.29	1,452.99	1,122.85	4,780.35
2029	385.45	1,838.44	1,268.12	6,048.47
2030	429.58	2,268.03	1,413.33	7,461.80
2031	476.12	2,744.14	1,566.43	9,028.23

2032	522.65	3,266.79	1,719.51	10,747.74
2033	569.49	3,836.28	1,873.62	12,621.37
2034	616.6	4,452.88	2,028.62	14,649.98
2035	664	5,116.88	2,184.56	16,834.54
2036	711.71	5,828.59	2,341.52	19,176.06
2037	759.76	6,588.35	2,499.60	21,675.66
2038	808.18	7,396.52	2,658.91	24,334.56
2039	857.02	8,253.54	2,819.59	27,154.15
2040	906.33	9,159.87	2,981.81	30,135.96
2041	956.17	10,116.04	3,145.80	33,281.76
2042	1,006.64	11,122.68	3,311.85	36,593.61
2043	1,057.85	12,180.53	3,480.33	40,073.93
2044	1,109.96	13,290.49	3,651.77	43,725.70
2045	1,163.20	14,453.69	3,826.92	47,552.63
2046	1,217.91	15,671.59	4,006.92	51,559.54
2047	1,274.64	16,946.23	4,193.56	55,753.11
2048	1,334.37	18,280.60	4,390.07	60,143.18
2049	1,399.09	19,679.69	4,603.00	64,746.18
2050	1,474.07	21,153.76	4,849.68	69,595.86
2051	1,583.82	22,737.58	5,210.77	74,806.63

Table 46. CCarbon stock in wood products at the APD baseline.

Year	Sum of strata			
	ha/year	ha (Accumulated)	tCO2eq/year	tCO2eq (Accumulated)
2021	664.02	664.02	2,184.64	2,184.64
2022	664.02	1,328.05	2,184.64	4,369.27
2023	664.02	1,992.07	2,184.64	6,553.91

2024	664.02	2,656.09	2,184.64	8,738.55
2025	664.02	3,320.12	2,184.64	10,923.18
2026	664.02	3,984.14	2,184.64	13,107.82
2027	664.02	4,648.16	2,184.64	15,292.46
2028	664.02	5,312.19	2,184.64	17,477.09
2029	664.02	5,976.21	2,184.64	19,661.73
2030	664.02	6,640.23	2,184.64	21,846.37
2031	664.02	7,304.26	2,184.64	24,031.00
2032	664.02	7,968.28	2,184.64	26,215.64
2033	664.02	8,632.30	2,184.64	28,400.28
2034	664.02	9,296.33	2,184.64	30,584.91
2035	664.02	9,960.35	2,184.64	32,769.55
2036	664.02	10,624.37	2,184.64	34,954.19
2037	664.02	11,288.40	2,184.64	37,138.82
2038	664.02	11,952.42	2,184.64	39,323.46
2039	664.02	12,616.44	2,184.64	41,508.10
2040	664.02	13,280.47	2,184.64	43,692.74
2041	664.02	13,944.49	2,184.64	45,877.37
2042	213.57	14,158.06	702.65	46,580.02
2043	-	14,158.06	-	46,580.02
2044	-	14,158.06	-	46,580.02
2045	-	14,158.06	-	46,580.02
2046	-	14,158.06	-	46,580.02
2047	-	14,158.06	-	46,580.02
2048	-	14,158.06	-	46,580.02
2049	-	14,158.06	-	46,580.02

2050	-	14,158.06	-	46,580.02
2051	-	14,158.06	-	46,580.02

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

To calculate the remaining carbon stock in the land after deforestation, we apply the conservative value of 27.50 $tCO_2eq.ha-1$, adopted by the country in the Fourth National Communication to the Convention - United Nations Framework on Climate Change - Report of Benchmark: Land Use Sector, Land Use Change and Forestry, 2020[139], for both AUD and APD components. The Table below summarizes the results obtained for carbon pools in pastures in the baseline scenario, for 30 years of the project.

Table 47. Baseline post-deforestation (pasture) carbon stock - AUD.

Year	Sum of strata			
	ha/year	ha (Accumulated)	tCO2eq/year	tCO2eq (Accumulated)
2021	22.21	22.21	610.76	610.76
2022	67.72	89.93	1,862.24	2,473.00
2023	113.48	203.41	3,120.67	5,593.66
2024	159.01	362.42	4,372.89	9,966.55
2025	204.22	566.64	5,615.97	15,582.52
2026	249.33	815.97	6,856.54	22,439.06
2027	295.74	1,111.70	8,132.76	30,571.82
2028	341.29	1,452.99	9,385.49	39,957.31
2029	385.45	1,838.44	10,599.81	50,557.12
2030	429.58	2,268.03	11,813.58	62,370.70
2031	476.12	2,744.14	13,093.24	75,463.93
2032	522.65	3,266.79	14,372.81	89,836.75
2033	569.49	3,836.28	15,660.99	105,497.73
2034	616.6	4,452.88	16,956.53	122,454.26

[139] Fonte: http://redd.mma.gov.br/images/FREL/RR_LULUCF_Mudana-de-Uso-e-Floresta.pdf (Tabela 5, é o valor de 7,57 tC/ha, para o bioma Amazônia, multiplicado pelo fator de conversão 44/12)

2035	664	5,116.88	18,259.97	140,714.23
2036	711.71	5,828.59	19,571.97	160,286.20
2037	759.76	6,588.35	20,893.30	181,179.49
2038	808.18	7,396.52	22,224.91	203,404.40
2039	857.02	8,253.54	23,567.97	226,972.37
2040	906.33	9,159.87	24,923.95	251,896.32
2041	956.17	10,116.04	26,294.69	278,191.01
2042	1,006.64	11,122.68	27,682.60	305,873.61
2043	1,057.85	12,180.53	29,090.87	334,964.48
2044	1,109.96	13,290.49	30,523.91	365,488.39
2045	1,163.20	14,453.69	31,987.97	397,476.36
2046	1,217.91	15,671.59	33,492.48	430,968.84
2047	1,274.64	16,946.23	35,052.58	466,021.42
2048	1,334.37	18,280.60	36,695.09	502,716.51
2049	1,399.09	19,679.69	38,474.95	541,191.46
2050	1,474.07	21,153.76	40,536.82	581,728.28
2051	1,583.82	22,737.58	43,555.07	625,283.35

Table 48. Post-deforestation (pasture) carbon stock at baseline - APD.

Year	Sum of strata			
	ha/year	ha (Accumulated)	tCO2eq/year	tCO2eq (Accumulated)
2021	664.02	664.02	18,260.64	18,260.64
2022	664.02	1,328.05	2,184.64	20,445.28
2023	664.02	1,992.07	2,184.64	2,184.64
2024	664.02	2,656.09	2,184.64	4,369.27
2025	664.02	3,320.12	2,184.64	2,184.64
2026	664.02	3,984.14	2,184.64	4,369.27

2027	664.02	4,648.16	2,184.64	2,184.64
2028	664.02	5,312.19	2,184.64	4,369.27
2029	664.02	5,976.21	2,184.64	2,184.64
2030	664.02	6,640.23	2,184.64	4,369.27
2031	664.02	7,304.26	2,184.64	2,184.64
2032	664.02	7,968.28	2,184.64	4,369.27
2033	664.02	8,632.30	2,184.64	2,184.64
2034	664.02	9,296.33	2,184.64	4,369.27
2035	664.02	9,960.35	2,184.64	2,184.64
2036	664.02	10,624.37	2,184.64	4,369.27
2037	664.02	11,288.40	2,184.64	2,184.64
2038	664.02	11,952.42	2,184.64	4,369.27
2039	664.02	12,616.44	2,184.64	2,184.64
2040	664.02	13,280.47	2,184.64	4,369.27
2041	664.02	13,944.49	2,184.64	2,184.64
2042	213.57	14,158.06	702.65	2,887.28
2043	-	14,158.06	-	2,887.28
2044	-	14,158.06	-	2,887.28
2045	-	14,158.06	-	2,887.28
2046	-	14,158.06	-	2,887.28
2047	-	14,158.06	-	2,887.28
2048	-	14,158.06	-	2,887.28
2049	-	14,158.06	-	2,887.28
2050	-	14,158.06	-	2,887.28
2051	-	14,158.06	-	2,887.28

3.2.2 Project Emissions

The Samaúma project does not include activities within the project areas (AUD and APD), therefore, there are no project emissions to be accounted for at this time.

3.2.3 Leakage Belt

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

$$LK_{MarketEffects,Timber} = \sum_{i=1}^{M} (LF_{Me} * AL_{T,i})$$

Where:

$LKMarketEffects,Timber$ = total GHG emissions decrease from market harvesting; tCO2-e;

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

ALT,i = Summed emissions from logging in stratum i in case of baseline potentially displaced by carbon project implementation; tCO2-e;

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 Leakage Belt was allocated considering the similarity of the Leakage Belt deforestation factors and the general characteristics of the forest (stratification, forest type, carbon stocks), therefore, the same parameters were applied for the Project Area and the leak belt.

The carbon footprint due to displaced logging has two components: the carbon from the biomass of the logged wood and the carbon from the biomass in the forest damaged in the logging process. The estimate of carbon displaced by wood 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 emission due to displaced wood harvests in the baseline scenario in stratum *i* at time *t*; t CO2-e;

$VBSL,XE,I,t$ = Volume of wood projected to be harvested within the project boundary during the baseline in stratum *i* at time *t*; m^3;

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

CF = Carbon fraction of biomass for commercially harvested species *j*; t C td.m.$^{-1}$;

LDF = Registry Damage Factor; tC.m^{-3} (default 0.53 t tC.m^{-3});

LIF = Timber infrastructure factor; t C m^{-3} (standard 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 Samaúma project is summarized in Table 49 below.

Table 49. Market leakage of the Samaúma project.

Year	ha/year	ha (Accumulated)	CBSL,XBT	ALT*LFEU
			tCO_2eq/year	tCO_2eq/year
2021	22.2	22.2	3,136.60	627.3
2022	67.7	89.9	9,563.60	1,912.70
2023	113.5	203.4	16,025.90	3,205.20
2024	159	362.4	22,455.80	4,491.20
2025	204.2	566.6	28,840.50	5,768.10
2026	249.3	816	35,211.00	7,042.20
2027	295.7	1,111.70	41,765.10	8,353.00
2028	341.3	1,453.00	48,197.80	9,639.60
2029	385.5	1,838.40	54,434.20	10,886.80
2030	429.6	2,268.00	60,666.40	12,133.30
2031	476.1	2,744.10	67,238.90	13,447.80
2032	522.7	3,266.80	73,809.90	14,762.00
2033	569.5	3,836.30	80,424.80	16,085.00
2034	616.6	4,452.90	87,077.80	17,415.60

2035	664	5,116.90	93,771.70	18,754.30
2036	711.7	5,828.60	100,509.50	20,101.90
2037	759.8	6,588.40	107,295.20	21,459.00
2038	808.2	7,396.50	114,133.20	22,826.60
2039	857	8,253.50	121,030.50	24,206.10
2040	906.3	9,159.90	127,994.20	25,598.80
2041	956.2	10,116.00	135,032.70	27,006.50
2042	1,006.60	11,122.70	142,160.20	28,432.00
2043	1,057.90	12,180.50	149,392.20	29,878.40
2044	1,110.00	13,290.50	156,751.30	31,350.30
2045	1,163.20	14,453.70	164,270.00	32,854.00
2046	1,217.90	15,671.60	171,996.30	34,399.30
2047	1,274.60	16,946.20	180,007.90	36,001.60
2048	1,334.40	18,280.60	188,443.10	37,688.60
2049	1,399.10	19,679.70	197,583.00	39,516.60
2050	1,474.10	21,153.80	208,171.90	41,634.40
2051	1,583.80	22,737.60	223,671.00	44,734.20

Leakage outside the Leakage Belt (Stage 4 - LK-ASU)

Conservatively assumed that immigrants prevented from migrating and deforesting the project area migrate to an alternative forest area and cause deforestation in the alternative area, which may overlap the Leakage Belt area. The proportion that migrates to the Leakage Belt is calculated as the ratio of the ratio between the Leakage Belt area and the total available forest area in the country (AVFOR), estimated as follows:

$$AVFOR = TOTFOR - PROTFOR - MANFOR$$

Where:

AVFOR = Total area of national forest available for unplanned deforestation; there is;

TOTFOR = Total available national forest area; there is;

PROTFOR = Total area of nationally fully protected forests; there is;

MANFOR = Total area of forests underactive national management; there is.

The table below presents the parameters applied for the AVFOR calculation in the baseline scenario of the project.

Table 50. Parameters applied for the calculation of AVFOR in the baseline scenario of the project.

Parameter	Area (hectare)
TOTFOR	486,461,572
PROTFOR	88,566,400
MANFOR	396,495,172

As a result, the estimated AVFOR is 396,495,172 ha.

The ratio of area between the leakage belt and the total available national forest area (PROPLB) was calculated by dividing the leakage belt area (LBFOR; 49,317.01 ha) by the AVFOR. This procedure results in PROPLB equal to 0.000124382.

Similarly, the proportion of the carbon stock in the leakage belt in relation to the carbon stock in the forest area outside the project boundary (PROPCS). Considering the similarity between the project area and the leak belt area, the PROPCS was calculated by dividing the carbon stock outside the leak belt (COLB = 578.1 tCO2/ha) and the stock inside the leak belt (CLB= 421, 06 tCO2/ha), which results in a value of 1.3730.

The proportion of baseline deforestation caused by the immigrant population (PROPIMM) considered the period from 2012 to 2020. According to the number of immigrants[140], the proportion of deforestation attributed to immigrant agents (PROPIMM) is 1.33%.

To calculate the proportional leak displaced by immigrant populations (LKPROP) the equation was applied:

$$LKPROP = PROPIMM * (1 - PROPLB) * PROPCS$$

Where:

$LKPRO$P = Proportional leakage for areas with immigrant populations;

$PROPIMM$ = Estimated proportion of baseline deforestation caused by the immigrant population; proportion;

[140] Resident population estimates for municipalities and states | IBGE. Available at: https://www.ibge.gov.br/estatisticas/sociais/populacao/9103-estimativas-de-populacao.html?=&t=resultados

$PROPLB$ = Forest area available for unplanned deforestation as a proportion of the total area of national forest available for unplanned deforestation;

$PROPCS$ = Proportional difference in stocks between forest areas available for unplanned deforestation inside and outside the Leakage Belt.

The $LKPROP$ is 0.0183.

GOE's ex-child emissions due to unplanned deforestation displaced out of the leakage belt were estimated according to the equation, according to the VMD0010 LK-Asu:

$$\Delta CLK\text{-}ASU,OLB = (\Delta CBSL,LK,unpl - \Delta CP,LB,) * LKPROP$$

Where:

$\Delta CLK-ASU,OLB$ = Net CO2eq emissions due to unplanned deforestation moved outside the leakage belt; t CO2-e;

$\Delta CBSL,LK,unplanned$= Net CO2eq emissions at baseline from unplanned deforestation in the leakage belt; tCO2-e;

$\Delta CP,LB,$= Net CO2eq emissions within the leakage belt in the case of the project; tCO2-e;

$LKPROP$ = Proportional leakage for areas with immigrant populations; proportion.

In each monitoring period, measure the deforested area in the project area (ADefPA,i,t) and the leakage (ADefLB,i,t), observing the M-REDD guidelines.

For the difference in emissions from unplanned deforestation within the leakage belt in the baseline and in the project case, a factor of 10% was applied, so ΔCP,LB was adjusted 10% larger than ΔCBSL,LK). This is assumed conservatively, as the project proponent will adopt a series of activities to mitigate leaks.

The results obtained for the leakage estimates outside the leakage belt are summarized in Table 51 below.

Table 51. Estimation of leakage of GHG emissions outside the Leakage Belt.

Year	ΔCBSL, LK, unplanned	ΔCP, LB	-ASU,OLB
2021	9,885.57	12,839.60	-54.06
2022	30,141.83	39,148.93	-164.83
2023	50,510.44	65,602.79	-276.19
2024	70,778.59	91,923.68	-386.96

2025	90,898.84	118,059.58	-497.04
2026	110,978.53	144,137.67	-606.81
2027	131,635.09	170,967.29	-719.78
2028	151,911.58	197,299.75	-830.6
2029	171,566.31	222,828.65	-938.1
2030	191,212.05	248,340.20	-1,045.45
2031	211,924.32	275,244.97	-1,158.77
2032	232,635.27	302,143.97	-1,272.01
2033	253,485.42	329,222.17	-1,385.98
2034	274,454.73	356,456.46	-1,500.63
2035	295,551.98	383,858.40	-1,616.01
2036	316,787.68	411,439.55	-1,732.13
2037	338,174.44	439,217.26	-1,849.08
2038	359,727.64	467,208.86	-1,966.91
2039	381,466.20	495,443.26	-2,085.78
2040	403,413.71	523,949.37	-2,205.80
2041	425,600.22	552,761.88	-2,327.06
2042	448,064.62	581,938.58	-2,449.89
2043	470,858.69	611,543.09	-2,574.52
2044	494,053.48	641,667.88	-2,701.34
2045	517,750.50	672,445.92	-2,830.93
2046	542,102.14	704,073.77	-2,964.08
2047	567,353.60	736,869.38	-3,102.14
2048	593,938.95	771,399.30	-3,247.52
2049	622,747.30	808,813.93	-3,405.02
2050	656,120.31	852,159.87	-3,587.52
2051	589,637.43	915,606.34	-5,965.23

Final Leakage Factor

Considering the expected effectiveness of the proposed REDD+ project activities, the changes in carbon stock and greenhouse gas emissions in the leakage belt that may occur due to the implementation of the activity REDD+ project costs were conservatively estimated to be 10% higher in the project case.

Thus, the leakage factor applied corresponds to 10% of the sum of the previously estimated leakage components (ie, Market Leakage + Leakage Outside the Leakage Belt), the results are shown in Table 52 below.

Table 52. Final leakage of the Samaúma project throughout its lifetime.

Year	ha/year	ha (Accumulated)	Sum of Strata		
			Market Leakage	Leakage Outside the Leakage Belt	Final Leakage
			tCO2eq/year	tCO2eq/year	tCO2eq (Accumulated)
2021	22.21	22.21	627.3	-54.1	57.3
2022	67.72	89.93	1,912.70	-164.8	174.8
2023	113.48	203.41	3,205.20	-276.2	292.9
2024	159.01	362.42	4,491.20	-387	410.4
2025	204.22	566.64	5,768.10	-497	527.1
2026	249.33	815.97	7,042.20	-606.8	643.5
2027	295.74	1,111.7	8,353.00	-719.8	763.3
2028	341.29	1,452.99	9,639.60	-830.6	880.9
2029	385.45	1,838.44	10,886.80	-938.1	994.9
2030	429.58	2,268.03	12,133.30	-1,045.40	1,108.80
2031	476.12	2,744.14	13,447.80	-1,158.80	1,228.90
2032	522.65	3,266.79	14,762.00	-1,272.00	1,349.00
2033	569.49	3,836.28	16,085.00	-1,386.00	1,469.90
2034	616.6	4,452.88	17,415.60	-1,500.60	1,591.50
2035	664	5,116.88	18,754.30	-1,616.00	1,713.80
2036	711.71	5,828.59	20,101.90	-1,732.10	1,837.00
2037	759.76	6,588.35	21,459.00	-1,849.10	1,961.00
2038	808.18	7,396.52	22,826.60	-1,966.90	2,086.00
2039	857.02	8,253.54	24,206.10	-2,085.80	2,212.00

2040	906.33	9,159.87	25,598.80	-2,205.80	2,339.30
2041	956.17	10,116.04	27,006.50	-2,327.10	2,467.90
2042	1,006.64	11,122.68	28,432.00	-2,449.90	2,598.20
2043	1,057.85	12,180.53	29,878.40	-2,574.50	2,730.40
2044	1,109.96	13,290.49	31,350.30	-2,701.30	2,864.90
2045	1,163.2	14,453.69	32,854.00	-2,830.90	3,002.30
2046	1,217.91	15,671.59	34,399.30	-2,964.10	3,143.50
2047	1,274.64	16,946.23	36,001.60	-3,102.10	3,289.90
2048	1,334.37	18,280.6	37,688.60	-3,247.50	3,444.10
2049	1,399.09	19,679.69	39,516.60	-3,405.00	3,611.20
2050	1,474.07	21,153.76	41,634.40	-3,587.50	3,804.70
2051	1,583.82	22,737.58	44,734.20	-5,965.20	3,876.90

3.2.4 Net GHG Emission Reductions and Removals

The net reductions and removals of GHG emissions estimated for the Samaúma project can be summarized as the "Estimated line emissions" minus the "Estimated project emissions" minus the "Estimated leakage emissions", presented in the Table 53 below.

Table 53. Ex-ante estimates of GHG emission reductions and removals related to Samaúma 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	406,628.19	0	57.33	406,570.86
2021	448,599.95	0	174.79	448,425.16
2022	474,639.33	0	292.9	474,346.43
2023	500,550.28	0	410.42	500,139.86
2024	526,272.18	0	527.11	525,745.07
2025	551,942.20	0	643.54	551,298.66
2026	578,349.69	0	763.32	577,586.37

2027	604,271.32	0	880.9	603,390.42
2028	631,643.77	0	994.87	630,648.90
2029	805,890.99	0	1,108.78	804,782.21
2030	839,692.29	0	1,228.90	838,463.39
2031	866,169.33	0	1,349.00	864,820.33
2032	892,824.32	0	1,469.90	891,354.42
2033	919,631.64	0	1,591.49	918,040.15
2034	946,602.52	0	1,713.83	944,888.69
2035	973,750.40	0	1,836.98	971,913.42
2036	1,001,091.40	0	1,961.00	999,130.40
2037	1,028,645.16	0	2,085.97	1,026,559.19
2038	1,056,435.90	0	2,212.03	1,054,223.87
2039	1,084,493.78	0	2,339.30	1,082,154.48
2040	1,112,857.17	0	2,467.95	1,110,389.22
2041	755,741.75	0	2,598.22	753,143.53
2042	601,949.29	0	2,730.39	599,218.90
2043	631,601.69	0	2,864.89	628,736.80
2044	661,896.14	0	3,002.31	658,893.83
2045	693,027.45	0	3,143.52	689,883.93
2046	725,309.11	0	3,289.94	722,019.17
2047	759,296.02	0	3,444.11	755,851.91
2048	796,124.83	0	3,611.16	792,513.67
2049	838,789.13	0	3,804.68	834,984.45
2050	796,392.28	0	3,876.90	792,515.38
Total	23,511,109.50	-	58,476.43	23,452,633.07

The total net reductions in greenhouse gas emissions corresponding to the baseline AUD and APD components are shown in the Table 54 below.

Table 54. Total net reductions in GHG emissions from the Samaúma project baseline AUD and APD components.

Ano	Emissões AUD (tCO2)	Emissões APD (tCO2)
2020	12,580.50	393,990.40
2021	38,358.80	410,066.40
2022	64,280.00	410,066.40
2023	90,073.40	410,066.40
2024	115,678.70	410,066.40
2025	141,232.30	410,066.40
2026	167,520.00	410,066.40
2027	193,324.00	410,066.40
2028	218,336.80	412,312.10
2029	243,338.10	561,444.10
2030	269,696.70	568,766.70
2031	296,053.70	568,766.70
2032	322,587.80	568,766.70
2033	349,273.50	568,766.70
2034	376,122.00	568,766.70
2035	403,146.80	568,766.70
2036	430,363.80	568,766.70
2037	457,792.50	568,766.70
2038	485,457.20	568,766.70
2039	513,387.80	568,766.70
2040	541,622.60	568,766.70
2041	570,210.90	182,932.60
2042	599,218.90	-
2043	628,736.80	-
2044	658,893.80	-

2045	689,883.90	-
2046	722,019.20	-
2047	755,851.90	-
2048	792,513.70	-
2049	834,984.40	-
2050	792,515.40	-
Total	12,775,055.90	10,677,577.20

○

3.3 Monitoring

3.3.1 Data and Parameters Available at Validation

Table 55. Data and parameters to be monitored during the crediting period of the Samaúma project.

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	Dimensional
Description	Mass of carbon to CO2e 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	Dimensionless
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	Dimensional
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	Dimensionless
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	PCOMi
Data Unit	Dimensional
Description	Commercial volume as a percentage of total aboveground volume in stratum *i*.
Data source	To calculate this parameter, the volume of marketable wood

	being explored (in m^3/ha) is based on the "Santa Maria Forestry Project" (35.08 m^3/ha[141]) , given the similarity with the Project area, observing forest classes, soil, climate and activity. Thus, as prescribed in the CP-W, a forest inventory of a proxy area in the same region, representing the same forest type and age class, was chosen for the calculation of this parameter.
Applied value	Submontane Dense Ombrophylous Forest: 0.07814 Alluvial Dense Ombrophylous Forest: 0.06863 Submontane Open Ombrophylous Forest: 0.07814
Justification for data choice or description of applied measurement methods and procedures	As prescribed in CP-W, a forest inventory of a proxy area in the same region, representing the same forest type and age class was chosen for the calculation of this parameter.
Purpose of data	● Calculation of baseline emissions
Comments	Updated at time of baseline review (at least every 10 years). Applying the trading percentage of total volume introduces the simplifying assumption (and conservative as it is only used in baseline ex-ante calculations) that all stocks are drawn

Data / Parameter	CWP,i
Data Unit	tCO2e ha-1
Description	Average carbon stock being incorporated into the tree stratum pool of wood products
Data source	VCS Module VMD0005 REDD+ Methodological 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	3.29 t CO2eha-1 for all three strata.
Justification for data choice or description of applied measurement methods and procedures	According to CP-W.
Purpose of data	● Calculation of baseline emissions
Comments	N/A

[141] Available at: https://registry.verra.org/mymodule/ProjectDoc/Project_ViewFile.asp?FileID=52137&IDKEY=9lksjoiuwqowrnoiuomnckjashoufifmln902309ksdflku098l71896923. Accessed on: 10/09/2021.

Data / Parameter	Cab_tree
Data Unit	tCO2-e ha-1
Description	Average aboveground carbon stock in stratum *i*
Data source	The value is the result of dividing the total carbon pool by stratum by area.
Applied value	Submontane Open Ombrophylous Forest: 394.42 Alluvial Dense Ombrophylous Forest: 342.14 Submontane Dense Ombrophylous Forest: 526.61
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	tCO2-e ha-1
Description	Average belowground carbon stock in stratum *i*
Data source	The value is the result of dividing the total carbon pool by stratum by area, as indicated in Table 78.
Applied value	Submontane Open Ombrophylous Forest: 39.23 Alluvial Dense Ombrophylous Forest: 103.03 Submontane Dense Ombrophylous Forest: 158.40
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	tCO2-e ha-1
Description	Average carbon stock of biomass extracted from the stratum *i*
Data source	Presented in section 3.1.4 Baseline Scenario, Wood Products Subsection
Applied value	27.03
Justification for data choice or description of applied	Calculated according to CP-W Module

measurement methods and procedures	
Purpose of data	● Calculation of baseline emissions
Comments	N/A

Data / Parameter	Pasture carbon pool
Data Unit	tCO2e
Description	Pasture 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	Dimensionless
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	Cabicl
Data Unit	tCO2/ 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	Submontane Open Ombrophylous Forest: 394.42 Alluvial Dense Ombrophylous Forest: 342.14 Submontane Dense Ombrophylous Forest: 526.61
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 ground, 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/m3 was applied, according to Nogueira (2008).
Purpose of data	● Calculation of baseline emissions
Comments	N/A

Data / Parameter	Cbbicl
Data Unit	tCO2/ 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	Submontane Open Ombrophylous Forest: 39.23 Alluvial Dense Ombrophylous Forest: 103.03 Submontane Dense Ombrophylous Forest: 158.40
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	tCO2/ha

Description	Post-deforestation carbon stock in non-trees aboveground vegetation in stratum *i*; tCO2-e ha-1; Post-deforestation carbon stock in non-tree belowground biomass in stratum *i*; tCO2-e 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	27.8 (sum of above and belowground biomass)
Justification for data choice or description of applied measurement methods and procedures	Value used in the National GHG Inventory.
Purpose of data	● Calculation of baseline emissions
Comments	Country-specific value provided for above and below ground pasture biomass.

Data / Parameter	Cabfcl
Data Unit	tCO2/ 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	27.8
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	Dimensionless
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	0.5
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 CH4e N2O).
Applied value	GCH4= 4.8 GN20 = 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 CO2-e 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	Dimensionless
Description	Leakage factor for market effects calculations
Data source	VMD0011 (LK-ME)
Applied value	0.2
Justification for data choice or description of applied measurement methods and procedures	When the average biomass is more than 15% greater than the biomass within the project boundary, the LFME will be considered 0.2.
Purpose of data	● Calculation of leakage
Comments	N/A

Data / Parameter	CLB
Data Unit	tCO2e ha-1
Description	Area-weighted average aboveground tree carbon stock for forests available for unplanned deforestation within the leakage belt
Data source	Project area data
Applied value	421.06
Justification for data choice or description of applied measurement methods and procedures	Based on the similarity analysis, the Project Area data were applied to the Leakage Belt area. A weighted average of the aboveground biomass within the Project Area was taken.
Purpose of data	● Calculation of leakage
Comments	N/A

Data / Parameter	COLB
Data Unit	tCO2e ha-1
Description	Area-weighted average aboveground tree carbon stock for forests

	available for unplanned deforestation outside the leakage belt
Data source	Saatchi, RA Houghton, RC dos Santos Alvalá, JV Soares, and Yifan Yu. Distribution of Live Aerial Biomass in the Amazon Basin. 2007. According to LK-ASU, the number is derived from peer reviews and appropriate literature as it considers the same biome.
Applied value	578.1
Justification for data choice or description of applied measurement methods and procedures	The value of 578.1 tCO2/ha is the average total biomass for the floodplain forest in the Amazon basin of 157.66 tC/ha (according to Table 7 of the previously cited study), multiplied by 44/12, the tC conversion factor for tCO2.
Purpose of data	● Calculation of leakage
Comments	N/A

Data / Parameter	*DLF*
Data Unit	%
Description	Displacement leakage factor
Data source	Local assessment
Applied value	10
Justification for data choice or description of applied measurement methods and procedures	If deforestation agents do not participate in leakage prevention activities and project activities, the Displacement Factor will be 100%. Where leak prevention activities are implemented, the factor should equal the proportion of baseline agents estimated to have the opportunity to participate in leak prevention activities and project activities. The project design team estimates that 100% of potential deforestation agents in the Reference Region will have the opportunity to participate in leakage prevention activities. Given that the PP is publicizing the project activity and recruiting new project instances, it can be said that most neighbors are having the opportunity to participate in leak prevention activities. Thus, the “Displacement Leakage Factor” (DLF) was conservatively set to 10%.
Purpose of data	● Calculation of leakage
Comments	This value is an ex-ante estimate. Accurate and actual values will be monitored and reported on verification periods

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 56. Data and parameters to be monitored during the Samaúma project crediting period.

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	External Leakage
Data unit	tCO_2/year
Description	Net CO_2 emissions due to unplanned deforestation moved outside the leakage belt by year *t**
Source of data	Remote sensing and GIS data. Secondary data.
Description of measurement methods and procedures to be applied	Leakage management areas that result in a decrease in the carbon stock will be subject to monitoring.
Frequency of monitoring/recording	Annually
Value applied	Values are described in Table 55.
Monitoring equipment	Remote sensing and GIS. Secondary data.
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of leakage
Calculation method	As per LK-ASU, Step 4.
Comments	N/A

Data / Parameter	MANFOR
Data unit	hectare
Description	Total area of forests under active management (nationally)
Source of data	Official country-specific data from IBAMA.
Description of measurement methods and procedures to be applied	According to the LK-ASU, it is necessary to demonstrate that the areas will be protected against deforestation. Such demonstrations must include sufficient numbers of rangers to prevent illegal colonization and an active management plan detailing harvest plans and return intervals and/or evidence that the concession owner has already expelled illegal settlers/invaders from forest areas.

Data / Parameter	MANFOR
	Ex-ante it can be assumed that MANFOR should remain constant.
Frequency of monitoring/recording	Annually
Value applied	396,495,172
Monitoring equipment	N/A
QA/QC procedures to be applied	As per REDD+ MoF section 9.3 or other VCS methodology that uses this module.
Purpose of data	Calculation of leakage
Calculation method	N/A
Comments	N/A

Data / Parameter	PROTFOR
Data unit	hectare
Description	Total area of nationally fully protected forests
Source of data	Official ISA country-specific data.
Description of measurement methods and procedures to be applied	According to the LK-ASU, it is necessary to demonstrate that the areas will be protected against deforestation. Such demonstrations are made by governmental mechanisms and national policies. Ex-ante it can be assumed that PROTFOR must remain constant.
Frequency of monitoring/recording	Annually
Value applied	88,566,400
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

Calculation method	N/A
Comments	N/A

Data / Parameter	TOTFOR
Data unit	hectare
Description	Total available national forest area
Source of data	Official country-specific data. As the country has a wide variety of forest biomes throughout its extension, TOTFOR considered only the Amazon Forest biome. This is a conservative approach. Thus, as a representation of the total area of the Amazon Forest in Brazilian territory, TOTFOR consisted of multiplying the size of the Brazilian Amazon by 97%, which represents its preserved area, according to SEMA.
Description of measurement methods and procedures to be applied	According to LK-ASU, forest areas suitable for conversion to livestock, it can be conservatively assumed that TOTFOR should remain constant for the baseline period.
Frequency of monitoring/recording	Annually
Value applied	486,461,572
Monitoring equipment	N/A
QA/QC procedures to be applied	As per REDD+ MoF section 9.3 or other VCS methodology that uses this module.
Purpose of data	Calculation of leakage
Calculation method	N/A
Comments	N/A

Data / Parameter	ΔCP, LB
Data unit	tCO_2e
Description	Liquid greenhouse gas emissions within the leakage belt in the case of the project
Source of data	According to the M-REDD Module.
Description of measurement methods and procedures to be applied	According to the M-REDD Module.

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
Calculation method	N/A
Comments	N/A

Data / Parameter	PROPIMM
Data unit	Proportion
Description	Estimated proportion of baseline deforestation caused by immigrant population
Source of data	Official country-specific data (government). The proportion of baseline deforestation caused by the immigrant population (PROPIMM) was estimated for a period from 2012 to 2020. For the calculation of PROPIMM, local data for births, deaths and population were used. It is then assumed that the total annual population growth of a given municipality is attributed to: i) births and ii) immigration. Thus, by subtracting the number of annual births from the total annual population growth, it is possible to infer the number of immigrants.
Description of measurement methods and procedures to be applied	Estimated as a proportion of the area deforested in the last 5 years by the population that migrated to the leakage belt and project area in the last 5 years (all areas within 2 km of the project area boundaries design and leakage belt should be considered here).
Frequency of monitoring/recording	Annually
Value applied	1.33
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
Calculation method	N/A
Comments	N/A

Data / Parameter	UMADefLB,i,t
Data unit	hectare
Description	Area of deforestation recorded in the leakage belt in the case of the project in stratum *i* in the year *t*
Source of data	As per the M-REDD Module. Satellite image.
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
Calculation method	N/A
Comments	N/A

Data / Parameter	UMADefPA,I,u,t
Data unit	hectare
Description	Area of deforestation recorded in the project area in case of project in stratum *i* converted to land use *u* in year *t*
Source of data	As per M-REDD Module. Satellite image.
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	To measure ex-post.
Monitoring equipment	N/A
QA/QC procedures to be applied	As per REDD+ MoF section 9.3 or other VCS methodology that uses this module.

Purpose of data	Calculation of leakage
Calculation method	N/A
Comments	N/A

Data / Parameter	RFt
Data unit	%
Description	Risk factor used to calculate VCS buffer credits
Source of data	Non-Permanence Risk Report (v3.1), Remote sensing and GIS data, Literature data
Description of measurement methods and procedures to be applied	All VCS Non-Permanence Risk Report data sources will be used to measure the various risk factors.
Frequency of monitoring/recording	Annually
Value applied	10
Monitoring equipment	VCS Approved AFOLU Non-Permanence Risk Tool
QA/QC procedures to be applied	Literature data from renowned sources will be used and critically checked. When possible, the average of two or more sources will be used.
Purpose of data	Calculation of project emissions
Calculation method	All risk factors described in the VCS Risk Report have been assessed.
Comments	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

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 "VM0007 REDD+ Methodology Framework (REDD+ MF), v1.6". According to the methodology, the Monitoring Plan requires the inclusion of the following tasks:

1. Monitoring of project implementation;
2. Monitoring of current carbon stock change and greenhouse gas emissions;
3. Monitoring of leakage in the change of carbon stock and emission of greenhouse gasses;
4. Estimation of ex-post net changes in carbon stock and greenhouse gas emissions.

3.3.3.1 Monitoring of the project implementation

The project implementation will be monitored considering the previously defined project activity. Table 57 below presents relevant information for this task, following the criteria of section 9.3.1 of VM0007. Terra Vista Gestora de Recursos Ltd. and Ituxi Administração e Participação Ltd. will be responsible for the implementation of the project activity and its monitoring. The implementation of specific project activities may be carried out by external consultants operating under the supervision of Terra Vista Gestora de Recursos Ltd. and Ituxi Administração e Participação Ltd. Digital files will be stored in the Terra Vista database and hard copies will be archived at its headquarters.

Table 57. Standardized Benefits Category, Project Activities and Technical Description of the Monitoring Task.

Standardized Benefit Category	Project Activities	Technical Description of Monitoring Task
Forest coverage/reduction of GHG emissions	Improvement of heritage surveillance	Deforestation, forest degradation and fire scars will be monitored annually through satellite images and field verifications. Land use change maps will be collected from PRODES and DETER/INPE[142], MAPBIOMAS[143] and orbital images from the *European Space Agency*[144].
Reduction of GHG emissions	Remote Biomass Monitoring	Maps of land use change will be used from scientifically recognized data sources, such as Mapbiomes.

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

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

[144] Available at: https://sentinels.copernicus.eu/web/sentinel/home . Accessed on: 12/12/2022.

		Remote monitoring of the area will also be carried out annually using satellite images and drone and radar flyovers in order to assess the conservation status of the project area and zone, more specifically, to assess whether there have been changes in forest cover during the period of monitoring.
Reduction of GHG emissions	Preventing and Combating Forest Fires	Training will be offered on good practices in handling and combating fires to communities living in the project area, in order to prevent the spread of forest fires. 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 recorded through activity reports. The number of training sessions will be informed in each monitoring report. Forest fires should also be avoided by setting up firebreaks. The number and length of firebreaks implemented 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 Samaúma Project, it is possible to monitor the processes, enabling learning and continuous improvements, guaranteeing the quality and efficiency of the project.

Terra Vista Gestora de Recursos Ltd. It has digital data storage on the Google Drive platform[145], 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.

The processes described will be the responsibility of Terra Vista Gestora de Recursos Ltd. and Ituxi Administração e Participação Ltd.

3.3.3.2 Monitoring changes in current carbon stock, GHG emissions and leakage

This monitoring task will follow the criteria set out in module VMD00015 V.2, which provides methods to monitor *ex post* GHG emissions and removals due to deforestation, forest degradation, disturbance of natural resources and increase of the carbon stock in the project area and leakage belt. The

[145] Available at: https://www.google.com/intl/pt-BR/drive/. Accessed at:12/01/2022

monitoring of changes in the current carbon stock and GHG emissions is carried out in three stages, presented in the next sections.

3.3.3.2.1 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 changes 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 Landsat series satellites, called “Landsat class”. These images are characterized by having spatial resolution in the range of 30 meters and at least 3 spectral bands. Currently, images from the Landsat-8, SENTINEL-2 (European Union) or CBERS-4 of INPE/CRESDA (Brazil/China) satellites are also used. Accuracy assessments are made with the SENTINEL satellite series of the European Space Agency (ESA), with a spatial resolution of 10x10m. Classified orbital images from INPE's DETER service are used to assess deforestation and forest degradation alerts. The DETER service uses images from WFI sensors, from the Sino-Brazilian Earth Resources Satellite (CBERS-4) and AWiFS, from the Indian Remote Sensing Satellite (IRS), with 64 and 56 meters of spatial resolution, respectively.

3.3.3.2.2 Land use and land cover change data processing

Landsat-8, SENTINEL-2 and CBERS-4 images are available from their suppliers already orthorectified, with a refined system of geometric correction through control points and digital models of terrain elevation . 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 current cartographic standards. The PRODES project composes images for several satellites (and dates) to reduce cloud cover in a scene and evaluate the increase in deforested area. The DETER system has high temporal resolution. Visual analysis of each scene is performed by INPE technicians to assess image quality, selecting images that are not excessively contaminated with clouds.

3.3.3.2.3 Post-processing and accuracy assessment

PRODES project data[146] will be used annually to monitor land use change on all land managed by the identified driver of deforestation (including the Project Area and land outside the project boundary). 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 Project Area deforestation (ADefPA,i,u,t) or leakage due to activity

[146] Available at: http://www.dpi.inpe.br/prodesdigital/dadosn/. Accessed on: 12/12/2022.

displacement (ADefLK,i,u,t) in the project scenario. If DETER data is not confirmed by PRODES, but is verified in the field through direct observation, it will be used to update the forest cover reference maps and, therefore, will also be accounted for as deforestation of the project Area or leakage. DETER data have higher temporal resolution and lower spatial resolution than PRODES data, which makes them suitable for generating deforestation alerts, which can be used to guide rapid responses by Project proponents.

3.3.3.2.4 Interpretation and Analyzes

PRODES project data will be used to monitor project area deforestation (ADefPA,i,u,t) and activity displacement leakage (ADefLK,i,u,t) in the project scenario. The net change in the carbon stock as a result of deforestation in the project area and the leakage belt will be calculated taking into account the net changes in the carbon stock in all reservoirs in the project scenario ($\Delta C_{pools,Def,u,i,t}$). The calculations will be made according to equations 03 to 06 of module VMD0015 v2.2 and equations 01 to 07 of module VMD0009 v1.3.

An initial participatory rural assessment of communities in and around the Project Area was carried out to determine if there was potential for illegal logging to occur. Considering the initial scope of the project, it was characterized that all families living within the project area explore the forest in search of wood and fuel, which should be considered a low-impact activity aimed at subsistence purposes. No logging or firewood economic activity was perceived by proponents. In this sense, the proponents assumed that the extraction of trees for wood or firewood is a constant in the property where the presence of the community is perceived. A participatory rural assessment will be carried out every two years, as established in the methodology.

In line with common practice in Amazonia, it is assumed that fire is used for land clearing after deforestation in the project area, baseline and project scenarios. Non-CO2 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.

3.3.3.2.5 Documentation

The monitoring report will bring relevant information about the time series of data on land use change and GHG emissions, considering data sources and processing protocols, data classification and accuracy assessment, following module VMD0015 v2.2.

The digital files will be stored in the proponents' database. Terra Vista Gestora de Recursos Ltd. and Ituxi Administração e Participação Ltd. 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 Ltd. and Ituxi Administração e Participação Ltd., being made available to the validation and verification body (VVBs) at each verification process.

3.3.3.3 Estimation of *ex post* in net carbon stock and GHG emissions

Ex-post estimates are performed according to the methodological procedures described in section 3.2. The technical description of the monitoring task and an overview of the data collection procedures are described in section 3.3.3. section 3.3.3.2.3 provides information on applicable quality control and assurance procedures.

3.3.3.4 Baseline revision for future project crediting periods

The baseline will be updated considering the methodological procedures described in section 3.1.4 after 10 years from the project start date.

3.3.4 Disclosure 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 Samaúma project must incorporate 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[147].

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[148][149]. The Intergovernmental Panel on Climate Change[150] '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[151].

The indication of increased rainfall in the Amazon in the GFDL model was the result of an error in the already corrected model[152]. 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

[147] FEARNSIDE, PM 2009. The Vulnerability of the Amazon Rainforest to Climate Change. 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: 12/14/2022.

[148] COX, PM, BETSS, RA, JONES, CD, SPALL, SA, TOTTRDELL, IJ 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 12/14/2022.

[149] COX, PM, BETTS, RA, COLLINS, M., HARRIS, PP, HUNTINGFORD, C., JONES CD 2004. Amazonian Forest Dieback under Climate-Carbon Cycle Projections for the 21st Century. Theoretical and Applied Climatology 708: 137-156. Available from: 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 12/14/2022.

[150] 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: 12/14/2022.

[151] KUNDZEWICZ, ZWLJ MATA, NW ARNELL, P. DÖLL, P. KABAT, B. JIMÉNEZ, KA MILLER, T. OKI, Z. SEN AND IA SHIKLOMANOV. 2007. Freshwater Resources and their Management. PP. 173-210. IN: ML PARRY, OF CANZIANI, JP PALUTIKOF, PJ VAN DER LINDEN, AND CE 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: 12/14/2022.

[152] FEARNSIDE, PM 2009. Vulnerability of the Amazon Forest to Climate Change. 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: 12/14/2022.

drier than the actual climate of today[153]. 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 warming in recent decades, with 2017 being the warmest year since the mid-20th century[154]. Figure 48 presents the observed temperature anomaly over 1961-1990 obtained from three data sources for the Amazon.

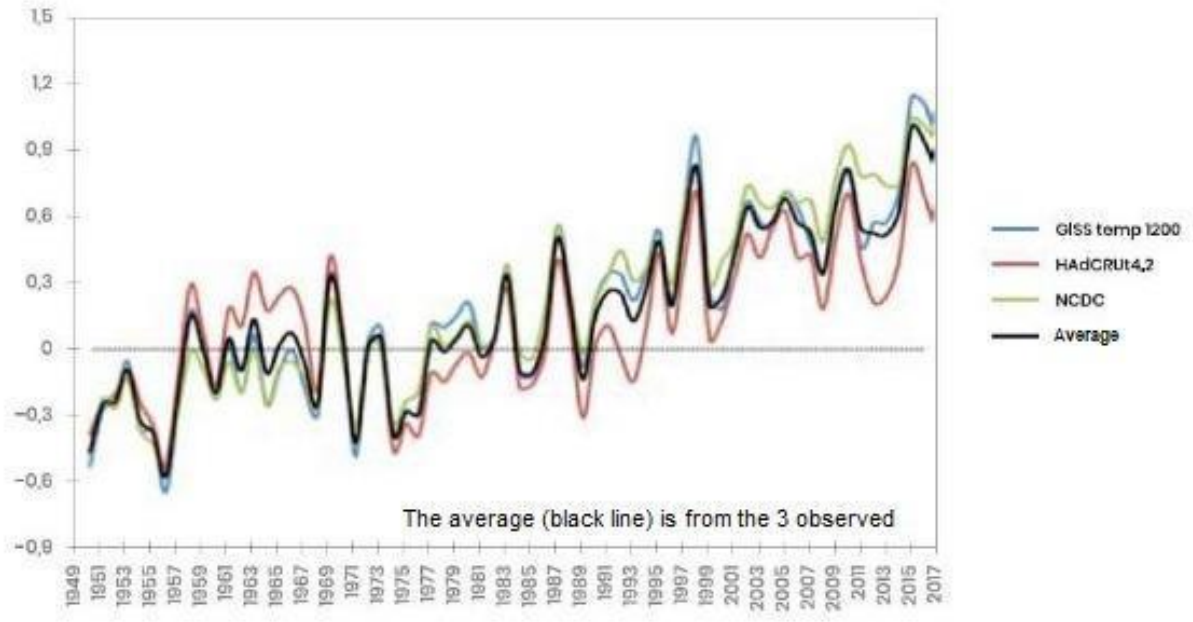

Figure 48. Observed temperature anomaly for 1961-1990 obtained from three data sources for Amazonia. Sources: GISS-NADA Goddard Institute for Space Studies, USA, NCDC-National Climatic Data Center, USA, HAdCRU-Hadley Centre-Climate Research United, United Kingdom.

[153] CANDIDO, LA; MANZI, AO; TOTA, J.; DA SILVA, PRT; SANTOS, RNN; CORREIA, FWS 2007. The current and future climate of the Amazon in IPCC scenarios: the issue of savannization. Science and culture 59(3): 44-47. Available at: http://cienciaecultura.bvs.br/scielo.php?script=sci_arttext & pid=S0009-67252007000300017 .Accessed on: 12/14/2022.

[154] MARENGO, JA, SOUZA JR, C. 2018. Climate Change: Impacts and Scenarios for the Amazon. SAO PAULO. 2018. Available at: https://www.oamanhaehoje.com.br/assets/pdf/Report_Climate_Change_impacts_and_scenarios_for_the_Amazon.pdf . Accessed on 12/14/2022.

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 49). 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 50).

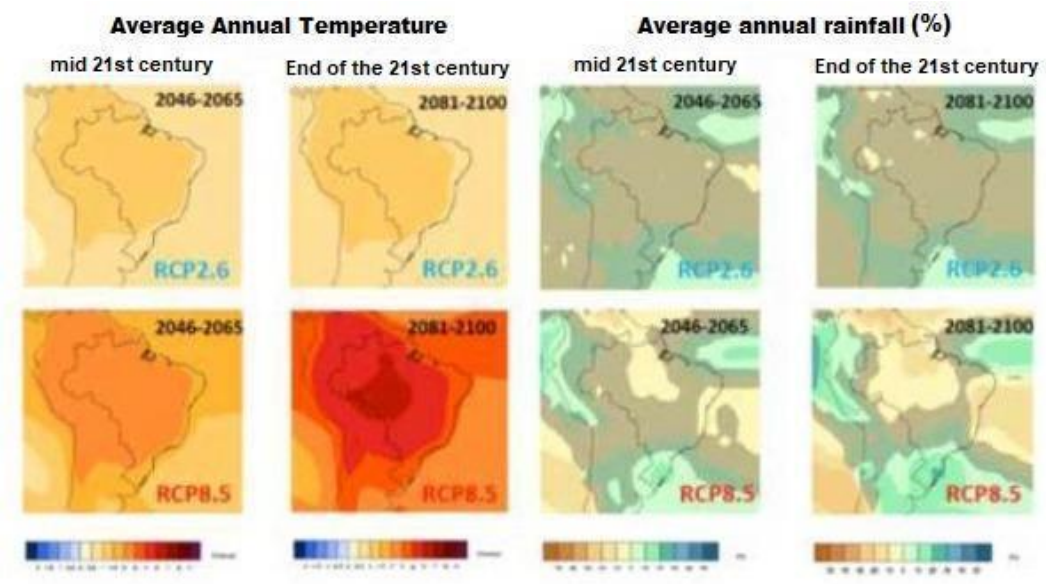

Figure 49. Projections of temperature and precipitation changes in the tropical region of South America produced by the IPCC AR5 model defined for 2046-2065 and 2081-2100 with low emission (RCP2.6) and high emission (RCP8.5) scenarios, for the period from 1981 -2010 [155].

[155] MARENGO, JA, SOUZA JR, C. 2018. Climate Change: Impacts and Scenarios for the Amazon. Sao Paulo. 2018. Available at: https://www.oamanhaehoje.com.br/assets/pdf/Report_Climate_Change_impacts_and_scenarios_for_the_Amazon.pdf . Accessed on 12/14/2022.

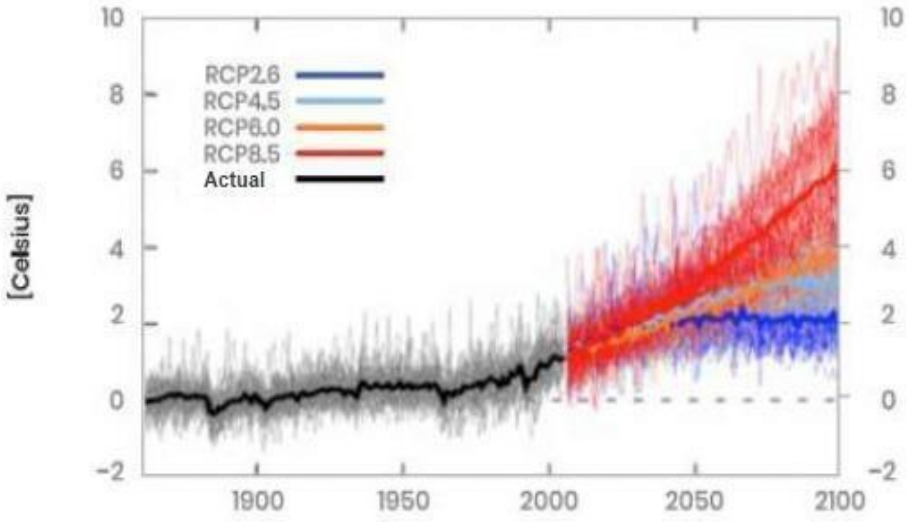

Figure 50 Projections of temperature changes up to 2100 for the various IPCC A5 emission scenarios for the Amazon[156].

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) [157] 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

[156] MARENGO, JA, SOUZA JR, C. 2018. Climate Change: Impacts and Scenarios for the Amazon. Sao Paulo. 2018. Available at: https://www.oamanhaehoje.com.br/assets/pdf/Report_Climate_Change_impacts_and_scenarios_for_the_Amazon.pdf . Accessed on 12/14/2022.

[157] RIBEIRO, BR, SALES, LP, 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: 12/14/2022.

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 study. Therefore, the fragmentation of ecosystems in the Amazon could potentiate the effects of climate change in the region [158].

Climate change will also have negative impacts on the well-being of communities and biodiversity in the Samaúma project 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

[158] 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.

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[159].

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:

1) 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;

2) Loss of plant and animal populations, mainly endemic species;

3) Forest fragmentation and habitat loss;

4) Extreme weather events, with more intense rains and storms, also affecting family members and subsistence agriculture;

5) Increased temperature, with a higher incidence of droughts and fires, and agricultural losses, affecting food security in the region;

6) Migration of people from the communities in search of conditions and life in neighboring cities, and in other larger cities;

7) Impacts on the ichthyofauna and effects on artisanal fishing, also affecting the food security of communities;

8) Increased incidence of tropical diseases and other types of medium/large scale epidemics (possibly even pandemics);

9) Stress and higher incidence of diseases in animals raised for the production of animal protein by traditional communities;

10) Impacts on nutrient cycling and soil biota, reducing productivity in cultivated areas and in the forest itself.

[159] BARCELLOS, C.; MONTEIRO, AMV; CORVALÁN, C.; GURGEL, HC; CARVALHO, MS; ARTAXO, P.; HACON, S.; RAGONI, V. Climate and Environmental Changes and Infectious Diseases: Uncertainty Scenarios for Brazil. Epidemiology and Health Services, V. 18, N. 3, P. 285-304, 2009. Available at: http://scielo.iec.gov.br/pdf/ess/v18n3/v18n3a11.pdf . Accessed on: 12/14/2022.

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 the Table 58 below.

Table 58. 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 adaptation measures	X	X	Training courses for extractive communities	Local population well-informed and motivated to adopt mitigation and adaptation measures to combat climate change	Less climate risk for the local population
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	Technical extension courses in low-carbon agricultural practices and the smart use of water and energy	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 to analyze the effects of climate change on the adaptation of species to the environment throughout their lives		X	Annual carbon reports executed	Improved knowledge about forest (and biodiversity) response to climate change	Biodiversity benefited

4 COMMUNITY

4.1 Without-Project Community Scenario

4.1.1 Descriptions of Communities at Project Start (CM1.1)

The creation and occupation of the municipality of Apuí are inserted in the idea of national security, of "integrating so as not to surrender", a political concept adopted by the military government in the 1970s, which consisted of an image of the demographic void of the Amazonian landscape that necessarily should be occupied by progress[160]. However, this view is not supported by data and information on the history of anthropic occupation in the Amazon. According to the Ecumenical Center for Documentation and Information (Cedi), the region between the Madeira and Tapajós rivers was occupied by indigenous peoples of the Diahoi, Morerebi, Mirá-pirahã, Numbiai, Parintintim, Tiverim and Munduruku[161] ethnic groups. The occupation of the territory by these peoples was marked by the intense displacement of the indigenous populations that roamed and had as their territory the extensive areas crossed by the Transamazônica highway between the Madeira and Tapajós rivers[162]. From the Ethnohistorical Map of Brazil and adjacent regions, adapted from Curt Nimuendaju's map, it is possible to identify an intense occupation and displacement of the Kagwahiva people from the upper Jurema and Teles Pires, towards the upper Aripuanã[163]. According to the information on the map, the Kagwahiva also occupied the upper Roosevelt, and the region between the Marmelos River and Madeira[164].

The process of occupation of this extensive territory by indigenous populations and Brazilian society was marked by intense conflicts. The relationship between the different indigenous peoples was based on alliance and conflict. In this dynamic, during the 19th century, the Kagwahiva, known as the Desterim, moved from the region of the upper course of the Jurema River towards the Madeira River[165]. This

[160] GALUCH, Mariana Vieira; MENEZES, Thereza Cristina Cardoso. Da reforma agrária ao agronegócio: notas sobre dinâmicas territoriais na fronteira agropecuária amazônica a partir do município de Apuí (Sul do Amazonas). Estudos Sociedade e Agricultura, Rio de Janeiro, v. 28, n. 2, p. 388-412, jun. 2020. Available at: https://www.redalyc.org/articulo.oa?id=599963212009 . Accessed on: 14/12/2022.

[161] GALUCH, Mariana Vieira; MENEZES, Thereza Cristina Cardoso. Da reforma agrária ao agronegócio: notas sobre dinâmicas territoriais na fronteira agropecuária amazônica a partir do município de Apuí (Sul do Amazonas). Estudos Sociedade e Agricultura, Rio de Janeiro, v. 28, n. 2, p. 388-412, jun. 2020. Available at: https://www.redalyc.org/articulo.oa?id=599963212009 . Accessed on: 14/12/2022.

[162] GALUCH, Mariana Vieira; MENEZES, Thereza Cristina Cardoso. Da reforma agrária ao agronegócio: notas sobre dinâmicas territoriais na fronteira agropecuária amazônica a partir do município de Apuí (Sul do Amazonas). Estudos Sociedade e Agricultura, Rio de Janeiro, v. 28, n. 2, p. 388-412, jun. 2020. Available at: https://www.redalyc.org/articulo.oa?id=599963212009. Accessed on: 14/12/2022.

[163] Ethno-historical map by Curt Nimuendaju / IBGE. Rio de Janeiro. National Pro-Memory Foundation; IBGE, 1981. 97p. : il., map color. Available at https://biblioteca.ibge.gov.br/index.php/biblioteca-catalogo?id=214278&view=detalhes

[164] Ethno-historical map by Curt Nimuendaju / IBGE. Rio de Janeiro. National Pro-Memory Foundation; IBGE, 1981. 97p. : il., map color. Available at https://biblioteca.ibge.gov.br/index.php/biblioteca-catalogo?id=214278&view=detalhes

[165] ISA - Socio Environmental Institute. Indigenous Peoples of Brazil: Tenharim. Available at: https://pib.socioambiental.org/pt/Povo:Tenharim

displacement was driven by the conflict with the Munduruku and pressure from expeditions by mining companies looking for gold[166]. The approach of the Kagwahiva to Brazilian society was also marked by intense conflicts that lasted from the 19th century until the second decade of the following century[167]. Conflicts in the region only ended with the action of the Indian Protection Service (SPI) and with the definitive installation of rubber tapper placements in the region[168]. Thus, since the period prior to the creation of the municipality, in addition to the indigenous presence, the region was also occupied by extractive communities that lived on the banks of the Aripuanã and Sucurundi rivers[169].

Even in a period prior to the creation of the municipality, the region received migratory waves of workers from the rubber cycle. Between the second half of the 19th century and the first half of the 20th, the Amazon region received a migratory population contingent mainly from the state of Ceará, which reconfigured the occupation of the channels of the Amazon rivers[170]. These workers in search of rubber absorbed the local culture and adapted to survive in the midst of the Amazon rainforest.

During the final process of formation of the municipality, Apuí received three waves of migration. Initially, with the closure of the agricultural frontier in southern Brazil in the 1980s, there was the first wave of migration from the state of Paraná. These families did not receive the support promised by the Brazilian government to strengthen initial agricultural activities. About sixty percent of the first families settled in PARJ return to their place of origin. Later, in the 1990s, there was a second wave of migration. This migration started from Rondônia, and was made up of farmers who, due to the depletion of areas destined for agro pastoral activities in their state, were looking for new areas to establish livestock. Farmers from Rondônia, as well as merchants from Apuí, bought lots from the pioneer families of PARJ who had returned to their home state at very low prices. The third migratory wave occurred in the mid-2000s, when Apuí received a large number of brasiguaia families who moved from Paraguay to Apuí in search of better conditions for agricultural production [171].

The migratory waves from Rondônia and Brasiguaia families were mostly made up of cattle ranchers who had the possibility of accumulating large tracts of land in Apuí. From incentives and the softening of

[166] ISA - Socio Environmental Institute. Indigenous Peoples of Brazil: Tenharim. Available at: https://pib.socioambiental.org/pt/Povo:Tenharim

[167] ISA - Socio Environmental Institute. Indigenous Peoples of Brazil: Tenharim. Available at: https://pib.socioambiental.org/pt/Povo:Tenharim

[168] ISA - Socio Environmental Institute. Indigenous Peoples of Brazil: Tenharim. Available at: https://pib.socioambiental.org/pt/Povo:Tenharim

[169] GALUCH, Mariana Vieira; MENEZES, Thereza Cristina Cardoso. From agrarian reform to agribusiness: notes on territorial dynamics in the Amazonian agricultural frontier from the municipality of Apuí (Southern Amazonas). Society and Agriculture Studies, Rio de Janeiro, v. 28, no. 2, p. 388-412, Jun. 2020. Available at: https://www.redalyc.org/articulo.oa?id=599963212009

[170] BARBOZA, Edson Holland Lima. Ceará migrants in the province of Amazonas: conization, work and conflict (1877 - 1979). Available at: https://www.scielo.br/j/rbh/a/HHtgr7H83cgfjWqdbbwQ67k/?lang=pt.

[171] GALUCH, Mariana Vieira; MENEZES, Thereza Cristina Cardoso. From agrarian reform to agribusiness: notes on territorial dynamics in the Amazonian agricultural frontier from the municipality of Apuí (Southern Amazonas). Society and Agriculture Studies, Rio de Janeiro, v. 28, no. 2, p. 388-412, Jun. 2020. Available at: https://www.redalyc.org/articulo.oa?id=599963212009

legislation, both at the federal and state levels, it was possible for these farmers to accumulate large tracts of land. Thus, the concentration of land in large estates owned by cattle ranchers and the low fertility of the soil in Apuí are correlated with the cattle breeding "vocation" of the municipality. This "vocation" is manifested not only in the local economy with the number of agricultural establishments and jobs generated, but fundamentally, it results in a profound change in land use that has repercussions in alarming data on deforestation and GHG pollution[172] in the municipality.

Apuí concentrates its structure of services and markets in the municipal headquarters[173]. This structure serves the region, mainly the population of the southern portion of the municipalities of Novo Aripuanã, Manicoré and Maués[174]. As indicated by the historic process of occupation of the municipality, Apuí has a strong productive profile focused on beef and dairy cattle, similar to the production carried out along the Trans-Amazonian Highway, to the south of Lábrea and Boca do Acre[175]. This region makes up part of the Arch of Deforestation, where there is a strong advance of the Agricultural Frontier over the Amazon forest[176]. The Arc of Deforestation extends to the Southwest of Pará, South of Amazonas and West of Acre[177]. Particularly, in recent years, the region delimited by the Arc of Deforestation, and especially the south of Amazonas, has shown an exponential growth in deforested areas[178].

It is in this historical, economic and sociocultural context that the communities residing on the banks of the Aripuanã River are inserted. According to reports from current residents, before the formation of Apuí, the communities on the Aripuanã River had a relationship linked to Manaus. During this period, extractive communities used roads and trails in search of rubber plantations, and moved along rivers to access distant areas.

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[172] GALUCH, Mariana Vieira; MENEZES, Thereza Cristina Cardoso. Da reforma agrária ao agronegócio: notas sobre dinâmicas territoriais na fronteira agropecuária amazônica a partir do município de Apuí (Sul do Amazonas). Estudos Sociedade e Agricultura, Rio de Janeiro, v. 28, n. 2, p. 388-412, jun. 2020. Available at: https://www.redalyc.org/articulo.oa?id=599963212009

[173] WWF – World Wide Fund For Nature. Perfil socioeconômico e ambiental do sul do estado do Amazonas: Subsídios para Análise da Paisagem 2017, página 27. Available at: https://www.wwf.org.br/?59402/Perfil-socioeconomico-e-ambiental-do-sul-do-estado-do-Amazonas-subsidios-para-analise-da-paisagem. Accessed on:14/12/2022.

[174] WWF – World Wide Fund For Nature. Perfil socioeconômico e ambiental do sul do estado do Amazonas: Subsídios para Análise da Paisagem 2017, página 27. Available at: https://www.wwf.org.br/?59402/Perfil-socioeconomico-e-ambiental-do-sul-do-estado-do-Amazonas-subsidios-para-analise-da-paisagem. Accessed on:14/12/2022.

[175] WWF – World Wide Fund For Nature. Perfil socioeconômico e ambiental do sul do estado do Amazonas: Subsídios para Análise da Paisagem 2017, página 27. Available at: https://www.wwf.org.br/?59402/Perfil-socioeconomico-e-ambiental-do-sul-do-estado-do-Amazonas-subsidios-para-analise-da-paisagem . Accessed on:14/12/2022.

[176] GALUCH, Mariana Vieira; MENEZES, Thereza Cristina Cardoso. Da reforma agrária ao agronegócio: notas sobre dinâmicas territoriais na fronteira agropecuária amazônica a partir do município de Apuí (Sul do Amazonas). Estudos Sociedade e Agricultura, Rio de Janeiro, v. 28, n. 2, p. 388-412, jun. 2020. Available at: https://www.redalyc.org/articulo.oa?id=599963212009 . Accessed on:14/12/2022.

[177] GALUCH, Mariana Vieira; MENEZES, Thereza Cristina Cardoso. Da reforma agrária ao agronegócio: notas sobre dinâmicas territoriais na fronteira agropecuária amazônica a partir do município de Apuí (Sul do Amazonas). Estudos Sociedade e Agricultura, Rio de Janeiro, v. 28, n. 2, p. 388-412, jun. 2020. Available at: https://www.redalyc.org/articulo.oa?id=599963212009 . Accessed on:14/12/2022.

[178] GALUCH, Mariana Vieira; MENEZES, Thereza Cristina Cardoso. Da reforma agrária ao agronegócio: notas sobre dinâmicas territoriais na fronteira agropecuária amazônica a partir do município de Apuí (Sul do Amazonas). Estudos Sociedade e Agricultura, Rio de Janeiro, v. 28, n. 2, p. 388-412, jun. 2020. Available at: https://www.redalyc.org/articulo.oa?id=599963212009 . Accessed on:14/12/2022.

Currently, the Aripuanã communities still depend on extractivism and livelihoods linked to the Amazon rainforest. These communities live on small swiddens, where manioc (or manioc) is planted mainly for the production of manioc flour. They also depend on fishing in the rivers, igarapés and igapós, hunting, extracting copaíba and chestnuts, in addition to working as a guide at the fishing lodges in the region. Today, due to the difficulty of obtaining income through extractivism, difficulty in accessing public services and issues related to land pressure and land grabbing, many families who lived on the Aripuanã and Guariba rivers have migrated to Vila de Mata Mata or to the headquarters of Apuí.

According to reports from current residents of the Aripuanã communities, the history and socioeconomic characterization of the occupation is related to the extractive tradition of the Guariba-Aripuanã region. The use of non-wood products on both banks of the Aripuanã River, between BR 230 (Transamazônica) and the border of the states of Mato Grosso and Amazonas, is part of their way of life. Thus, there is an identity-territorial aspect that, according to the norms of the CCB standard, make the project dialogue process with these residents necessary.

The Aripuanã communities are within the PAE Aripuanã-Guariba area, an agroextractive project created by the National Institute for Colonization and Agrarian Reform (INCRA). According to community reports, local extractivists make use of areas that extend from the PAE Aripuanã-Guariba and Apuí Mosaic Conservation Units to the border with the state of Mato Grosso.

According to reports from local extractivists, during the summer, in the dry season, they travel by canoe or sterndrive within a radius of 60 to 70 km. In winter, extractivists work throughout the PAE Aripuanã-Guariba and in the Apuí Mosaic of Conservation Units, navigating the igarapés and igapós, traveling 100 to 120 km in relation to the communities. The main products collected by these extractivists are copaiba and Brazil nuts. In the cycle of extractive collections, the copaiba tree needs three years to recover the oil and start a new harvest. The chestnut groves can be exploited from December to March, however, with more intense biennial production. These alternating collection cycles are carried out seasonally by the traditionally occupied and used areas, determining the harvest and the fallow period the main extraction routes that are carried out in the forest.

These alternating collection cycles are carried out seasonally in traditionally occupied and used areas, determining the harvest and the fallow period the main extraction routes that are carried out in the forest.

Currently, some of the extractivists in the PAE Aripuanã-Guariba are associated with the Agroextractivist Association Aripuanã-Guariba (ASAGA). The association, in addition to representing the group of extractivists who work in the region of the Aripuanã and Guariba rivers, also manages the production of copaiba extracted at 51 points in areas of the PAE Aripuanã-Guariba and the Apuí Mosaic of Conservation Units. The association plays a fundamental role in the organization of copaiba extractive production and in the representativeness of PAE communities. However, according to reports from local residents, due to lack of income, many families are unable to remain associated.

From the field visits to the communities on the Aripuanã River carried out in September and December 2022, it was possible to draw a sociocultural and economic panorama of these communities. In the field surveys carried out in the communities, demographic, cultural, spiritual, lifestyle and production information and territoriality were collected. Questionnaires were applied using the Sustainable Livelihoods (MVS) methodology, addressing the human, social, environmental, physical and financial dimensions.

As reported by residents, there is currently a population depletion in the region. According to the reports, many families are moving to the village of Mata Mata or to the Apuí headquarters in search of better living conditions. These families seek to improve their income, since extractivism is not profitable in the region, in addition to improving access to public services, since the PAE region has not been adequately served by the state. It was also reported that part of these families moved due to land pressure practiced by land grabbers. Table 59 below presents the demographic data of the assessed riverside communities.

Table 59. Communities identified with their respective demographic data.

Riverside Communities	Number of inhabitants	Total		Adults		Children		Elderly		Dwellings
		M	F	M	F	M	F	M	F	
Vila Batista	12	6	6	4	4	1	1	1	1	4
Projo	8	4	4	2	2	1	1	1	1	4
Aruanã	21	10	11	8	8	1	2	1	1	5
Bela Vista do Guariba	12	8	4	4	3	3	1	1		3
Japiim	5	3	2	2	2	1				2
Total	58	31	27	20	19	7	5	4	3	18

The ASAGA was created in 2004, then paralyzed, being reactivated in 2019 from the Floresta em Pé Program of the Sustainable Amazon Foundation (FAS)[179]. The association receives about 500 kilos of copaiba per month from its members and independent suppliers. This product is filtered and sanitized in the village of Bela Vista do Guariba or at the Apuí headquarters, where a shed built with support from the Amazon Fund[180] implemented by IDESAM is located. The association valued the remuneration of extractivists by paying more and at the time of delivery of the product, different from what middlemen usually offer. The association manages to buy the products of the extractivists using the capital reserve from other sales, but it has difficulties in accessing the market and keeping resources available in cash.

Associates and independent suppliers must follow the collection and storage quality standards communicated in the good practices manual, in addition to knowing the production chain and how to record production to ensure traceability, giving the purchasing industries the opportunity to obtain international quality seals and good practices.

Another issue raised was about problems in fiscal and logistical management caused by high taxes, around 18% collected on each sale, and by the high freight costs for transporting production to large

[179] Fundação Amazônia Sustentável. Available at: https://fas-amazonia.org/
[180] Fundação Amazônia Sustentável. Available at: https://fas-amazonia.org/

centers. Proposals to encourage the production chain are needed to assign a fairer value to its products, aiming at agreements that adequately remunerate all costs and related services, including the cost of freight and alternatives to offset the cost of taxes on the sale of extractive production.

From this dialogue with the interlocutors of ASAGA and the PAE Aripuanã-Guariba region, a relevant organizational structure is noted from a strategic point of view for the viability of the Samaúma project. By being organized into a strong and active association, the families that are economically and culturally dependent on the project area become key stakeholders to be consulted.

As explained in section 2.1.11, the methodology used to describe the baseline and its subsequent monitoring was that of Sustainable Livelihoods. For the purpose of carbon credit origination projects, 21 indicators were stipulated, which are grouped into five dimensions: human, social, environmental, physical and financial. The indicators and their averages calculated with data obtained from the application of the MVS questionnaires are presented in Table 60 below (also see Figure 51).

Table 60. Dimensions, indicators and corresponding averages stipulated from the application of the MVS questionnaires.

Asset types/dimensions	Information to be obtained for baseline description (Indicators)	Average
Human Dimension	H1 - Family food security	0.525
	H2 - Use and appreciation of traditional/local ecological knowledge	0.6
	H3 - Access to new knowledge	0.3
	H4 - Satisfaction and motivation with work and life in the territory	0.74
	H5 – Workplace safety	-
Social Dimension	S1 and S2 - Relations with communities, partners and institutions	0.5 and 0.4
	S3 - Visibility and opportunity for young people	0.6
	S4 - Participation and appreciation of women in productive activities	0.2
	S5 - Access to public policies aimed at strengthening their ways of life	0.21
Environment Dimension	A1 - Access to water for human and animal drinking	0.9

	A2 - Access to land suitable for the various traditional uses and their aspirations	0.47
	A3 - Conservation and use of forest and wildlife	0.83
Physical Dimension	P1 - Individual production infrastructure	0.77
	P2 - Collective production infrastructure	0.77
	P3 and P4 - Individual/family housing, transportation and well-being infrastructure	0.6 and 0.7
Financial Dimension	F1 - Income	0.68
	F2 - Price of products and working capital, when applicable	0.4
	F3 - Commercialization	0.62
	F4 - Access to lines of credit and other financial aid policies	0.26

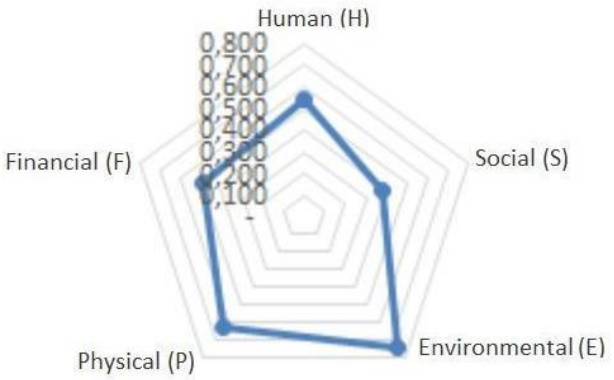

Figure 51: Polar chart with the five dimensions of sustainable livelihoods (MVS).

In the human dimension, the result of the MVS points to positive rates for the use and appreciation of traditional ecological knowledge, satisfaction and motivation with work and life in the territory. For the community members of the Aripuanã river, the traditional use of the territory and their knowledge are present and shared among extractive families. In this dimension, food security had a medium index. The food of the visited communities is based on the production obtained in small cassava fields and on the production of puba flour, fishing, hunting, and the collection of plant species. However, in this sphere,

families reported that in recent years there has been a significant reduction in the availability of hunting and fishing. With regard to access to new knowledge, the results show low rates that demonstrate the need to create and strengthen channels for acquiring technical knowledge and social technologies that can contribute to the ways of life of these communities and provide the assimilation of new knowledge. The results obtained for the indicators in the Human Dimension of the MVS are presented in Figure 52 below.

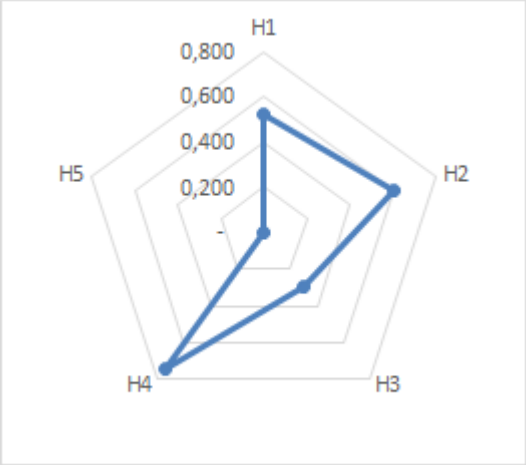

Figure 52. Polar chart with indicators of the human dimension of sustainable livelihoods (MVS).

As for the social dimension, the visibility and opportunity for young people in these communities are highly dependent on tourism carried out by the fishing lodges in the region. Working as a guide, these young people and adults manage to earn income that they would hardly get in another local productive activity. In this sense, this indicator receives a low average. The relationship with community members, partners and institutions, as shown by the index, can improve in terms of institutional strengthening and ASAGA's productive capacity. Finally, according to the indices and field research, the participation and appreciation of women in productive activities, as well as access to public policies aimed at strengthening their ways of life, show low indicators, which demonstrate differentiation in the sexual division of labor and a lack of public policies aimed at strengthening ways of life. The results obtained for the indicators in the Social Dimension of the MVS are shown in Figure 53 below.

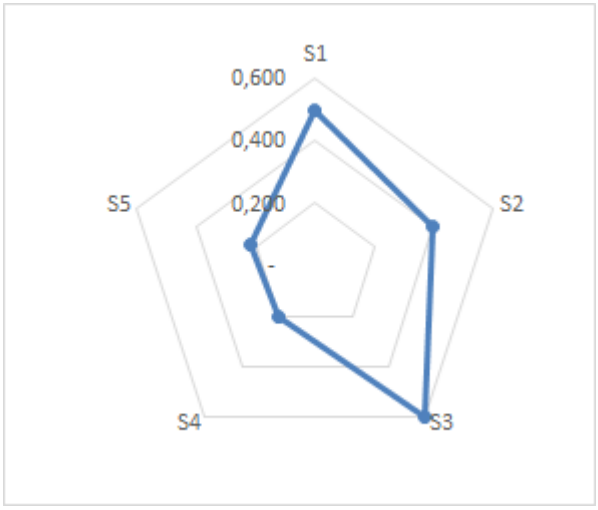

Figure 53. Polar graph with indicators of the social dimension of sustainable livelihoods (MVS).

Indicators of the Environmental Dimension show broad access to drinking water for humans and animals and security in the conservation and use of the forest and wild fauna. Access to land suitable for the various traditional uses and their aspirations, however, does not meet the expectations of the community members of the Aripuanã river. The low index of the indicator translates to a negative expectation in the relationship between the soil and the forest available for traditional extractivism practices. This drop in expectations is related to land pressure and deforestation in the PAE Guariba-Aripuanã forest area. In recent years, both the forest area and its non-timber resources, as well as hunting and fishing, have drastically decreased. The results obtained for the indicators in the Environmental Dimension of the MVS are shown in Figure 54 below.

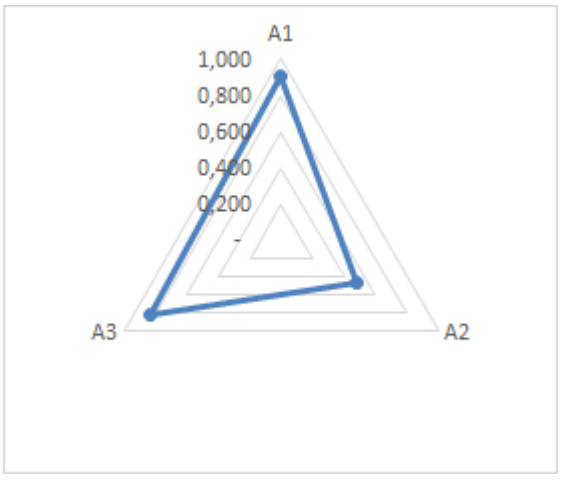

Figure 54. Polar chart with indicators of the environmental dimension of sustainable livelihoods (MVS).

The Physical Dimension showed indexes of individual and collective production infrastructure that demonstrate a certain organization in extractive production. With regard to individual or family housing, transport and well-being infrastructure, the indicator shows that people are not satisfied with housing, transport and well-being. In this regard, due to the isolation of the location and the absence of public services, residents are forced to travel long distances to access markets, sell production or access public services. The results obtained for the indicators in the Physical Dimension of the MVS are shown in Figure 55 below.

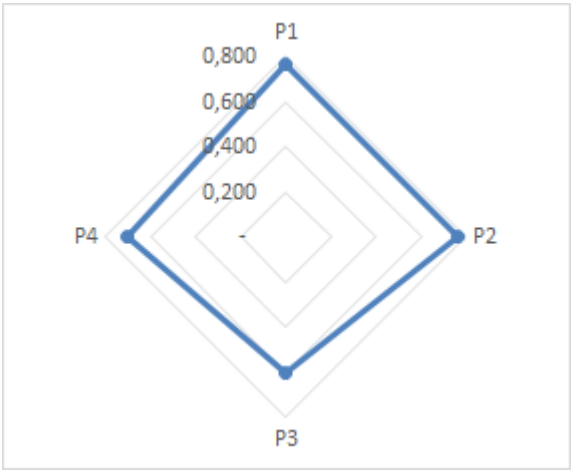

Figure 55. Polar chart with indicators of the Physical Dimension of Sustainable Livelihoods (MVS).

For the Financial Dimension, the MVS indicators show that the circulation of income in these communities is restricted and low. According to the indicators, the prices paid for extractive products are low and there is great difficulty in marketing them. Finally, access to credit lines and other financial aid policies are restricted to high interest rates and do not benefit extractive communities in the region. The results obtained for the indicators in the Environmental Dimension of the MVS are shown in Figure 56 below.

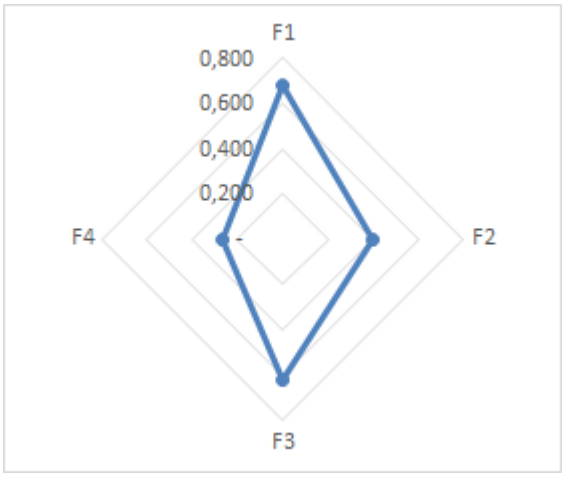

Figure 56: Polar chart with indicators of the financial dimension of sustainable livelihoods (MVS).

4.1.2 Interactions between Communities and Community Groups (CM1.1)

The communities presented here are not inserted within the project area, however, the community members who live in them make use of the PAE Aripuanã-Guariba, which covers the project area, for the extraction of copaiba, Brazil nuts, hunting and fishing. Community members can be divided into two distinct groups. The first group comprises the riverside communities that live on the banks of the Aripuanã River, at a distance of 40 to 60 km from the project area. The second group is represented by extractivists who live in the city of Apuí, located approximately 150km from the project area.

Along the Aripuanã and Guariba rivers, these traditional communities live from fishing, small swiddens, extractivism and the youngest work for a few months of the year in tourist inns located on the banks of the Roosevelt and Aripuanã rivers. In the other four months (December to April), with the seasonal closure of the inns, young people join their families in extractive activities. The relationship between the communities that live on the banks of the Aripuanã and Guariba rivers is not only linked to extractive activities and a common association, there are ties of kinship and affinity between the families of the communities on these two rivers. In the same community, there are kinship ties between family groups with the same ancestry. The relationship between the communities, on the other hand, resides in affinity ties and in the work relationship.

As described in section 2.1.8, a portion of the identified extractivists live in the seat of the municipality of Apuí, 150 kilometers away from the area where they carry out extractivism. They identify themselves as extractivists of latex from rubber trees, chestnuts, copaiba and açaí. In the questionnaire applied to each participant in the community meeting, of the 15 respondents, 14 declared themselves extractivists of non-timber forest products and one pointed to fishing as their main activity. They participate

in support programs for extractivists by IPAAM, IDAM, IDESAM and by the fishing colony, especially fishermen.

4.1.3 High Conservation Values (CM1.2)

The concept of High Conservation Values (HCVs) was developed by the Forest Stewardship Council (FSC)[181] for the certification of wood products from responsible forest management, according to principles, criteria and standards that reconcile environmental and ecological safeguards with benefits and economic viability[182]. According to Jennings et al. (2003)[183], an area with HCV represents a natural or managed area with exceptional values or critical importance, with social and cultural relevance for the reproduction of the communities' livelihoods. The Samaúma project is fully inserted within an area of high conservation value for the aforementioned community, directly related to three HCVs criteria:

- HCV 4 - Ecosystem services: basic ecosystem services in critical situations, including watershed protection and erosion control of vulnerable soils and slopes;
- HCV 5 - Community needs: key areas and resources to maintain the basic needs of local communities (livelihood, food, health, water, etc.);
- HCV 6 - Cultural values: areas of special cultural, archaeological or historical importance, nationally and globally, and/or of cultural, ecological, economic or religious/sacred importance to local communities.

Table 61. High Conservation Value related to communities within the Samaúma project zone.

High Conservation Value	Copaiba, chestnut, hunting and fishing (HCV 4; HCV 5 e HCV 6)
Qualifying Attribute	The conservation of the Samaúma project area favors the extractive activities of copaiba (C. *reticulata*, C. *paupera* and C. *multijuga*) and chestnut (*Bertholletia excelsa*), and the increase of local fauna, used as an important food resource by communities. These factors together favor the reproduction of the livelihoods of the riverside populations.
Focal Area	Improvement of heritage surveillance, remote monitoring of forest cover, monitoring and deepening of biodiversity studies, in addition to activities

[181] COUNCIL, Forest Stewardship. Forest Stewardship Council®. Protocol for Endorsing National Iniciatives. FSC. Doc, v. 1, n. 2, 1996.

[182] COUNCIL, Forest Stewardship. FSC'S "Theory Of Change". Intended Impacts And Related Indicators.[Available at: ToC https://ic. fsc. org/en/our-impact/program-areas/monitoring-and-evaluation/fsc-theory-of-change, 2014.

[183] JENNINGS, Steve et al. The high conservation value forest toolkit. Edition I, ProForest, Oxford OX, v. 12, p. 1-62, 2003.

	to intensify the engagement of communities with the preservation of the forest and forest resources.

In all five communities on the Aripuanã and Guariba rivers there are families associated with ASAGA. In total, the association has 32 associates, of which 14 work in 32 collection points on the Fazenda Samaúma, from the PAE Aripuanã-Guariba to the Apuí Mosaic of Conservation Units. In the study carried out in partnership with ASAGA, IDESAM[184] followed the extractivists in the forest and plotted their collection points for Brazil nuts and copaiba oil (Figure 57).

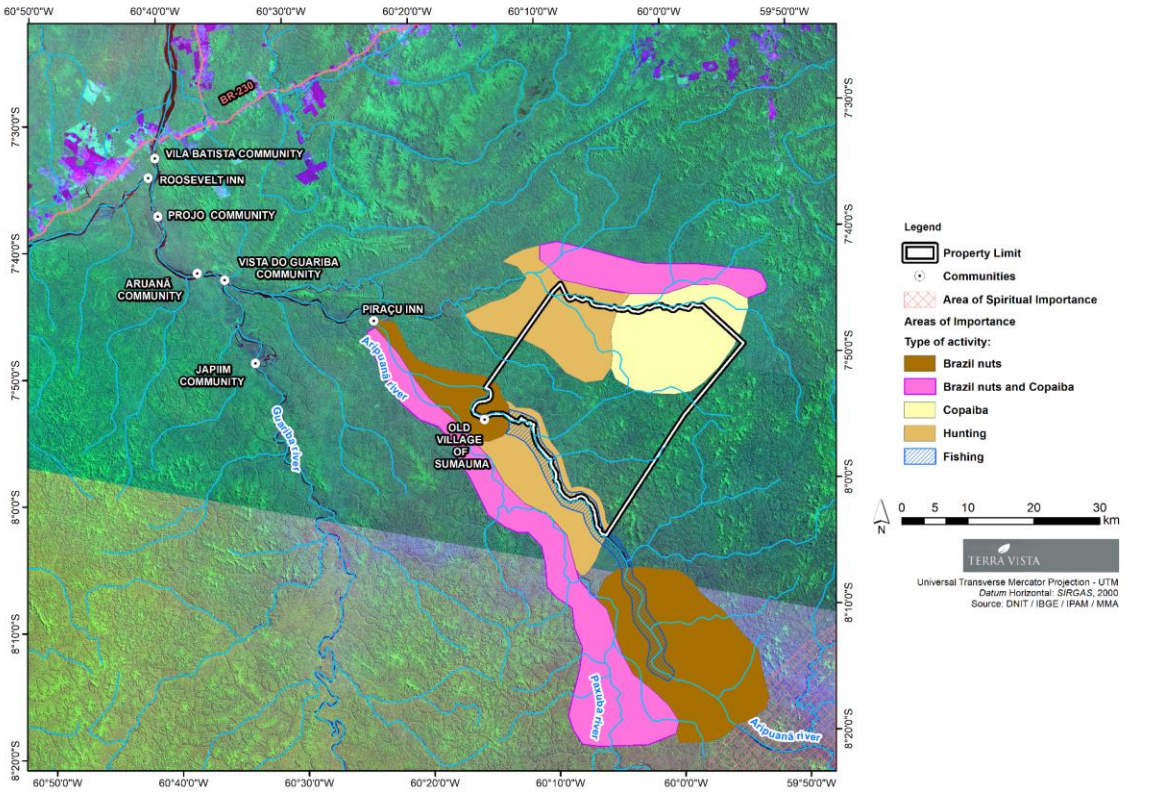

Figure 57 - Chestnut and copaiba collection areas in the PAE Aripuanã-Guariba and location of communities.

Regarding extractivism carried out by the communities of Guariba and Aripuanã, it was found that it is carried out up to the border with the state of Mato Grosso. To collect copaiba and Brazil nuts, the extractivists camp during the harvest and work at the PAE Aripuanã - Guariba and at the Apuí Mosaic of Conservation Units.

[184] SOARES et. al. Oportunidade dos serviços ambientais para as cadeias produtivas florestais do Amazonas. Manaus: IDESAM, 2019.

In the cycle of extractive collections, the copaiba tree needs 3 years to recover the oil and provide a new harvest. The chestnut groves can be exploited from December to March, however, with more intense biennial production. These alternating collection cycles are carried out seasonally by the traditionally occupied and used areas, determining the harvest and the fallow period and the main extraction routes in the forest. Below is the seasonal calendar of the communities (Table 61).

Table 61- Seasonal calendar of communities located in the PAE Aripuanã-Guariba.

Samaúma Project	seasonal calendar - communities											
Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Copaíba	x	x	x	x	x	x	x	x	x	x	x	x
Chestnut	x	x	x*									x
Fishing Guide					x	x	x	x	x	x		
Cassava flour	x	x	x	x	x	x	x	x	x	x	x	x
* chestnut season with the highest market value												

4.1.4 Without-Project Scenario: Community (CM1.3)

The Samaúma project has as its main objective the conservation of around 71,508.24 ha of native Amazon Forest in a region that has a long history of deforestation. In the absence of the project, it was highlighted in the present study that the expected scenario would be the advance of deforestation and degradation of the area, considering the planned deforestation, recommended in Law n 12,651/12, in which the owner of land in the Amazon has the legal right to deforest 20% of the property area and unplanned deforestation, in which properties would be invaded and forest areas converted into pasture areas.

Due to the high cost of maintaining activities that guarantee the monitoring and security of forest areas, it would be unfeasible for landowners to bear such costs and efforts in the long term and on a large scale, making it impossible to prevent unplanned deforestation and uncontrolled invasions. In this way, the scenario with the presence of the Samaúma 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.

For the riverside communities, the implementation of strategies aimed at improving the quality of life, which would not have occurred in the absence of the project, such as: implementation of a community photovoltaic system, implementation of a system for capturing and distributing water, acquisition of transport for health care and emergencies, logistical alternatives to ensure community access to public services (health and education) and disposal of non-timber forest products. In addition, local communities would benefit from training and courses aimed at strengthening the productive chain of Brazil nuts and copaiba oil, improving living conditions and providing better job opportunities for families. Finally, by

preserving the forest area that presents a high risk of deforestation for extractivism and subsistence, the project tends to strengthen the ways of life of local traditional communities and their economic production.

4.2 Net Positive Community Impacts

The International Association for Impact Assessment (IAIA 2003)[185] 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;
- 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" [186].

4.2.1 Expected Community Impacts (CM2.1)

The impacts on communities presented below include benefits, costs and risks, being related to community, social, cultural, environmental and psychological aspects. In addition to the observed impacts, consultations were carried out with the community members, seeking to capture their perception of the

[185] Social and Biodiversity Impact Assessment (SBIA) Manual for REDD+ Projects Part 1 – Core Guidance for Project Proponents. 2011.

[186] Social and Biodiversity Impact Assessment (SBIA) Manual for REDD+ Projects Part 1 – Core Guidance for Project Proponents. 2011.

possible positive and negative changes that the project will bring. The impact assessment activities took place in conjunction with public consultation hearings with community members between December 1st and 2nd, 2022, in the Vila Batista and Bela Vista do Guariba communities.

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. Maintaining biodiversity favors the extraction of copaiba and Brazil nuts, in addition to increasing hunting and fishing. In addition, maintaining the forest, according to the community, helps to maintain a mild climate, improving the quality of life.

Community development was identified as the main positive impact. The project's activities foresee bringing infrastructure to the communities, such as: electricity, water collection and distribution, internet access, river transport for children to go to schools and for community members to go to health units, means of transport to assist in cassava crops, training courses for processing extracted products and product management.

Regarding the negative impacts perceived by the community, it was pointed out possible future conflicts with land invaders that are close to the project area, carrying out illegal mining. The PAE Aripuanã-Guariba region has been under pressure from the invasion of prospectors, who have unduly taken possession of extensive areas occupied by preserved forests.

Another negative impact raised was the time cost of participating in the project, since the community members included in the project will eventually have to participate in meetings and activities. During the meeting, the team at Terra Vista Gestora de Recursos Ltd. that a communication plan will be developed respecting the decision of the community members to define meetings and activities.

However, the negative impacts pointed out in the workshops were interpreted as costs and risks. The cost of time to carry out activities was pointed out as the “cost” of positive impacts. Threats and possible conflicts with prospectors, on the other hand, appear as a “risk” for the community members who participate in the project and use the area. Thus, no negative impacts of the project were identified.

The diagram below presents the perceptions evaluated in the workshops (Figure 58).

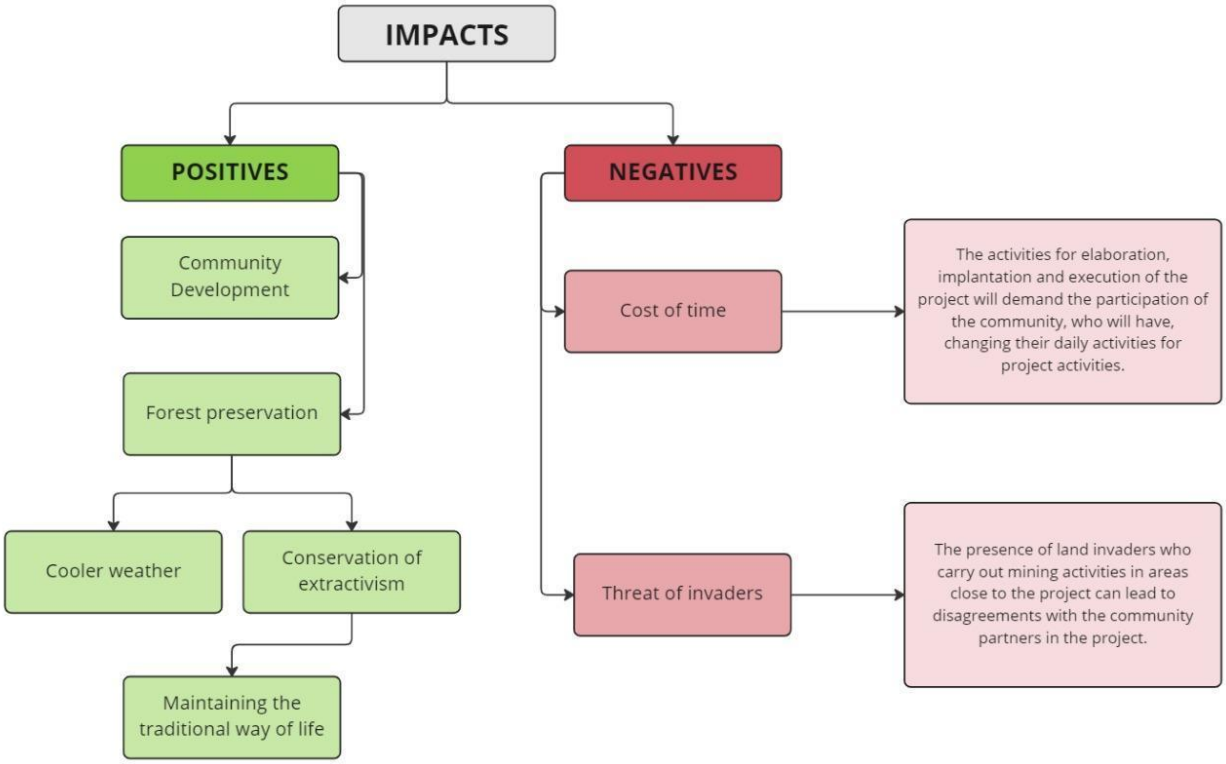

Figure 58: Diagram of perceived positive and negative impacts.

The impacts considered are listed below:

Direct Impacts

Table 62: Expected direct positive social impacts arising from the Samaúma project activities.

Community Group	Riverside Aripuanã; extractivists from Apuí.
Impact(s)	• Improvement in agricultural production techniques and improvement of products extracted from the forest; • Access to training in agroforestry and agricultural techniques; • Access to technical assistance and rural extension services tailored to the reality of each community. • Access to training in management, leadership and finance; • Greater knowledge and skills in agroforestry systems, agricultural production and REDD+; • Generation of an institutional environment favorable to the generation of new businesses; • Creation of new spaces for participation, generating opportunities for direct communication with other interested parties; • Communication with new markets;

	● Strengthening of social organization; ● Environmental awareness in waste management; ● Knowledge of fire control and management techniques.
Type of Benefit/Cost/Risk	● Benefit: these impacts are directly related to the project, expected to occur in the short, medium and long term, offering benefits to extractivists who will learn processing, management and marketing techniques for their businesses, with direct support from trained professionals. These activities will also help riverside people who are cassava flour producers. Social organization will be favored, creating a favorable environment for generating new business and expanding the activities carried out. ● Cost: no significant costs are expected from community groups, only the time that producers must invest in developing activities is considered a cost to communities. ● Risk: the identified risk is related to the activity of illegal mining that has invaded areas of the PEA Aripuanã-Guariba. There is a possibility that riverside dwellers and extractivists may be threatened by criminals because they are part of the project and thus helping the inspection teams in the areas.
Change in Well-being	Impacto positivo, direto e de grande magnitude.

No direct negative impacts were identified, only the cost of time to carry out activities and risks associated with project participation and local criminals.

Indirect Impacts

Table 63: Expected indirect positive social impacts arising from the Samaúma project activities.

Community Group	Riverside Aripuanã; extractivists from Apuí
Impact(s)	● Empowerment of resource management; ● Access to information on global trends; ● Increased self-esteem and confidence; ● Greater access to local public policies; ● Greater opportunities to access credit (loans), natural resources used consciously; ● Settlement of rural communities and consequent reduction of rural exodus and urban marginalization; ● Risk mitigation of extreme weather events; ● Access to energy in desirable quantity and quality; ● Greater availability of food ● Approximation and dialogue with public agents.

Type of Benefit/Cost/Risk	• Benefit: These impacts are indirectly related to the project, expected to occur in the short, medium and long term, offering benefits to extractivists and agricultural producers. • Cost: No significant costs are expected from community groups, only the time that producers must invest in developing activities is considered a cost to communities. • Risk: The identified risk is related to the activity of illegal mining that has invaded areas of PAEPEA Aripuanã-Guariba. There is a possibility that riverside dwellers and extractivists may be threatened by criminals because they are part of the project and thus helping the inspection teams in the areas.
Change in Well-being	Positive impact, indirect and of great magnitude.

No indirect negative impacts were identified, only the cost of time to carry out activities and risks associated with project participation and local criminals.

4.2.2 Negative Community Impact Mitigation (CM2.2)

The Samaúma project does not cause negative impacts on local communities and communication channels have been established to clarify doubts and receive suggestions and complaints.

4.2.3 Net Positive Community Well-Being (CM2.3, GL1.4)

The Samaúma project proposes a process of socioeconomic development for the communities involved, with a special focus on social strengthening, through the consolidation of local social organizations and the increase and commercialization of production, associated with activities of social interest and an environmental focus. Direct training will be carried out for producers through participatory strategies and joint construction of knowledge with the most appropriate techniques for the communities, maximizing the results to be obtained and continuously involving producers.

As described in section 4.1.4, the no-project scenario would be unfeasible to prevent unplanned deforestation and uncontrolled invasions. In this way, the scenario with the presence of the 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 of the region, conserving the way of life and the well-being of the people who live in these communities.

The Samaúma project proposes to consolidate a socioeconomic development plan focused on strengthening social organizations, improving production processes by offering technical assistance, and improving local social and productive infrastructure. These actions combined will result in direct and indirect positive impacts that will change the quality of life of local communities, without changing their traditional way of life.

4.2.4 High Conservation Values Protected (CM2.4)

The project's activities consist of converting the forest used as an area for extracting products by the riverside communities of the PAE Aripuanã-Guariba and by extractivists from Apuí, serving to maintain the reproduction of their way of life and improve the supply of ecosystem services, such as copaiba, and chestnut, hunting and fishing.

4.3 Other Stakeholder Impacts

4.3.1 Impacts on Other Stakeholders (CM3.1)

The development of the Samaúma project is not expected to cause negative impacts on other stakeholders. On the other hand, the development of the project can cause positive impacts for other stakeholders. In this sense, the positive impact on their well-being will be related to the benefits activities of the Samaúma project. Aiming 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 products from local extractivism;
- Promote technical training not only for traditional communities, but also for interested communities that live in the municipality and practice extractivism.

Although not expected to occur, the negative impacts can be listed as:

- Conflict between the time dedicated to daily activities and the time available for carrying out training and participating in the project;
- Failure in communication between the technical team and the community and, consequently, disagreement between the stakeholders.

4.3.2 Mitigation of Negative Impacts on Other Stakeholders (CM3.2)

The Samaúma 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 take place in a participatory manner, allowing the free exercise of manifestations by other stakeholders, as well as efficient and permanent communication between the developer of Samaúma and all stakeholders.

4.3.3 Net Impacts on Other Stakeholders (CM3.3)

The Samaúma project is not expected to negatively impact other stakeholders. As stated above, the project is only intended to positively impact other stakeholders. By preserving the forest area used by extractivists and allowing access to local communities, the Samaúma project will cause positive impacts on

communities and other stakeholders by stimulating traditional ways of life as well as their maintenance and strengthening. Aiming to serve all stakeholders, the project aims at the inclusion and well-being of 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)

TThe methodology adopted for Sustainable Livelihoods (MVS) makes it possible to recognize the community's future aspirations for change in line with forest conservation and protection measures. Due to its multidimensional aspect (human, social, environmental, physical and financial), the baseline assessment allows the project to consider precisely that the fragile bases are strengthened and the expected changes come with a structured connection of these changing dimensions. This will happen based on a governance that transversally considers community participation in the decision-making process for local projects and monitoring them in the light of sustainable changes.

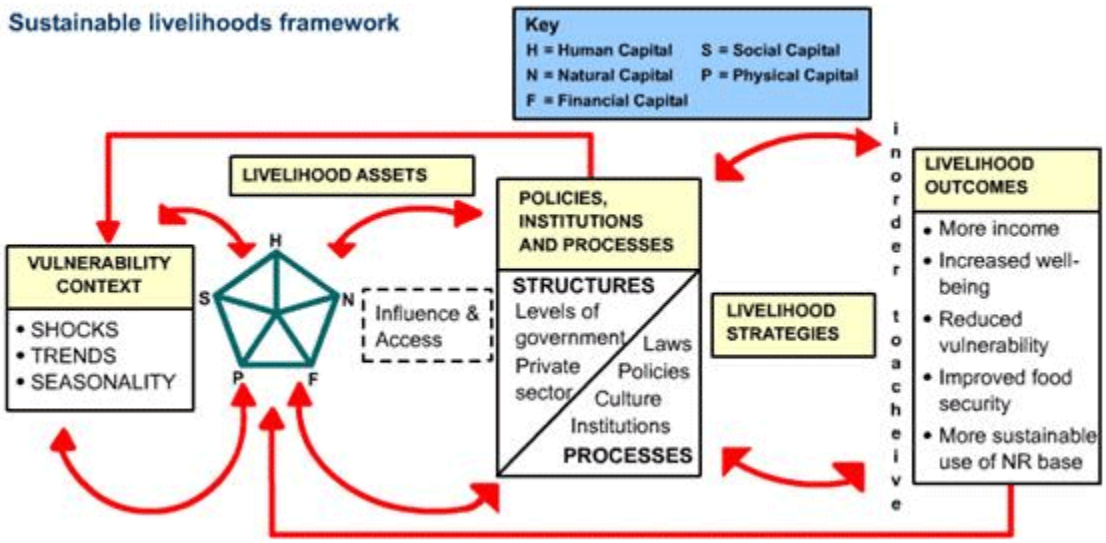

Figure 59 - Structure of the Means of Sustainable Lives method.

A push or an exogenous factor can be an impact like a force majeure that strengthens, empowers or disrupts and unbalances this tenuous web of interactions between what was available in their livelihoods and what can happen to improve access and /or the strengthening of this asset base. Carbon credit projects, in order to generate maximum positive impacts, must be chosen and recognized for their viability in accordance with the way of life of the communities, either by ensuring or improving access to the assets of

the five dimensions, simultaneously maintaining the balance and respecting the dreams and goals of the community.

As a large part of extractivists and riverside communities are from socioeconomically vulnerable social groups, projects to strengthen their assets in the five dimensions must drive individual, family and community forces towards rebalancing and positive impacts, so that the intervention process of the projects do not provoke an incurable erosion of available ways of life. It is therefore necessary to avoid that riverside communities and extractivists suffer damage to their asset bases and their aspirations and strategies for the future.

Considering the role of the company that prepares and implements the carbon credit project as a means of guaranteeing elements that strengthen and encourage livelihoods and human rights associated with them, the methodology and expected results of this study and precise analysis 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 population and users of the areas of carbon credit projects know foster their rights and livelihoods in order to positively achieve the even greater strengthening of their assets for the autonomous and independent continuity of their family and community life.

As a starting option for the dialogue on indicators for measuring the process and results of community carbon credit projects, with the description of the baseline and future monitoring, the methodology must cover its effects in the defense of rights, aspirations, needs and livelihoods of people, families and communities in the territories of the projects that result from the investigation into the before and after of each project designed and executed by Terra Vista Gestora de Recursos Ltd., taking inspiration, for example, from the dimensions and aspects proposed in the table below. This can be made possible, of course, by means of a deep dialogue between the parties that are interested in the performance resulting from the projects being a differential in terms of qualified information, effective social participation and achievement of community development aspirations.

Table 64 – Dimensions, indicators and corresponding averages stipulated from the application of the Sustainable Livelihoods (MVS) questionnaires. Source: Terra Vista, 2022.

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 ways of life and aspirations of people, families and communities resident and/or users of the territories of carbon credit projects. Subsequently, it will be possible to develop projects in partnership with the communities in a dialogic way through informed and enlightened participation, respecting the autonomy and way of seeing and living of each group in the territory. Clear and precise indicators will be adopted that can help measure the advances and results achieved each year, considering the positive impacts of the intended carbon credit project.

The evaluation will take place through the annual systematic application of the questionnaire based on the Sustainable Livelihoods (MVS), with a sample of up to 25% of the beneficiary community members, considering that the indicators measured in the baseline survey below the 0.5 average (from Zero to One) must point a positive growth impact of 20% per year for the indicators of the human, social and physical dimensions and of 15% per year for the indicators of the financial dimension.

As for the indicators that in their baseline received an average score of 0.5 above, the expected improvement is that the score increases in general for indicators of all these dimensions by 5% per year.

This metric is justified by the fact that the resource base of the five dimensions, with the exception of the natural dimension (has forest, hunting, fishing, ecosystem services that support them) were evaluated with an average score below 0.5, demonstrating that insufficient for a sustainable base of their livelihoods

and indicating that a more rapid change is needed in order to guarantee stability, especially so that young people and women do not give up and are willing to emigrate.

In this case, reaching the median level of the indicators that make up the dimensions of the Sustainable Livelihoods (MVS) will create a more sustainable basis for livelihoods, considering that programming beyond this level will be slower as it will depend on a series of factors outside the project's governance and will have to greatly reduced the risk of the population of these communities giving up being extractivists and guardians of the forest along with the project.

4.4.2 Disclosure of the Monitoring Plan (CM4.3)

The indicator monitoring plan will be disclosed by email and in meetings with 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 section 2.1.8 Identification of Stakeholders and 2.1.19 Permanence of Benefits (G1.11), five riverside communities and a group of 17 extractivists residing in the municipality of Apuí who will be beneficiaries of the project were identified. The project will have the communities as protagonists in defining socio-environmental programs and activities in the territories, making it possible to carry out the extraction of non-timber products and access projects to improve the production chain, associativism and improve the quality of life.

As described in section 2.1.6 Social Parameters (G1.3), residents of riverside communities, mainly those in the PAE Aripuanã and Guariba, live in a region of social vulnerability, in which people below the poverty line are present, defined as individuals who live on less than R$ 457.00 a month. The FIRJAN Index of Municipal Development (IFDM) Employment and Income of Apuí for the year 2016 was 0.386 points, being considered a low performance, occupying the 4,089th in the national ranking of 5,570º, which, added to the IFDM Health and Education, represents one of the worst performances at national level. According to the Central Register of Companies, consulted through the IBGE Cidades portal, in 2020, the average monthly salary of formalized workers in Apuí was 1.9 minimum wages[187]. However, considering the monthly

[187] IBGE - Brazilian Institute of Geography and Statistics. Average monthly salary of formal workers. IBGE, Central Register of Companies 2020. Rio de Janeiro: IBGE, 2022. Available at < https://cidades.ibge.gov.br/brasil/am/apui/panorama> Accessed on: 08/30/2022.

income of up to half the minimum wage per person, Apuí had 47.5% of its population in this condition[188]. This indicates a situation of wide wage inequality and the labor market characterized by high informality.

4.5.2 Short-term and Long-term Community Benefits (GL2.2)

As described in section 4.2.1 Expected Impacts on Communities (CM2.1), the project has activities that generate short- and long-term benefits for communities. As short-term benefits, communities will benefit from direct jobs in surveillance in the project area, in addition to training and courses aimed at strengthening the production chain and associativism, such as: a) Access to training in agroforestry and agricultural techniques; b) Access to training in management, leadership and finance; c) Access to technical assistance and rural extension services geared to the reality of each community; d) Access to information on global trends; e) Approximation and dialogue with public agents.

In the medium term, the implementation of strategies aimed at improving the quality of life of local communities, which would not have occurred in the absence of the project, such as: a) Photovoltaic electricity; b) Collection and distribution of water; c) Acquisition of transport for health care and emergencies; d) Logistical alternatives to ensure community access to public services (health and education) and disposal of non-timber forest products; e) Infrastructure for the production of cassava flour and processing of non-timber products extracted from the forest; f) Internet access via satellite.

In addition, the courses and the renewed management of the territory, presented in the short term, will bring benefits in the medium and long term, such as: a) Improvement in agricultural production techniques and improvement of products extracted from the forest; b) Greater knowledge and skills in agroforestry systems, agricultural production and REDD+; c) Environmental awareness in waste management; d) Knowledge of fire control and management techniques; e) Empowerment of resource management; f) Increased self-esteem and confidence; g) Greater access to local public policies; h) Access to information; i) Generation of a favorable institutional environment; j) Communication with new markets; k) Strengthening of social organization.

By preserving the forest area used in extractivism and for subsistence and which is at imminent risk of deforestation, the project tends to provide the following impacts in the long term: a) Strengthening the ways of life of local traditional communities and their reproduction economic and cultural; b) Reduction of rural exodus and urban marginalization; c) Mitigation of risks of extreme weather events; d) Improvement of quality of life.

[188] IBGE - Brazilian Institute of Geography and Statistics. Average monthly salary of formal workers. IBGE, Central Register of Companies 2020. Rio de Janeiro: IBGE, 2022. Available at https://cidades.ibge.gov.br/brasil/am/apui/panorama. Accessed on: 08/30/2022.

4.5.3 Community Participation Risks (GL2.3)

Regarding the risks associated with community participation in the Samaúma Project, as described in section 4.2.1 Expected Impacts on Communities (CM2.1), possible threats suffered by invaders of lands that are close to the project area, carrying out illegal mining. The PAE Aripuanã-Guariba region has been under pressure from the invasion of miners, who have unduly taken possession of extensive areas occupied by preserved forests. As pointed out in section 4.2.2 Mitigation of Negative Impacts on Communities (CM2.2), as a way of mitigating the possible threat risk, it is proposed to create a reporting channel for possible threats suffered, directly directed to a specialized team that it will proceed with the legally applicable actions to safeguard the integrity of community members.

Regarding the risks associated with not carrying out the project, as described in section 4.1.4 Scenario Without the Project: Community (CM1.3), the Samaúma project has as its main objective the conservation of approximately 71,508.24 ha of Amazon Forest native in a region with a long history of deforestation. Due to the high cost of maintaining activities that guarantee the monitoring and security of forest areas, it would be impracticable for landowners to prevent unplanned deforestation and invasions for logging and mining.

The 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. For the community, the implementation of strategies aimed at improving the quality of life of local communities, described in the previous section, stands out. It should be noted that by preserving the forest area used in extractivism and for subsistence and which is at imminent risk of deforestation, the project tends to strengthen the ways of life of local traditional communities and their economic production.

4.5.4 Marginalized and/or Vulnerable Community Groups (GL2.4)

The two groups benefited by the Samaúma Project: Riverside people from the Aripuanã and Guariba rivers and the Extractivists from Apuí, stand out for living in regions of social vulnerability. In this sense, the changes foreseen by the project for each of these groups are described below, aiming to improve the quality of life and the socioeconomic development of these communities, as well as the possible associated risks and the proposed method to minimize the risks.

Table 65. Positive and negative impacts of project activities and access to benefits for Group 1 Riverside people from Aripuanã and Guariba.

Group 1	Riverside people from Aripuanã and Guariba
Net positive impacts	• Access to training in agroforestry and agricultural techniques; • Access to training in management, leadership and finance; • Access to technical assistance and rural extension services tailored to the reality of each community; • Access to information on global trends; • Approximation and dialogue with public agents. • Implementation of community photovoltaic systems; • Implementation of water collection and distribution systems; • Acquisition of transport for health care and emergencies; • Logistical alternatives to ensure community access to public services (health and education) and disposal of non-timber forest products; • Improved infrastructure for the production of cassava flour and for processing non-timber products extracted from the forest; • Infrastructure for internet access via satellite. • Improvement in agricultural production techniques and improvement of products extracted from the forest; • Greater knowledge and skills in agroforestry systems, agricultural production and REDD+; • Environmental awareness in waste management; • Knowledge of fire control and management techniques; • Empowerment of resource management; • Increased self-esteem and confidence; • Greater access to local public policies; • Greater life opportunities for young people provided by access to the internet, • Creation of an institutional environment favorable to the generation of new businesses; • Communication with new markets; • Strengthening of social organization; • Greater opportunities to access credit (loans), natural resources used consciously; • Strengthening the ways of life of local traditional communities and their economic and cultural reproduction; • Reduction of rural exodus and urban marginalization; • Risk mitigation of extreme weather events; • Improved quality of life.

Access to the benefit	A possible associated risk identified is the increase in threats suffered by community members from land invaders who are close to the project area, carrying out illegal mining. The PAE Aripuanã-Guariba region has been under pressure from the invasion of miners, who have unduly taken possession of extensive areas occupied by preserved forests.
Negative impacts	There is no negative impact related to the project, however, as a way to mitigate the possible risk of threat, it is proposed to create a reporting channel for possible threats suffered, directly directed to a specialized team that will proceed with the legally applicable actions to safeguard the integrity of the community.

Table 66. Positive and negative impacts of project activities and access to benefits for Group 2 Extractivists from Apuí.

Group 2	Extractivists from Apuí
Net positive impacts	● Access to training in agroforestry and agricultural techniques; ● Access to training in management, leadership and finance; ● Access to technical assistance and rural extension services tailored to the reality of each community; ● Access to information on global trends; ● Approximation and dialogue with public agents. ● Improvement in agricultural production techniques and improvement of products extracted from the forest; ● Greater knowledge and skills in agroforestry systems, agricultural production and REDD+; ● Environmental awareness in waste management; ● Knowledge of fire control and management techniques; ● Empowerment of resource management; ● Increased self-esteem and confidence; ● Greater access to local public policies; ● Generation of an institutional environment favorable to the generation of new businesses; ● Communication with new markets; ● Strengthening of social organization; ● Greater opportunities to access credit (loans), natural resources used consciously; ● Risk mitigation of extreme weather events; ● Improved quality of life.
Access to the benefit	A possible associated risk identified is the increase in threats suffered by community members from land invaders who are close to the project area, carrying out illegal mining. The PAE Aripuanã-Guariba region has been under pressure from the invasion of miners, who have unduly taken possession of extensive areas occupied by preserved forests.
Negative impacts	There is no negative impact related to the project, however, as a way to mitigate the possible risk of threat, it is proposed to create a reporting channel for possible threats suffered, directly directed to a specialized team that will proceed with the legally applicable actions to safeguard the integrity of the community.

4.5.5 Net Impacts on Women (GL2.5)

The process of socioeconomic diagnosis, public consultation and communication with Aripuanã communities took place in an open and participatory manner, without distinction of sex or gender. In this sense, there was a concern on the part of the technical team to enable female participation throughout the project development process. Thus, during the meetings, activities and interviews, women from the community participated and influenced decision-making and project development.

Through the sociocultural diagnosis, a local differentiation in the division of labor was verified, in which women are more restricted to domestic work services. Bearing in mind this web of social relationships, the meetings and activities between the technical team and the communities took place within the domestic environment, in the homes of the community members, so that there was female participation in the activities.

Thus, to enable equal participation between men and women in the activities and benefits of the project, knowing that women's activities are associated with domestic work and raising children, while men are dedicated to activities outside the domestic environment, there should be an equitable distribution of vacancies for training courses. Vacancies for training in social technologies will be allocated and guaranteed to women through the establishment of participatory quotas of 45% of total vacancies. To ensure female participation in training, the presence of children and other children will be welcomed.

4.5.6 Benefit Sharing Mechanisms (GL2.6)

The Samaúma project focuses 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, ensuring their maturation in the appropriation of actions involving 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 publicity.

The public meeting and its ritual is the legal and normative tool developed for the collective participation of communities, in which they decide on their willingness to get involved, at what level this will take place and what are the expectations in terms of benefits. For the definition and approval of the project's actions, public consultations were carried out in the riverside and extractive communities, in which, after explaining the project and clarifying all the doubts of the communities, it received their consent, support and participation. The results of the public hearings can be seen in detail in section 2.3.7 Stakeholder Consultations (G3.4).

In addition, 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 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. Added to this transparency and communication factor, the presentation of project monitoring results in periodic meetings with communities, in addition to the availability of summarized information in appropriate language and publicly on the internet pages of Verra and the proponent Terra Vista Gestora de Recursos Ltd.

4.5.7 Benefits, Costs, and Risks Communication (GL2.7)

The public meetings for the project's conception had moments for clarifying the benefits, costs and risks provided by the project, as presented in section 2.3.7 Consultations with Stakeholders (G3.4). In addition, the periodic meetings to be held in the communities will also 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 Project will be managed by Terra Vista Gestora de Recursos Ltd. together with Ituxi Administração e Participação Ltd. The communities will participate in the management of the project based on the developed communication channels 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)

As detailed in section 2.3.14 Training of Workers (G3.9), the Samaúma project aims to build broad technical training for community members, integrating social technologies from traditional riverside communities on the Aripuanã River, addressing the strengthening of the extractive production chain and strengthening of community associations.

The communities involved will benefit from training and courses aimed at: a) Strengthening the productive chain of Brazil nuts and copaiba oil, 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 Copaíba and Castanha, e) Training in maintenance of water collection and distribution systems, photovoltaic system and communication equipment. As a result, the project activity will have a positive impact by strengthening the autonomy of families, providing decent conditions for community infrastructure and ensuring better conditions for permanence in the territory.

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[189] [190] [191].

The southeast of Amazonas, the region where the Samaúma project is located, was defined, according to the initiative of the project for the Conservation and Sustainable Use of Brazilian Biological Diversity (PROBIO), as a priority region for biodiversity conservation. This definition is based on the high richness and diversity of species that occur in the region, in addition to the existence of endemic and new species for science, among other factors. It should be noted that the priority of conservation is also related to the strong pressure that the region receives due to the Arc of Deforestation, which can result in loss of biodiversity[192]. Also, it should be noted that the Project area is located within two zones considered of "Very High" relevance for conservation and biological protection[193].

In order to avoid the loss of biodiversity due to the disorderly advance of land occupation in the region, the Apuí Mosaic was created in 2005, which has about 2.46 million hectares, encompassing nine Protected Areas. The creation of this Mosaic is of great relevance from an environmental point of view, being a region characterized as one of the main zones of endemism in the Southern Amazon for the group

[189] 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

[190] 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 Acessed on: 22/10/2022

[191] 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 Acessed on: 22/10/2022

[192] ICMBIO. 2019. Plano de Manejo da Floresta Nacional do Jatuarana/AM. Available at: https://www.gov.br/icmbio/pt-br/assuntos/biodiversidade/unidade-de-conservacao/unidades-de-biomas/amazonia/lista-de-ucs/flona-do-jatuarana/arquivos/plano_de_manejo_flona_do_jatuarana.pdf Acessed on: 22/10/2022

[193] MMA. 2018. 2ª Atualização das Áreas Prioritárias para Conservação da Biodiversidade 2018. Available at: https://www.gov.br/mma/pt-br/assuntos/servicosambientais/ecossistemas-1/conservacao-1/areas-prioritarias/2a-atualizacao-das-areas-prioritarias-para-conservacao-da-biodiversidade-2018. Acessed on: 21/07/2022.

of birds and mammals[194,195,196], in addition to being one of the least scientifically known regions in Brazil, which lacks fauna and flora survey studies[197].

The Samaúma project is located near the Protected Areas that are part of both the Apuí Mosaic and the Southern Amazon Mosaic, playing an important role in the conservation of local biodiversity, as well as helping to prevent the advance of deforestation in the region.

According to data from the Jatuarana National Forest Management Plan[198], a protected area located close to the project area, the main threats to biodiversity in the region can be related to the practice of using fire to create pasture and burn garbage, hunting, mining practices and land grabbing. Land grabbing in the region is the main threat to the fauna, resulting in the degradation of habitats and deforestation, which jeopardizes the existing connectivity in the region, which is essential to maintain the gene flow of populations.

To characterize the potential fauna and flora occurring in the project area, secondary data presented in the Juruena National Park Management Plan were used[199], a protected area located in the vicinity of the project (about 63 km) that shares similar environmental characteristics with the area of interest, and data from the environmental monitoring carried out under the Evergreen REDD+ Project[200], which is located in an area adjacent to the Samaúma project. It should be noted that biodiversity surveys are scarce in the region as a whole. Thus, a survey of primary data on fauna and flora will be carried out at the beginning of the project implementation in order to characterize and deepen the specific knowledge of the area, in addition to environmental monitoring throughout the project lifetime.

Flora

[194] Cracraft. J. 1985. Historical biogeography and patterns of differentiation within the South American avifauna: areas of endemism. p. 49-84. In: Buckley, P. A., Foster, M. S., Morton, E. S., Ridgely, R. S. & Buckley, F. G. (eds). Neotropical Ornithology. Washington, American Ornithologists's Union. (Ornithological Monographs, n° 36). Available at: https://www.jstor.org/stable/40168278 Acessed on: 22/10/2022

[195] Haffer, J. 1969. Speciation in Amazonian Forest Birds. Science Vol. 165 N° 3889:131- 137. Available at: https://www.science.org/doi/10.1126/science.165.3889.131 Acessed on: 22/10/2022

[196] Haffer, J. 1997. Contact zones between birds of southern Amazonia. p. 281-305. In:J.V. Remsen Jr. (ed.) Studies in Neotropical Ornithology honoring Ted Parker. Washington D.C.: American Ornithologists' Union. Available at: https://www.jstor.org/stable/40157539 Acessed on: 22/10/2022

[197] WWF. 2010. Plano de Gestão do Mosaico de Unidades de Conservação do Apuí. Available at:https://documentacao.socioambiental.org/ato_normativo/UC/2367_20160901_114249.pdf?_ga=2.253530953.1734345866.1658001805-1514520224.1658001805. Acessed on: 12/07/2022.

[198] ICMBIO. 2019. Plano de Manejo da Floresta Nacional do Jatuarana/AM. Available at: https://www.gov.br/icmbio/pt-br/assuntos/biodiversidade/unidade-de-conservacao/unidades-de-biomas/amazonia/lista-de-ucs/flona-do-jatuarana/arquivos/plano_de_manejo_flona_do_jatuarana.pdf Acessed on: 22/10/2022

[199] ICMBIO. 2011. Plano de Manejo do Parque Nacional do Juruena. Available at: https://documentacao.socioambiental.org/ato_normativo/UC/1587_20140813_154621.pdf. Acessed on: 28/09/2022

[200] Ambiens. 2022. Projeto REDD+ Evergreen. Diagnóstico da Biodiversidade.

The Samaúma project area comprises five different phytophysiognomies, with a predominance of Submontane Dense Ombrophylous Forest with emerging canopy and Submontane Open Ombrophylous Forest with palm trees, as shown in section 2.1.5.

The Submontane Ombrophylous Forest occurs mainly in lower places and with deeper soils, presenting characteristic species such as the chestnut tree (*Bertholletia excelsa*), the palm tree (*Euterpe precatoria*), the angelim-pedra (*Dinizia excelsa*), the ipê (*Handroanthus serratifolius*), among others[201].

On the other hand, the Submontane Open Ombrophylous Forest presents a more spaced arrangement of trees, favoring the development of palm trees, lianas and bamboo. In the survey carried out in the Juruena National Park, this vegetation was characterized by the presence of species such as itaúba (*Mezilaurus itauba*), pequiarana (*Caryocar glabrum*), rosinha (*Vochysia ferruginea*), canelão (*Ocotea* sp.), amescla-aroeira (*Protium* sp.), cedro-rosa (*Cedrela odorata*), cumaru (*Dipteryx odorata*), garapeira (*Apuleia leiocarpa*), palmeira babaçu (*Attalea speciosa*), marajá (*Bactris cf. killipii*), jatobá (*Hymenaea parvifolia*), amapá (*Brosimum* sp.), tachi (*Tachigali* sp.), ubim (Geonoma sp.), jussara palm (*Euterpe precatoria*), paxiúba (*Socratea exorrhiza*), tucumã (*Astrocaryum tucuma*), inajá (*Attalea maripa*), among others.

Figure 60: Submontane Dense Ombrophylous Forest with emergent canopy on the banks of the Juruena River. Source: Juruena National Park Management Plan - Image: Ayslaner Gallo - ICMBIO, 2011.

[201] ICMBIO. 2011. Plano de Manejo do Parque Nacional do Juruena. Available at: https://documentacao.socioambiental.org/ato_normativo/UC/1587_20140813_154621.pdf. Acessed on: 28/09/2022

The forest inventory carried out by the Evergreen Project[202] in areas close to the Samaúma project recorded about 79 species of flora, distributed in 26 families and 62 genera. The families with the highest number of species were Fabaceae (19 species), Arecaceae (eight species), Sapotaceae and Lecythidaceae (six species each), Moraceae and Malvaceae (four species each), Meliaceae and Euphorbiaceae (three species each) and Anacardiaceae and Urticaceae (two species each).

With regard to the species present in categories of extinction threat raised in the region (Table 67), a total of 12 species are registered in the official lists of threat, being three present only in the international list of the IUCN[203], three in the national list of Brazil (MMA) [204] and six species present on both lists.

Table 67. List of endangered tree species (VU = Vulnerable. CR = Critically Endangered. EN = Endangered).

Scientific Name	Common Name	Threat Status
Mezilaurus itaúba	Itaúba	VU (IUCN, 1998; MMA, 2022)
Cedrela odorata	Cedro-rosa	VU (IUCN, 2017; MMA, 2022)
Apuleia leiocarpa	Garapeira	VU (MMA, 2022)
Hymenaea parvifolia	Jatobá	VU (MMA, 2022)
Bertholletia excelsa	Castanheira	VU (IUCN, 1998; MMA, 2022)
Virola surinamensis	Ucuuba	EN (IUCN, 1998); VU (MMA, 2022)
Couratari guianensis	Maú	VU (IUCN, 1998)
Vouacapoua americana	Acapú	CR (IUCN, 1998); EN (MMA, 2022)
Elizabetha speciosa	-	VU (IUCN, 2018; MMA, 2022)
Manilkara elata	Maçaranduba	EN (IUCN, 1998)
Joannesia princeps	Indaguaçu	VU (IUCN, 1998)
Hymenolobium excelsum	Angelim da mata	VU (MMA, 2022)

We highlight the presence of the species *Virola surinamensis* and *Manilkara elata*, classified as “Endangered” by the IUCN, and the species *Vouacapoua americana* classified as “Critically Endangered” by the IUCN and “Endangered” by the MMA.

Among the threatened species, *Bertholletia excelsa* is a species of great commercial value, widely distributed and of great frequency in the Brazilian Amazon. This species, despite being protected by law

[202] Ambiens. 2022. Projeto REDD+ Evergreen. Diagnóstico da Biodiversidade.

[203] IUCN. 2022. The IUCN Red List of Threatened Species. Available at: https://www.iucnredlist.org/ Acessed on: 20/10/2022

[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 Acessed on: 22/10/2022

(Decree 5.975/2006)[205], suffers great extractive pressure. The species *Mezilaurus itauba, Cedrela odorata, Hymenaea parvifolia*, and *Apuleia leiocarpa* are considered timber species of high commercial value[206]. The species *Vouacapoua americana* ("Critically Endangered") shows a continuous decline due to overexploitation of wood, presenting alarming data, mainly in the State of Pará[207].

With regard to endemism, the region has about 12 species endemic to Brazil, seven of which are restricted to the phytogeographic domains of the Amazon, namely: *Schizolobium parahyba var. amazonicum, Copaifera glycycarpa, Eschweilera grandiflora, Copaifera piresii, Elizabetha speciosa, Eschweilera atropetiolata* and *Elizabetha durissima*[208].

According to secondary data, communities in the region use some species for extractivism, such as cipó-titica (*Heteropsis* sp.), babaçu (*Attalea speciosa*), envireiras (*Xylopia* spp. e *Guatteria* spp.), itaúba (*Mezilaurus itauba*), jussara palm (*Euterpe precatoria*), patauá (*Oenocarpus bataua*), bacaba (*Oenocarpus bacaba*), and copaíba (*Copaifera* cf*. multijuga*). In the Samaúma project area, according to the data collected by the project socio-environmental team, the local communities use copaíba, itaúba and cedar species for extractivism, in addition to exploiting chestnut trees.

Fauna (Vertebrate)

Herpetofauna

The Herpetofauna of the Amazon is very rich, with around 92 species of lizards, 164 amphibians and 138 species of snakes recorded [209,210,211,212]. In the study region, around 98 species were sampled for the Herpetofauna group, the majority being Amazonian species, corroborating the high species richness

[205] Available at: http://www.planalto.gov.br/ccivil_03/_ato2004-2006/2006/decreto/d5975.htm Acessed on: 22/10/2022

[206] CNCFlora. *Bertholletia excelsa* 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/Bertholletia excelsa>. Acessed on: 25/08/2022.

[207] CNCFlora. *Vouacapoua americana* 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/Vouacapoua americana>. Acessed on: 01/09/2022.

[208] Flora e Funga do Brasil. Available at: https://floradobrasil.jbrj.gov.br/reflora/listaBrasil/PrincipalUC/PrincipalUC.do;jsessionid=B7F4D24BEE3413FC00898683CED1991B Acessed on: 22/10/2022

[209] Ávila-Pires, T. C. S., 1995. Lizards of brazilian Amazonian (Reptilia: Squamata). Zool. Verh. Leiden 299:1-706. Available at: https://repositorio.museu-goeldi.br/handle/mgoeldi/1222 Acessed on: 22/10/20222

[210] Ávila-Pires, T. C. S., Vitt, L. J., 1998. A new species of Neusticurus (Reptilia: Gymnophthalmidae) from the Rio Jurua, Acre, Brazil. Herpetologica 54:235-245. Available at: https://www.jstor.org/stable/3893429 Acessed on: 22/10/2022

[211] Ávila-Pires, T. C. S., Hoogmoed, M. S., 2000. On two new species of Pseudogonatodes Ruthven, 1915 (Reptilia: Squamata: Gekkonidae), with remarks on the distribution of some other sphaerodactyl lizards. Zoologische Mededelingen Leiden. Leiden 73:209-223. Available at: https://www.researchgate.net/publication/254912123_On_two_new_species_of_Pseudogonatodes_Ruthven_1915_Reptilia_Squamata_Gekkonidae_with_remarks_on_the_distribution_of_some_other_sphaerodactyl_lizards Acessed on: 22/10/2022

[212] Azevedo-Ramos, C., Galatti, U. 2002. Patterns of amphibian diversity in Brazilian Amazônia: conservation implications. Biological Conservation 103:103-111. Available at: https://www.sciencedirect.com/science/article/abs/pii/S000632070100129X Acessed on: 22/10/2022

recorded in the Biome [213,214]. Of these, two species are registered on the lists of endangered species (Table 68), such as the tortoise (*Chelonoidis denticulata*) and the tracajá (*Podocnemis unifilis*), both considered as "Vulnerable" of extinction at the international level[215]. It is noteworthy that, according to the data collected in the field by the project socio-environmental team, the local communities have a high consumption of tracajás.

Table 68. List of endangered herpetofauna species (VU = Vulnerable).

Scientific Name	Common Name	Threat Status
Chelonoidis denticulata	Jabuti	VU (IUCN, 1996)
Podocnemis unifilis	Tracajá	VU (IUCN, 1996)

Mammalian fauna

The mammals found in the region are represented by 95 species, distributed in the orders Chiroptera, Primata, Rodentia, Carnivora, Didelphimorphia, Pilosa, Cingulata, Artiodactyla, Cetacea and Perissodactyla[216, 217].

In total, about 16 endangered species were recorded (Table 69), four of which are exclusive to the IUCN international list, three to the national list (MMA) and nine species present in both endangered lists.

Table 69. List of endangered mammalian species (VU = Vulnerable,. EN = Endangered).

Scientific Name	Common Name	Threat Status
Myrmecophaga tridactyla	Tamanduá-bandeira	VU (IUCN, 2014; MMA, 2022);
Priodontes maximus	Tatu-canastra	VU (IUCN, 2014; MMA, 2022)
Speothos venaticus	Cachorro-do-mato	VU (MMA, 2022)
Leopardus wiedii	Maracajá-mirim	VU (MMA, 2022)
Panthera onca	Onça-pintada	VU (MMA, 2022)
Pteronura brasiliensis	Ariranha	EN; VU (IUCN, 2021; MMA, 2022)

[213] ICMBIO. 2011. Plano de Manejo do Parque Nacional do Juruena. Available at: https://documentacao.socioambiental.org/ato_normativo/UC/1587_20140813_154621.pdf. Acessed on: 28/09/2022

[214] Ambiens. 2022. Projeto REDD+ Evergreen. Diagnóstico da Biodiversidade.

[215] IUCN, 2016. Tortoise & Freshwater Turtle Specialist Group. 1996. *Podocnemis unifilis* (errata version published in 2016). The IUCN Red List of Threatened Species 1996. Available at: https://www.iucnredlist.org/species/17825/97397562 Acessed on: 22/10/2022

[216] ICMBIO. 2011. Plano de Manejo do Parque Nacional do Juruena. Available at: https://documentacao.socioambiental.org/ato_normativo/UC/1587_20140813_154621.pdf. Acessed on: 28/09/2022

[217] Ambiens. 2022. Projeto REDD+ Evergreen. Diagnóstico da Biodiversidade.

Inia geoffrensis	Boto-vermelho	EN (IUCN, 2018; MMA, 2022)
Chiropotes albinasus	Cuxiú-de-nariz-branco	VU (IUCN, 2021)
Tayassu pecari	Queixada	VU (IUCN, 2013; MMA, 2022)
Alouatta belzebul	Bugio-mão-ruiva	VU (IUCN, 2021; MMA, 2022)
Tapirus terrestres	Anta	VU (IUCN, 2019; MMA, 2022)
Ateles chamek	Cuamba	EN; VU (IUCN, 2015; MMA, 2022)
Lagothrix lagothricha cana	Macaco barrigudo	EN (IUCN, 2021; MMA, 2022)
Mico marcai	Sagui-de-marca	VU (IUCN, 2021)
Mico munduruku	Sagui-dos-munduruku	VU (IUCN, 2020)
Sotalia fluviatilis	Tucuxi	EN (IUCN, 2020)

With regard to endemism, the region deserves to be highlighted for the presence of endemic primate species, such as *Callicebus cinerascens, Chiropotes albinasus, Alouatta belzebul, Mico marcai* and *Mico munduruku* [218, 219, 220, 221, 222].

In the region, some species are under hunting pressure by local communities, such as medium and large primates, wild pigs (*Pecari tajacu* and *Tayassu pecari*), paca (*Cuniculus paca*), armadillo (*Dasypus spp*.), red deer (*Mazama americana*) and tapir (*Tapirus terrestris*)[223].

[218] Van Roosmalen, M.G.M.; Van Roosmalen, T. & Mittermeier, R.A. 2002. A taxonomic review of the titi monkeys, genus Callicebus Thomas, 1903, with the description of two new species, Callicebus bernhardi and Callicebus stephennashi, from Brazilian Amazonia. Neotropical Primates, 10(suppl.): 1-52. Available at: https://www.researchgate.net/publication/242073663_A_taxonomic_review_of_the_titi_monkeys_genus_Callicebus_Thomas_1903_with_the_description_of_two_new_species_Callicebus_bernhardi_and_Callicebus_stephennashi_from_Brazilian_Amazonia Acessed on: 22/10/2022

[219] Gregorin, R. 2006. Taxonomia e variação geográfica das espécies do gênero *Alouatta Lacépède* (Primates, Atelidae) no Brasil. Revista Brasileira de Zoologia, 23 (1): 64-144. Available at: https://www.scielo.br/j/rbzool/a/TMzTcKJS6rFYnqNjKrsFNRz/abstract/?lang=pt Acessed on: 22/10/2022

[220] Noronha, M.N.; Spironello, W.R. & Ferreira, D.C. 2008. Callicebus cinerascens. In: IUCN Red List of Threatened Species, Version 2011.2. www.iucnredlist.org. Acessed on: 22/10/2022

[221] Sampaio, R.; Dalponte, J.C.; Rocha, E.C.; Hack, R.O.; Gusmão, A.C.; Aguiar, K.M.O.; Kuniy, A.A.; Silva Junior, J.S. 2012. Novos registros com uma extensão da distribuição geográfica de Callicebus cinerascens (Spix, 1823). Mastozoologia Neotropical, 19(1):159-164. Available at: https://www.researchgate.net/publication/256496436_Novos_registros_com_uma_extensao_da_distribuicao_geografica_de_Callicebus_cinerascens_SPIX_1823 Acessed on: 22/10/2022

[222] Ambiens. 2022. Projeto REDD+ Evergreen. Diagnóstico da Biodiversidade.

[223] ICMBIO. 2011. Plano de Manejo do Parque Nacional do Juruena. Available at: https://documentacao.socioambiental.org/ato_normativo/UC/1587_20140813_154621.pdf. Acessed on: 28/09/2022

Avifauna

The avifauna of the region presents a great diversity, composed of about 437 species[224, 225]. A total of 14 endangered species were recorded (Table 70), with six present only on the IUCN red lists, three on the national list (MMA), and five species present on both lists.

Table 70. List of endangered bird species (VU = Vulnerable, EN = Endangered).

Scientific Name	Common Name	Threat Status
Tinamus tao	Azulona	VU (IUCN, 2019; MMA, 2022)
Agamia agami	Garça-da-mata	VU (IUCN, 2016)
Harpia harpyja	Gavião-real	VU (IUCN, 2021; MMA, 2022)
Pipile cujubi	Cujubi	VU (IUCN, 2021)
Crax fasciolata	Mutum-de-penacho	VU (IUCN, 2021)
Psophia viridis	Jacamim-de-costa-verde	VU (IUCN, 2016; MMA, 2022)
Pyrrhura perlata	Tiriba-pérola	VU (MMA, 2022)
Pionites leucogaster	Marianinha	VU (IUCN, 2021)
Capito dayi	Capitão-de-bigode-de-cinta	VU (IUCN, 2016)
Pteroglossus bitorquatus	Araçari-de-pescoço-vermelho	EN (IUCN, 2016)
Clytoctantes atrogularis	Choca-de-garganta-preta	VU (IUCN, 2017; MMA, 2022)
Rhegmatorhina gymnops	Mãe-de-taoca-de-cara-branca	VU (IUCN, 2016; MMA, 2022)
Anabazenops dorsalis	Barranqueiro-de-topete	VU (MMA, 2022)
Hypocnemis striata	Cantador-estriado	VU (MMA, 2022)

With regard to endemism, several species endemic to the Southern Amazon were recorded, such as *Gypopsitta aurantiocephala*, *Rhegmatorhina gymnops*, *Lepidothrix natterer*, *Psophia viridis, Selenidera*

[224] ICMBIO. 2011. Plano de Manejo do Parque Nacional do Juruena. Available at: https://documentacao.socioambiental.org/ato_normativo/UC/1587_20140813_154621.pdf. Acessed on: 28/09/2022

[225] Ambiens. 2022. Projeto REDD+ Evergreen. Diagnóstico da Biodiversidade.

gouldi, *Odontorchilus cinereus, Clytoctantes atrogularis* and *Hypocnemis striata*[226] [227]. In reference to species with migratory habits, the following stand out: *Progne subis*, *Hirundo rústica*, *Tyrannus albogularis*, *Tyrannus savana* and *Tyrannus melancholicus*.

The species *Tinamus tao*, *Tinamus major*, *Tinamus guttatus*, *Nothocrax urumutum*, *Pipile cujubi* and *Mitu tuberosum*, recorded in the region, are considered of interest for conservation because they are used by the population as a source of food and hunting. According to data from CEMAVE, the species *T. tao,* endangered species, is considered a species sensitive to forest disturbances and intensely pressured by hunting, which considerably accentuates its population reduction. The species *Ara chloroptera*, *Ara macao* and *Ara ararauna* are widely used in the international trade of wild animals[228].

From the collected data, it is observed that the region presents a great richness and diversity of avifauna, being recorded some species with little known geographic distribution, threatened, endemic and migratory.

Ichthyofauna

The ichthyofauna of the region is composed of 127 species belonging to 73 genera, 25 families and seven orders[229]. Of the recorded species, nine have migratory characteristics. With regard to important species for fishing in the region, both for consumption and for sport fishing, around 14 species were recorded: *Brycon* (matrinxã), *Myleus* and *Metynis* (pacus and pacupeva), *Leporinus* (piaus), *Hydrolicus scomberoides* (cachorra), *Boulengerella* (bicuda), *Hoplias* (trairão), *Prochilodus* (corimba), *Paulicea luetkeni* (jaú), *Leiarius marmoratus* (jundiá), *Pseudoplatystoma* (pintado, cachara and surubim), *Plagioscion squamossismus* (curvina), *Phractocephalus hemioliopterus* (pirarara), *Brachyplatystoma filamentosum* (piraíba). It is noteworthy that in addition to the species mentioned, others can be used for fishing by communities in the region.

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[230] (Table 71).

Table 71. High Conservation Value related to biodiversity within the Project Zone.

[226] Ambiens. 2022. Projeto REDD+ Evergreen. Diagnóstico da Biodiversidade.

[227] ICMBIO. 2011. Plano de Manejo do Parque Nacional do Juruena. Available at: https://documentacao.socioambiental.org/ato_normativo/UC/1587_20140813_154621.pdf. Acessed on: 28/09/2022

[228] ICMBIO. 2011. Plano de Manejo do Parque Nacional do Juruena. Available at: https://documentacao.socioambiental.org/ato_normativo/UC/1587_20140813_154621.pdf. Acessed on: 28/09/2022

[229] ICMBIO. 2011. Plano de Manejo do Parque Nacional do Juruena. Available at: https://documentacao.socioambiental.org/ato_normativo/UC/1587_20140813_154621.pdf. Acessed on: 28/09/2022

[230] https://www.hcvnetwork.org/

High Conservation Value	HCV 1- Protected Areas
Qualifying Attribute	The project area is located on a private property surrounded by a mosaic of Protected Areas which have high biodiversity, in addition to overlapping areas considered as "Very High" for conservation and protection by the Ministry of the Environment (MMA). The implementation of the Samaúma project will contribute to the conservation of an area inserted in an important environmental context for biodiversity, enabling the maintenance of the biological connectivity of the species in the region.
Focal Area	Throughout the project area, mainly bordering the Jatuarana National Forest.

High Conservation Value	HCV 1 - Endemic and threatened plant species
Qualifying Attribute	In the project region, flora species threatened with extinction internationally by the International Union for Conservation (IUCN) and nationally (MMA) were recorded. A total of 12 threatened species were recorded: *Hymenolobium excelsum*, *Joannesia princeps*, *Manilkara elata, Elizabetha speciosa, Vouacapoua americana, Couratari guianensis, Virola surinamensis, Bertholletia excelsa, Hymenaea parvifolia, Apuleia leiocarpa, Cedrela odorata* and *Mezilaurus itauba.* With regard to endemism, the seven endemic species of the phytogeographic domains of the Amazon stand out: *Schizolobium parahyba* var. *amazonicum*, *Copaifera glycycarpa, Eschweilera grandiflora, Copaifera piresii, Elizabetha speciosa, Eschweilera atropetiolata* and *Elizabetha durissima.*
Focal Area	In project areas where populations of endangered species potentially occur

High Conservation Value	HCV 1- Endemic and threatened fauna species
Qualifying Attribute	Several species of threatened and endemic fauna were recorded in the region. For the group of mammals, 16 threatened species were recorded, while for avifauna 14 were recorded and for herpetofauna two species.

	We highlight the following species that are classified as endangered by the IUCN: *Pteronura brasiliensis* (ariranha), *Ateles chamek* (cuamba), *Inia geoffrensis* (boto-vermelho), *Sotalia fluviatilis, Lagothrix cana* (macaco-barrigudo) and *Pteroglossus bitorquatus* (araçari-de-pescoço-vermelho). With regard to endemism, the region deserves to be highlighted for the presence of endemic primates in the region and endemic bird species of the Southern Amazon.
Focal Area	Throughout the project area

5.1.3 Without-project Scenario: Biodiversity (B1.3)

The municipality of Apuí has a high rate of deforestation in the Amazon, currently occupying the 10th position in the ranking of highest annual deforestation rates among municipalities, with an accumulated deforestation of 1,942.25 km² in 2021, which represents 1.80% of its territory[231], as shown in Figure 1 of section 2.1.1.

Located in the south of the State of Amazonas, on the banks of the Transamazônica Highway (BR-230), Apuí is considered, according to IDESAM data[232], a front for agricultural expansion, with the main conflicts being land regularization and disorderly occupation along the BR-230, illegal logging, and irregular subdivisions[233].

Several factors can be attributed as the cause of deforestation in the south of the state, such as illegal logging, land grabbing, conversion of forests into pastures, burning of forests for crops, pressure from prospectors, among others.[234]. In Apuí, according to Fearnside (2009)[235] livestock is on a business scale and deforestation is advancing rapidly as new pasture areas are needed.

According to the land use and occupation history in the region, the scenario without the Samaúma Project, which is located in a private area, tends to be the replacement of native vegetation areas by pasture areas, in compliance with the provisions of Law nº 12.651/12, where the owner has the right to deforest about 20% of his area, according to section 2.5.

[231] INPE. 2021. Instituto Nacional de Pesquisas Espaciais - Prodes project: Satellite Monitoring of the Amazon. Available at: http://terrabrasilis.dpi.inpe.br/app/dashboard/deforestation/biomes/legal_amazon/increments Accessed on: 20/09/2022

[232] IDESAM.2020. Boletim de Desmatamento e Queimadas Apuí, Sul do Amazonas. Edição Nº 05/Dezembro de 2020. Available at: https://idesam.org/wp content/uploads/2020/10/Boletim_05_Dezembro2020.pdf. Accessed on: 28/07/2022.

[233] WWF. 2017.Perfil socioeconômico e ambiental do sul do estado do Amazonas: Subsídios para Análise da Paisagem. Available at: https://www.wwf.org.br/?59402/Perfil-socioeconomico-e-ambiental-do-sul-do-estado-do-Amazonas-subsidios-para-analise-da-paisagem. Accessed on: 28/07/2022.

[234] Alencar, A.; Nepstad, D.; Mcgrath, D.; Moutinho, P.; Pacheco, P.; Diaz, M. D. C. V.; Filho-Soares, B. Indo Além da "Emergência Crônica." Belém, Pará, 89pp. 2004. Available at: https://ipam.org.br/bibliotecas/desmatamento-na-amazonia-indo-alem-da-emergencia-cronica/ Accessed on: 22/10/2022

[235] Available at: https://www.cabdirect.org/cabdirect/abstract/20093208206 Accessed on: 22/10/2022

The project area is located in a region that presents a mosaic of Protected Areas, highlighting its importance for biodiversity conservation due to the presence of a great diversity of species and the presence of endangered and endemic species.

With deforestation and degradation of the area in the absence of the project, biodiversity could suffer several impacts due to fragmentation and loss of habitats, resulting in the scaring away and loss of species, especially those that have less mobility and that have more specialist characteristics.

In this context, the implementation of the Samaúma project guarantees forest conservation, due to the implementation of surveillance measures and activities within the area, in a region with a history of increased deforestation and recognized biological importance. Also, the protection of the area favors the maintenance of continuous forest environments, guaranteeing the maintenance of the gene flow of the species, in addition to ensuring the maintenance of ecosystem services in the region, favoring the local communities.

5.2 Net Positive Biodiversity Impacts

5.2.1 Expected Biodiversity Changes (B2.1)

Table 72. Expected changes in biodiversity resulting from Samaúma project activities.

Biodiversity Element	Vegetation
Estimated Change	Reducing deforestation and conserving habitats
Justification of Change	The Samaúma project aims to prevent deforestation and forest degradation, protecting an area of vegetation of great biological importance. The factors that will contribute to the change refer to conservation, periodic remote monitoring and improvement of heritage surveillance in the area during project activities.

Biodiversity Element	Fauna e Flora
Estimated Change	Conservation and maintenance of biodiversity
Justification of Change	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 connectivity between habitats. The factors that will contribute to the change are related to the conservation of the area, monitoring and deepening knowledge of biodiversity in the project area, environmental education actions with local communities aimed at raising awareness and engaging in the conservation of the local fauna and flora.

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5.2.2 Mitigation Measures (B2.3)

The Samaúma project aims to maintain the forest cover in the project area, conserving the region's biodiversity. Thus, in order to maintain or improve HCV attributes (Table 73), the project aims to monitor groups of fauna and flora in the region, with the aim of deepening knowledge of the structure and composition of communities, especially of endangered and endemic species registered in the region.

Also, measures such as improving heritage surveillance in the area with the aim of preventing invasions, deforestation and illegal practices for fauna and flora, and frequent monitoring of forest cover through satellite images, in order to track any land use changes in the area. area, will be adopted to ensure the protection of biodiversity.

It should be noted that as the project progresses, knowledge of the structure and assessment of the faunal and floristic communities will be deepened and other activities can be proposed in order to guarantee the conservation of biodiversity.

Table 73. Measures for maintaining and improving the attributes of HCVs identified in the project area.

HCVs	Maintenance and Improvement Measures
HCV 1 – Protected Areas	- Improvement of heritage surveillance in the area; - Remote monitoring of the area; - Periodic monitoring of fauna and flora; - Engagement and awareness of local communities; - Activities focused on priority species and commercial value; - Scientific deepening of biodiversity in the project area.
HCV 1 – Endemic and threatened plant species	
HCV 1- Endemic and threatened fauna species	

5.2.3 Net Positive Biodiversity Impacts (B2.2, GL1.4)

The implementation of the Samaúma project foresees the conservation of an area of 71,508.24 ha of Ombrophylous Forest in the Amazon with great biological importance, resulting in positive impacts on biodiversity in 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, with the maintenance of vegetation cover and the structure and composition of biodiversity. The implementation of the project, in addition to conserving biodiversity, will allow greater knowledge of the local fauna and flora based on surveys carried out within the scope of the envisaged environmental monitoring, ensuring better scientific knowledge of the region. Also, the conservation of the area favors the maintenance of continuous forest environments, ensuring the maintenance of the gene flow of the species.

As shown in section 5.1.3, the region where the project is inserted has a history of changes in land use and occupation, with a high rate of deforestation and degradation. In the absence of the project, the area would probably be deforested, causing several negative impacts on biodiversity due to fragmentation and loss of habitats and, thus, species. Still, the activities proposed for the project would not be developed, which demonstrates that the scenario with the project guarantees net positive impacts on biodiversity compared to the non-implementation of the project in the region.

5.2.4 High Conservation Values Protected (B2.4)

As shown in section 5.1.2, the project area has high conservation values related to the HCV 1 category - Species Diversity. The activities proposed for the project aim at maintaining and conserving biodiversity, ensuring the conservation of 71,508.24 ha, not negatively affecting any of the identified HCVs.

5.2.5 Species Used (B2.5)

New species will not be used, in addition to those native to the area, within the scope of the Samaúma project.

5.2.6 Invasive Species (B2.5)

The Samaúma project will not introduce or increase the population of invasive species in the project affected area.

5.2.7 Impacts of Non-native Species (B2.6)

Not applicable. No invasive species will be introduced within the scope of the Samaúma project.

5.2.8 GMO Exclusion (B2.7)

The Samaúma project guarantees that no GMO 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)

Fertilizers, chemical pesticides, biological control agents and other inputs will not be used in the Samaúma project.

5.2.10 Waste Products (B2.9)

The Samaúma project activities do not intend to generate solid waste in the area. However, if there is a need for any waste generation in the project area, the criteria for classifying solid waste will be followed in terms of its management and potential risks to the environment and human health established in the National Solid Waste Policy (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 Samaúma project area will not be considered. The biodiversity conservation activity within the scope of the project does not foresee any action that will cause a negative impact on the ecosystem, both within the project area and outside the project zone. In addition, no local agent was identified that depends on the project area for any activity to generate income.

5.3.2 Net Offsite Biodiversity Benefits (B3.3)

As shown in the section above, the Samaúma project does not foresee negative impacts on biodiversity outside the project area, therefore it is not necessary to analyze the comparison of the negative impacts with the positive ones of the project.

5.4 Biodiversity Impact Monitoring

5.4.1 Biodiversity Monitoring Plan (B4.1, B4.2, GL1.4, GL3.4)

Biodiversity monitoring (Table 74) is an important tool to assess and monitor project activities, providing relevant information on the structure and composition of fauna and flora communities during implementation.

For Flora monitoring, the characterization of tree vegetation will be carried out through forest inventory using permanent sample 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 plots will be carried out based on the physical and environmental characteristics of the area, which will be defined through satellite analyzes 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 and identified at species level, when possible, by an experienced botanist. At each monitoring campaign, the plots will be revisited and the tree individuals will be sampled again. In case there

are recruits (i.e. individuals who were not present in the first sampling but reached the minimum DBH in the following campaign), they will be included in the sampling. Additionally, remote monitoring of the area will be carried out annually using satellite images, in order to assess the conservation status of the project area and zone, more specifically, whether there have been changes in forest cover.

With regard to fauna, the monitoring of Herpetofauna, Mammalian fauna and Avifauna groups will be carried out considering an initial campaign in the implementation of the project (data survey), and two campaigns every three years, encompassing seasonality.

Non-interventional methods will be used to survey and monitor the fauna. To obtain species records, linear transects will be carried out in the project area, in two periods of the day (morning and afternoon), where data will be collected through direct and indirect records.

For the amphibians and reptiles (Herpetofauna), the Visual Active Search method will be used throughout the transects, which consists of walking, slowly, in visually accessible microhabitats with a greater chance of finding the organisms, in addition to the Active Search method in reproductive sites, and recording of organisms in opportunistic encounters.

As for the Mammalian fauna, the Active Search methodology will be used along the transect, in order to register animals in displacement and traces (footprints, feces, burrows, vocalizations, hair, carcasses and nail marks), in addition to the use of traps photographic cameras (trap cameras) fixed at sampling points defined in the field, for recording medium and large animals.

For Avifauna, the Mackinnon List methodology[236] will be used, which consists of recording all species seen and/or heard along pre-existing trails that will be walked randomly. In order to complement the information on the species richness of the site, data referring to occasional records of avifauna during the campaign will be included in the survey.

In order to provide prior knowledge of the area with primary data, an initial biodiversity survey campaign is planned prior to project implementation, where sample designs will be defined and which will represent the zero point of biodiversity parameters. Flora and Fauna monitoring, in turn, is planned for the area throughout the project lifetime. The summary of the monitoring plan is detailed in the table below:

Table 74. Summary of the biodiversity monitoring plan in the Samaúma project area.

Biodiversity parameters to be monitored	Variables to be monitored	Method	Frequency

[236] 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

Flora	- Species diversity - Vegetation conservation status - Number of threatened and endemic species	- Forest inventory	- An initial survey campaign during the project implementation - Periodic monitoring campaign
Flora	- Vegetation conservation status - Area (ha) preserved	- Remote monitoring by satellite images	- Annually
Avifauna	- Species richness - Number of threatened and endemic species - Species accumulation curve	- Mackinnon List - Indirect Records	- Campaign prior to project implementation - Two annual campaigns (seasonality) every three years
Mammalian fauna	- Species richness - Number of threatened and endemic species - Species accumulation curve	- Active Search - Trap cameras	- Campaign prior to project implementation - Two annual campaigns (seasonality) every three years
Herpetofauna	- Species richness - Number of threatened and endemic species - Species accumulation curve	- Visual Active Search - Active Search - Indirect Records	- Campaign prior to project implementation - Two annual campaigns (seasonality) every three years

5.4.2 Biodiversity Monitoring Plan Dissemination (B4.3)

The results of biodiversity monitoring will be made available on the project's website and scientific articles will be published in technical journals.

5.5 Optional Criterion: Exceptional Biodiversity Benefits

5.5.1 High Biodiversity Conservation Priority Status (GL3.1)

In the Project region, the presence of endangered species of flora and fauna that meet the Gold Level criteria was verified, such as Critically Endangered (CR) and Endangered (EN) species, according to the IUCN list.

- Critically Endangered (CR)

  Flora: *Vouacapoua americana*

- Endangered (EN)

  Flora: *Virola surinamensis, Manilkara elata*

  Fauna: *Pteronura brasiliensis, Inia geoffrensis, Ateles chamek, Lagothrix lagothricha cana, Sotalia fluviatilis, Pteroglossus bitorquatus.*

5.5.2 Trigger Species Population Trends (GL3.2, GL3.3)

The trigger species identified for the Samaúma project and their respective population trends are described in the tables below:

Table 75. Population trends of trigger species.

Trigger Species	*Vouacapoua americana* (acapú)
Population Trend at Start of Project	According to CNCFlora and IUCN, populations of this slow-growing species are in decline mainly due to the high economic potential of its wood and the continuous decline in area, extent and/or habitat quality. Its population is suspected to have reduced by around 50% over the last 90 years (CNCFlora), and its subpopulations are now reduced to remnant areas of dense tall forest (IUCN).
Without-project Scenario	In the absence of the Samaúma Project, the population would continue to decline due to loss of habitat due to deforestation, since it is a species that does not tolerate open environments (CNCFlora, IUCN), and the overexploitation of its wood since it has a high commercial value. due to its use in civil construction and in the furniture industry.
With-project Scenario	The Samaúma Project, through monitoring through forest inventories and conservation of 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 the exploitation of this species driven by the high economic value of its wood. Therefore, with the Samaúma Project, it is expected, in addition to maintaining the population of *Vouacapoua americana*, its increase, as the

	forest will tend to develop structurally (e.g., larger trees and denser canopy), becoming a favorable habitat for this species, which is better adapted to closed environments.
References	1. CNCFlora. Vouacapoua americana 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/Vouacapoua americana>. Accessed on: 14/09/2022. 2. IUCN. Varty, N. & Guadagnin, D.L. 1998. Vouacapoua americana. The IUCN Red List of Threatened Species 1998: e.T33918A9820054. Available at: <https://dx.doi.org/10.2305/IUCN.UK.1998.RLTS.T33918A9820054.en>. Accessed on: 14/09/2022.

Trigger Species	*Virola surinamensis* (ucuuba)
Population Trend at Start of Project	According to CNCFlora, the subpopulations of *Virola surinamensis*, a species not endemic to Brazil and predominant in flooded forests, have suffered a reduction of more than 30% in the last 90 years, having been reduced by 90% and reported extinct in some places. This decline is mainly due to overexploitation due to its high economic value for the timber and pharmaceutical industries, as well as for the riverside and indigenous populations who commercialize their resources to compose their income - which can reach 50%. This species is considered the second most economically important wood in the Amazon basin region (CNCFlora)
Without-project Scenario	In the absence of the Samaúma Project, the population would continue to decline due to habitat loss due to deforestation and the exaggerated exploitation of its resources used in interior construction, carpentry, carpentry, manufacture of boxes, toothpicks, laminates, plywood, cellulose and paper; in addition to its economic potential in the production of cosmetics and pharmaceuticals (CNCFlora, IUCN).
With-project Scenario	The Samaúma Project, through monitoring through forest inventories and conservation of 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 the exploitation of this species driven by the high economic value of its resources. Therefore, with the Samaúma Project, it is expected to maintain and/or increase the population of *Virola surinamensis*, as the forest will tend to develop structurally (e.g., larger trees and denser canopy), becoming a favorable habitat for this species, once that their seedlings develop better initially in shaded environments, and the presence of their seed dispersers, mainly birds and monkeys.

References	1. 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/Virola surinamensis>. Accessed on: 14/09/2022. 2. IUCN. Americas Regional Workshop (Conservation & Sustainable Management of Trees, Costa Rica, November 1996). 1998. Virola surinamensis. The IUCN Red List of Threatened Species 1998: e.T33959A9816820. Available at: <https://dx.doi.org/10.2305/IUCN.UK.1998.RLTS.T33959A9816820.en>. Accessed on: 14/09/2022.

Trigger Species	*Manilkara elata* (maçaranduba, cow tree)
Population Trend at Start of Project	Population data on this species are scarce (CNCFlora), but according to the IUCN and CNCFlora, their populations are threatened due to the continuous decline in area, extension and/or quality of habitat and the exploitation of their timber resources.
Without-project Scenario	In the absence of the Samaúma Project, the population would continue to decline due to habitat loss through deforestation and overexploitation of its wood, which is used to produce stringed instruments (CNCFlora, IUCN).
With-project Scenario	The Samaúma Project, through monitoring through forest inventories and conservation of 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 the exploitation of this species driven by the high economic value of its wood. Therefore, the Samaúma project is expected to maintain and increase the population of *Manilkara elata.*
References	1. CNCFlora. Manilkara elata 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/Manilkara elata>. Accessed on: 14/09/2022. 2. IUCN. Pires O'Brien, J. 1998. Manilkara elata. The IUCN Red List of Threatened Species 1998: e.T35609A9943876. Available at: <https://dx.doi.org/10.2305/IUCN.UK.1998.RLTS.T35609A9943876.en>. Accessed on: 14/09/2022.

Trigger Species	*Pteronura brasiliensis* (ariranha, giant otter)
Population Trend at Start of Project	According to IUCN, the *Pteronura brasiliensis* population is in decline, however, there is no estimate of the current population size of this species.

	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 CITES - Convention on International Trade in Endangered Species of Wild Flora and Fauna.
Without-project Scenario	In the absence of the Samaúma Project, the population of *Pteronura brasiliensis* would probably continue to decline due to the loss of habitat due to deforestation and environmental degradation that has been occurring in the region.
With-project Scenario	The Samaúma Project, through monitoring and conservation of 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., 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: 18/09/2022. 2. CITES (2022). Available at: https://cites.org/eng/app/appendices.php. Accessed on: 18 Setembro de 2022.

Trigger Species	*Ateles chamek* (macaco-aranha-peruano, peruvian spider monkey)
Population Trend at Start of Project	The population of *Ateles chamek* has declined by at least 50% over the past 45 years, according to IUCN. Such decline is related to the loss of habitat by deforestation, environmental degradation, in addition to predatory hunting activities. *Ateles chamek* is a species restricted to primary forest environments. 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 Samaúma 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 Samaúma Project, through monitoring and conservation of 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: 18/09/2022. 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 non-flooded forests. *Journal of Tropical Ecology* 13: 381-405.

- **APPENDICES**

  - **Appendix 1: Stakeholder Identification Table**

Group of Stakeholders Involved in the Project	Rights Regarding the Project	Interests in Participation in the Project	Relevance in Participation
Landowner and Project Proponent - Ituxi Administração e Participação Ltd.	Owns the farm where the Samaúma project will be developed, is co-owner of the carbon credits and responsible for meeting the legal conditions for the development and permanence of the project.	Ensure support to the technical team to develop the studies for generating carbon credits in the project area, ensure access to community members that 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 – The engagement of this project proponent is an essential condition for the development of actions related to the CCB certification.

Public Authorities - Apuí Municipality; Apuí Municipal Environment Department; Secretary of State for the Environment – Amazonas State (SEMA); Agricultural and Forestry Defense Agency of the Amazonas State (ADAF); Department of Climate Change and Management of Conservation Units (DEMUC); Amazon Sustainable Development Agency (ADS)	Partners for the implementation or improvement of public policies with local stakeholders.	Strengthen the relationship between the communities benefited by the Project's activities and the public power, making them aware of their benefits, especially in the scope of the communities, climate, and biodiversity.	High - Organizations are responsible for developing and enforcing social and environmental policies, as well as monitoring them.
Communities - Group 01 - Riverside (Riparian): Vila Batista (12 people); Projo (ten people); Aruanã (21 people); Bela Vista do Guariba (12 people); Japiim (5 people). Group 02 - Extractivists: Residents of Apuí (15 people).	Beneficiaries of projects related to the CCB certification and users of the property authorized by the owner. Legitimate and legal utilities and occupants of the project area.	Continue to access and use areas in which they can extract non-timber products and access projects for improving the production chain, associativism, and improving 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 - Union of Rural Workers, Farmers and Family Farmers of Apuí; Rural Union of the South of Amazonas Sindisul; Associations/Cooperatives - Apuí Pro-Forest Management and Sustainable Development Association (APROFAP); Apuí Family Forestry Extractive Cooperative (CEFFAP);	Stakeholders Partners in the defense of social rights and facilitation of integration into higher value production chains.	Raise awareness of the project's beneficiary stakeholders about their rights, strengthen associative relationships, provide access to the productive chain of non-timber forest products of greater value.	Medium - They are not executors of public policies, but can help improve production chains, offer training to add value to products, and strengthen the associations of communities benefited by the project. Eventually, they can act as a

Women's Cooperative (COOPERAR); Apuí School Workshop Association; Association of Agroecological Producers of Apuí (ASPOAGRO); Aripuanã/Guariba Agroextractive Association; Impact Accelerator - Impact Business Accelerator in the Amazon (AMAZ); Institute for Conservation and Sustainable Development of Amazonas (IDESAM); Muraki Institutional Support Foundation			representative instance of community members.

- **Appendix 2: Project Activities and Theory of Change Table**

Activity description	Expected climate, community, and/or biodiversity			Relevance to project's objectives
	Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
Conservation and monitoring of forest cover	Signing of long-term conservation agreements with landowners in the Amazon biome. Periodic monitoring of changes in forest cover in the project area and zone.	Periodic monitoring of forest cover using remote sensing data. Monitoring emissions from planned deforestation (comparison with baseline).	Maintenance of 71,822.07 ha of coverage and forest carbon stock. Understanding of the local context of deforestation advances.	Reduction of GHG emissions from planned and unplanned deforestation. Maintenance of forest cover and provision of ecosystem services.

	Adaptive management of project leaks and risks. Continuous monitoring and identification of agents and drivers of deforestation and periodic updating of the baseline. Biomass inventory. Preparation of monitoring reports.	Opportunity for intervention if deforestation increases. Support for the field team to understand the context of local deforestation. Carbon stocks in different reservoirs to be verified and reported.	Improvement in intervention processes. Possibility of understanding the impacts generated by planned and unplanned deforestation.	Increased family income in communities. Samaúma Project, by maintaining forest cover in the project area, contributes to improving the well-being of communities associated with the project through the management of ecosystems and their associated services, encouraging the harmonious integration between biodiversity conservation and human development.
Improvement of heritage surveillance in the project area	Improve existing surveillance actions in the area. Assess, *in loco*, deforested areas identified by remote monitoring. Define the periodicity of the rounds. Evaluate potential partnerships for surveillance activities.	Improvement of processes and procedures carried out. Field monitoring of deforested areas detected by remote monitoring. Hiring and training of community agents. Periodic rounds. Definition and contact with possible partnerships.	Improvement of tactical surveillance actions. Greater understanding of the local context of deforestation. Efficiency in surveillance activities by driving vehicles on the river along with remote monitoring. Support from partners in activities.	

Sanitation and water security	Implementation of a community water collection and treatment system. Communities: Aruanã, Bela Vista do Guariba and Japiim. Training in maintenance of water collection and treatment systems	Provide water for homes with improvements in home drinking 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. Strengthening the autonomy of families. Ensure minimum autonomy in maintaining the system in areas of difficult access.	Decrease in the rate of waterborne diseases, such as diarrhea, cholera and worms infections. Decrease the female workload in water collection and domestic activities. Dissemination of social technologies. Provide dignified housing conditions and ensure better conditions for their stay in the territory.	Improve quality of life by strengthening the five dimensions of sustainable livelihoods. Provide dignified housing conditions, ensure better conditions for permanence in the territory and expand access to rights and citizenship.
Health	Acquisition and donation of transportation for health care and emergencies; Facilitate travel for outpatient and emergency health care.	Reduction of the risk and aggravation of diseases or accidents through emergency care.	Assist in the consolidation of a public health policy in the territory.	

Energy infrastructure	Acquisition and implementation of photovoltaic systems. Reduce the cost of electricity generation by fossil fuel generator systems (fuel transport and related atmospheric emissions). Training for maintenance of the photovoltaic system.	Enable the autonomous generation of sustainable electricity, guarantee basic infrastructure for internet, communication, household appliances and basic electrical tools that help reduce the effort in housework and income generation. Ensure minimum autonomy in maintaining the system in areas of difficult access. Allow learning and use of new technologies and tools.	Provide decent housing conditions. Ensure communicative inclusion and access to rights and citizenship. Strengthen the autonomy of families.	
Communication	Facilitate emergency communications, access to information, education, commercial relations, and establish basic communication infrastructure with the Samaúma project. Training for maintenance of the communication system.	Guarantee minimum infrastructure for the implementation of face-to-face education mediated by technology, facilitate training in fundamental, secondary and technical education Improve the infrastructure for learning new management techniques	Consolidate a communication channel with the Samaúma project. Contribute to the completion of the basic and productive training cycle, reducing the need to migrate to the city. Strengthen the autonomy of families, provide decent housing conditions.	

		and the quality of agroforestry products. Continue with the product traceability process, such as the ICATU system, which is already a partner of local extractivists.	Ensure basic communicative and digital inclusion to expand access to rights and citizenship.	
Education	Purchase and donation of river transport in the educational school year. Increased security for children and adolescents to access formal education	Decreased dropout rates and age-grade distortion Permanence of children and adolescents with the family during the school period.	Contribute to the basic education of children and adults. Reduction of school dropouts and exodus to the city center for educational reasons. Expansion of opportunities for the family to carry out productive development and diversification.	
Income generation	Logistic support - Acquisition of a boat with an engine capable of supporting volumes of up to 1 ton for quick production flow + motor vehicle to aid in cassava agriculture.	Increase capacity and speed in transporting production to the city. Reduction of shipping costs on delivery to buyers.	Increased income of extractive families; Strengthening associations; Valuing the productive chain of non-timber forest products	

	Copaiba oil - Search for new commercial partnerships, ways of processing copaiba oil (development of new products); Own brand development. Marketing and promotion; Building business relationships. Chestnut - Training and courses aimed at valuing the product; Working capital; Encourage the participation of young people and women. Structure for processing and packaging. Training aimed at diversifying the production chain and processing non-timber forest products; Training for sustainable management in the extraction of copaiba and chestnut.	Decrease dependence on a single buyer; Add value to copaiba oil to demand fairer prices; Valuing associated producers; Marketing and promotion; Building business relationships. Increase income in direct sales with private label; Establishment of commercial partnerships, diversification of production and processing of chestnuts; New products and technologies; Building business relationships. Diversification of private label products; Decrease dependency on copaiba and nut oil,	Increase in the value of carbon credits by raising the socio-environmental value and the bioeconomy of the projects.	

	Encourage the participation of young people and women.	increase access to new markets Search for new products that are already known to extractivists but that are not processed due to lack of equipment and quality control training.		
Associativism	Establishment of rules of responsibility and use regarding the maintenance of equipment received by the projects.	Ensuring the autonomy of community members in the management of implemented infrastructure systems and projects. Ensuring 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.	

- **Appendix 3: Project Risks Table**

Internal Risks

Project Management		
Risk Factor	**Risk Factor and/or Mitigation Description**	**Risk Rating**

a)	Not applicable: the project does not involve plantations.	0
b)	Ongoing enforcement is required to prevent encroachment by outside actors. The Samaúma project employs forest patrols to prevent encroachment by outside actors into the project area. An annual budget is projected for this activity.	0
c)	Management team includes individuals and institutions with significant experience in all skills necessary to successfully undertake all project activities. ● *Territorial protection*. The Project is the result of a partnership between Terra Vista Gestora de Recursos Ltd. and Ituxi Administração e Participação Ltd., whose economic group has already developed other relevant carbon projects, such as Fortaleza Ituxi REDD+, Unitor REDD+ and Evergreen REDD+. ● *Monitoring.* Satellite and drone images, flight images, boat photos ● *Social programs.* The implementation of social and infrastructure improvements will be provided with support from Vivian Fernanda Carneiro Martins, with more than 15 years of experience in elaboration and coordination of socio-environmental projects in the Amazon.	0
d)	The management team is based entirely in the country. Proponents hired people from communities close to the project area to contribute to project management. Support staff for technical advice and financial management are located in-country (Terra Vista Gestora de Recursos Ltd., headquarters in São Paulo).	0
e)	Management team includes individuals with experience in AFOLU project design and implementation, carbon accounting and reporting under the VCS Program or other approved GHG programs. As an example of The Terra Vista Gestora de Recursos Ltd. management team is: ● **Rômulo Pereira da Silva Arantes** (technical director): He has experience in Reduction of Emissions from Deforestation and forest Degradation (REDD) projects. He worked on the first project that originated forest carbon credits in Brazil and has more than 15 years of experience in baseline diagnostics for assessing environmental impacts on climate, communities and biodiversity. ● **Rafaela Martins** (Sustainability Analyst): She has two years of experience in designing, managing and developing REDD+ projects and forestry and reforestation projects to offset carbon emissions, as well as environmental projects focused on sustainability and preservation of the environment. Complete CVs are available to auditors.	-2
f)	Not applicable: the project does not have a plan in place.	0

Total Project Management (PM) (a + b + c + d + e + f)] Total may be less than zero.	**-2**

Financial Viability		
Risk Factor	**Risk Factor and/or Mitigation Description**	**Risk Rating**
a)	Not applicable. Project payback is less than 10 years.	0
b)	Not applicable. Project payback is less than 7 years.	0
c)	Not applicable. Project payback is less than 4 years.	0
d)	The cash flow break-even point 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
e)	Not applicable. The project has secured more than 15% of the funding needed to cover total cash before the project breaks even.	0
f)	Not applicable. The project has secured more than 40% of the funding needed to cover total cash before the project breaks even.	0
g)	Not applicable. The project has secured more than 80% of the funding needed to cover total cash before the project breaks even.	0
h)	The project has secured 80% or more of the funding needed to cover total cash before the project breaks 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 Viability (FV) [as applicable, ((a, b, c or d) + (e, f, g or h) + i)]		**0**

Total may not be less than zero.	

Opportunity Cost		
Risk Factor	**Risk Factor and/or Mitigation Description**	**Risk Rating**
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
e)	Not applicable. The NPV of the project activities are expected to be more than 50% higher than the most profitable alternative land use activity.	0
f)	The NPV of the project activities is expected to be at least 50% higher than the most profitable land use alternative. Justification to follow.	-4
g)	Not applicable: 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.	-2
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)] Total may be less than 0.	**-6**

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.
- For unplanned deforestation, it is considered that the owner does not make a profit because it is an invasion.
- The area available for cattle raising is equal to 14,158.3 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[237].
- 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 15%, above the SELIC rate.
- The Selic rate[238] on December 14, 2022 was 13.75%, 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.

Carbon credit price references used

[237] https://repositorio.uft.edu.br/handle/11612/3127

[238] https://www.bcb.gov.br/controleinflacao/historicotaxasjuros

(i) CME Group[239], CBL Nature-Based Global Emissions Offset - USD 9.41 corresponding to 09/19/2022;

(ii) S&P Global Platts[240] - USD 11.22 corresponding to the date of 09/27/2022; and

(iii) Platts Nature-Based Avoidance Carbon Credits[241] - USD 13.75 corresponding to 04/22/2022.

References to recent company transactions were also made available to project validators.

Project Longevity		
a)	Not applicable	0
b)	There is a legal contractual agreement with an amendment to maintain project activities and maintain the project area as forest for 32 years from the project start date. The landowner is legally able to maintain project activities throughout the life of the project. The project area management and financing plans consider the operation of the project for a period of 32 years.	14
Total Project Longevity (PL) May not be less than zero		**14**

[239] Available at: https://www.cmegroup.com/markets/energy/emissions/cbl-nature-based-global-emissions-offset.html

[240] Available at: Carbon Credit Indices - CARBEX | S&P Global Commodity Insights (spglobal.com)

[241] Available at: https://storymaps.arcgis.com/collections/1e05ebf390554cb8b7cefa80e521afda?utm_source=plattsweb&item=8.

CNC, Nature-based Avoidance carbon price spread stays wide after record high in March | S&P Global Commodity Insights (spglobal.com)

Internal Risk	
Total Internal Risk (PM + FV + OC + PL) Total may not be less than zero.	**-2+0-6+14** **6**

External Risks

Land Tenure and Resource Access/Impacts		
Risk Factor	**Risk Factor and/or Mitigation Description**	**Risk Rating**
a)	Ownership and access/use rights to resources are held by the same entity.	0
b)	Not applicable. Ownership and access/use rights to resources are held by the same entity.	0
c)	Not applicable. There is no dispute over land tenure or ownership in any part of 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.	-2
g)	Not applicable. There is no dispute over tenure or ownership of the land, therefore the mitigation measure is not required	0
Total Land Tenure (LT) [as applicable, ((a or b) + c + d + e + f + g)] Total may not be less than zero.		**0**

Community Engagement		
Risk Factor	**Risk Factor and/or Mitigation Description**	**Risk Rating**
a)	Not applicable: There are no populations living within the project area or even within 20 km of the project boundaries	0
b)	Not applicable: There are no populations living within the project area or even within 20 km of the project boundaries	0
c)	Not applicable: despite the project generating positive impacts for the communities, the communities benefited by the project are not within the limit of 20 km from the project boundary	0
Total Community Engagement (CE) [where applicable, (a + b + c)] Total may be less than zero.		**0**

Political Risk		
Risk Factor	**Risk Factor and/or Mitigation Description**	**Risk Rating**
a)	Not applicable: Governance score is -0.203	0
b)	Not applicable: Governance score is -0.203	0
c)	Governance score is -0.203	2
d)	Not applicable: Governance score is -0.203	0
e)	Not applicable: Governance score is -0.203	0
f)	Brazil is implementing REDD+ Readiness or other activities:	-2

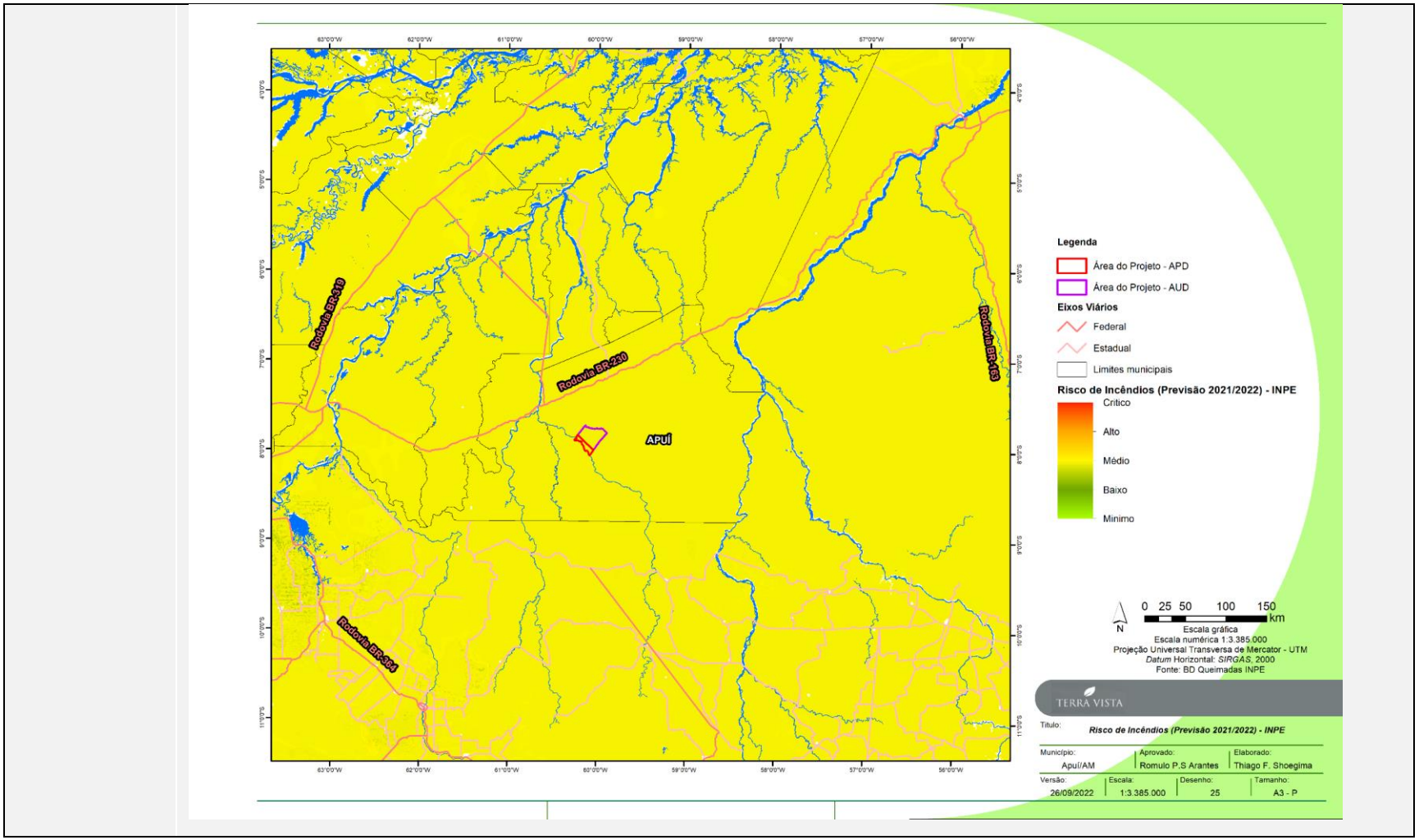
	e) The country has an established Designated National Authority under the CDM (Clean Development Mechanism) and has at least one registered CDM Afforestation/Reforestation project	
Total Political (PC) [as applicable ((a, b, c, d or e) + f)] Total may not be less than zero.		**0**

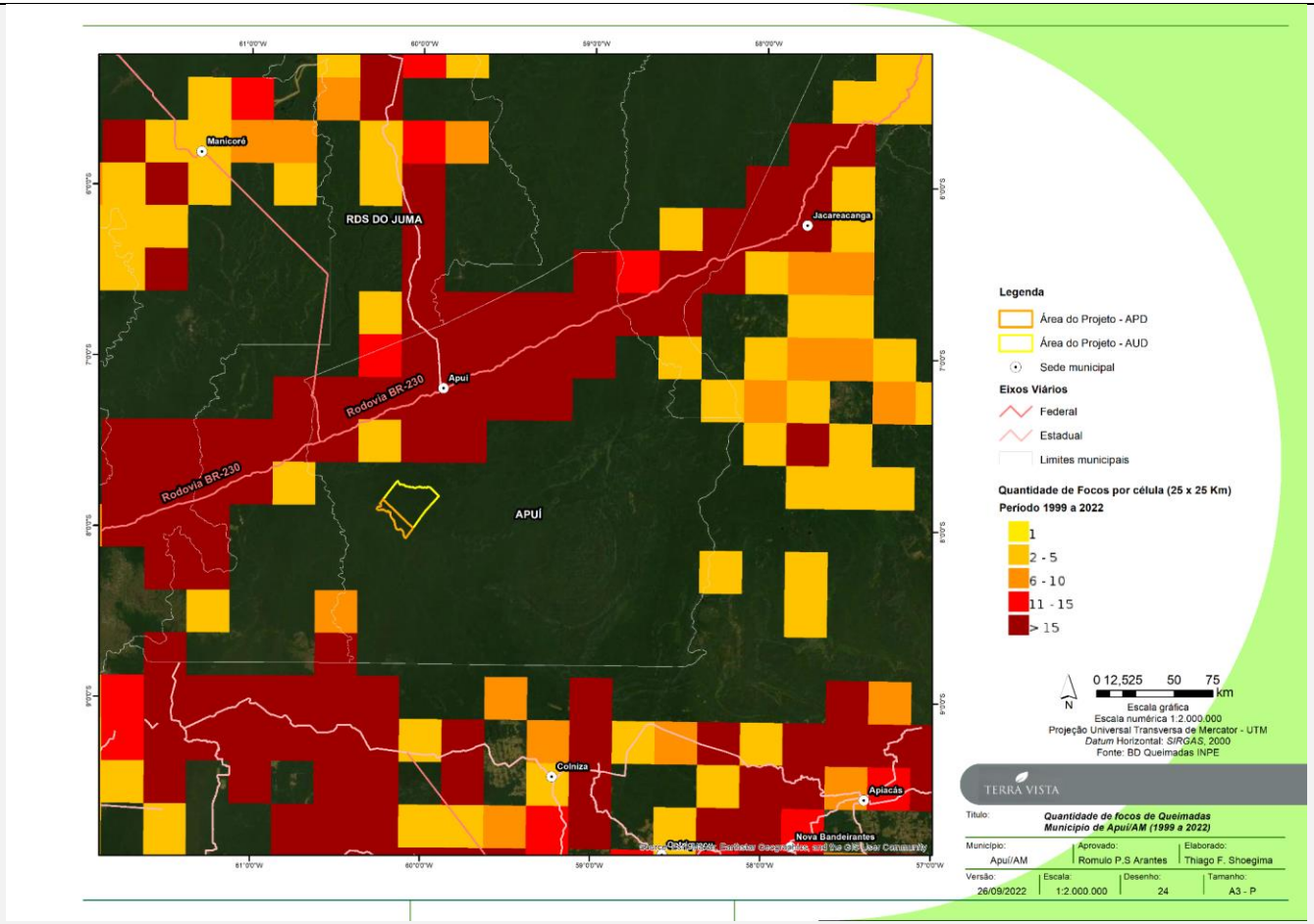
External Risk	
Total External Risk (LT + CE + PC) Total may not be less than zero.	0

Natural Risks

Natural Risk - Fire	
Significance	No losses. Although environmental agencies classify the project area as having a medium probability of fire occurrence, this classification occurs on a very broad 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 no fire outbreaks were registered in the area for the period from 1999 to 2022. Both the large and small scale analysis were based on INPE data[242].

[242] Available at: https://queimadas.dgi.inpe.br/queimadas/bdqueimadas


Rodovia BR-319
Rodovia BR-230
Rodovia BR-163
Rodovia BR-364
APUÍ
Legenda
Área do Projeto - APD
Área do Projeto - AUD
Eixos Viários
Federal
Estadual
Limites municipais
Risco de Incêndios (Previsão 2021/2022) - INPE
Critico
Alto
Médio
Baixo
Minimo
0 25 50 100 150
km
Escala gráfica
Escala numérica 1:3.385.000
Projeção Universal Transversa de Mercator - UTM
Datum Horizontal: SIRGAS, 2000
Fonte: BD Queimadas INPE
TERRA VISTA
Título:
Risco de Incêndios (Previsão 2021/2022) - INPE
Município:
Apuí/AM
Aprovado:
Romulo P.S Arantes
Elaborado:
Thiago F. Shoegima
Versão:
26/09/2022
Escala:
1:3.385.000
Desenho:
25
Tamanho:
A3 - P



Likelihood	0
Score (LS)	0

Mitigation	None

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	None

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	None

Natural Risk - Geological Risk	
Significance	No losses. Neither volcanoes nor active tectonic faults are present in the project area.
Likelihood	0

Score (LS)	0
Mitigation	None

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

- **Appendix 4: Additional Information**

Use appendices for supporting information. Delete this appendix (title and instructions) where no appendix is required.