Document Prepared By ECCON Soluções Ambientais

CARBONFLOR
REDD

Project Title	REDD Carbonflor
Version	v1.1
Date of Issue	March 21th, 2023
Project Location	Brazil
Project Proponent(s)	ECCON Soluções Ambientais. Address: St. Dr. Fernandes Coelho 64 Cj 31 Pinheiros, São Paulo/SP, Brazil, CEP 05423-911 | yuri@ecconsa.com.br | Yuri Rugai Marinho | www.ecconsa.com.br
Prepared By	ECCON Soluções Ambientais
Validation Body	EcoLance
Project Lifetime	30-year lifetime (From 06-october-2021 to 05-october-2051)
GHG Accounting Period	06-october-2021, and 05-october-2051; 30 years total period
History of CCB Status	Not applicable
Gold Level Criteria	Not applicable
Expected Verification Schedule	Initial Verification expected in April 2023; monitoring period reported 06-October-2021 to 31-March-2023

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1 SUMMARY OF PROJECT BENEFITS

1.1 UNIQUE PROJECT BENEFITS

Table 1. Summary of expected Project Benefits.

Outcome or Impact Estimated by the End of Project Lifetime	Section Reference
1. Conservation of native, old-growth, undisturbed forest, around 6,057 hectares (ha) in the Cerrado biome and 3,533 ha in the Amazon biome, and prevention of the conversion of this forest to grassland by planned and unplanned deforestation;	2.1.5 3.1.2
2. Long-term climate mitigation, avoiding the emission of 3,012,633.36 tCO_2e of GHG for 30 years, which corresponds to an annual average of 100,421.11 tCO_2e throughout the duration of REDD Carbonflor; The total VCUs generated in the project will be 2,560,738.35 tCO_2e;	2.1.17 3.2.1
3. Promoting the well-being of the traditional resident communities and indigenous peoples of the Project Zone. Including improvement in community organization, capacity building of young women, youth, and elderly, and encouraging the sustainable use of natural resources. Special community research and development projects will be supported;	2.2.3 4.2
4. Promote private sector actions in conservation initiatives, creating a link between the REDD Carbonflor area, the official public nature reserves (UCs), and traditional communities existing in the region, reducing the threats of deforestation and forest degradation agents, protecting around 10,000 hectares of highly biodiverse forest in the Amazon and Cerrado.	2.5.1 5.1.6
5. Protection of hundreds of species of flora and fauna and their habitats, including threatened and endemic. Species will be inventoried and monitored with a view to conserving their natural habitat within the Carbonflor REDD boundary.	5.1
6. Exceptional climate adaptation benefits by systematically analyzing data, monitoring the effects of regional and local climate changes on the local households living close to the *REDD Carbonflor* area (traditional, settled, and indigenous), and promoting environmental and climate change education/training among them;	4.2
7. Exceptional benefits of biodiversity by promoting the protection of 6,057.12 hectares of undisturbed area in four different phytophysiognomies, in an area classified as an extreme conservation priority by the Brazilian government, in the Cerrado biome, and 3,533.50 hectares of two other phytophysiognomies in the Amazonia biome. Special projects to monitor forest cover in conservation units of these biomes will be supported.	3.1.5
8. Exceptional community benefits. The REDD Carbonflor will be implemented around vulnerable communities beginning with Acaba Vida, a rural settlement close to PAI 01. The *REDD Carbonflor* will generate short- and long-term net positive welfare for community members and empowerment of community members;	4.2

1.2 STANDARDIZED BENEFIT METRICS

Table 2. Estimates of the net benefit for different metrics during the lifecycle of the Project

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
GHG emission reductions or removals	Net estimated emission removals in the REDD Carbonflor area, measured against the without-project scenario.	Not applicable	-
	Net estimated emission reductions in the REDD Carbonflor area, measured against the without-project scenario. From these emissions reductions 2.201.028,20 are from APD and 901.025,95 are from AUDD (not accounting for leakage and buffer).	3,102,054.14 tCO_2eq	2.1.17 3.2.4
Forest[1] cover	For REDD[2] projects: Estimated number of hectares of reduced forest loss in the project area measured against the without-project scenario	9,590 ha avoided deforestation (AUDD+APD)	2.1.5 3.2.1
	For ARR[3] projects: Estimated number of hectares of forest cover increased in the project area measured against the without-project scenario	Not applicable	-
Improved land management	Number of hectares of existing production forest land in which IFM[4] practices are expected to occur as a result of project activities, measured against the without-project scenario	Not applicable	-
	Number of hectares of non-forest land in which improved land management practices are expected to occur as a result of project activities, measured against the without-project scenario	Not applicable	-
Training	Total number of community members who are expected to have improved skills and/or knowledge resulting from the training provided as part of project activities	data not available	4.1

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

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
	Number of female community members who are expected to have improved skills and/or knowledge resulting from training as part of project activities	data not available	4.1.2
Employment	The total number of people expected to be employed in project activities[5] expressed as the number of full-time employees[6]	data not available	4.1.2 4.4.1
	The number of women expected to be employed as a result of project activities expressed the number of full-time employees	data not available	4.1.2 4.4.1
Livelihoods	Total number of people expected to have improved livelihoods[7] or income generated because of project activities	data not available	4.1.2 4.4.1
	Number of women expected to have improved livelihoods or income generated because of project activities	data not available	4.1.2 4.4.1
Health	Total number of people for whom health services are expected to improve because of project activities, measured against the without-project scenario	data not available	4.1.2 4.4.1
	Number of women for whom health services are expected to improve because of project activities, measured against the without-project scenario	data not available	4.1.2 4.4.1
Education	Total number of people for whom access to, or quality of, education is expected to improve because of project activities, measured against the without-project scenario	data not available	4.1.2 4.4.1
	Number of women and girls for whom access to, or quality of, education is expected to improve because of project activities, measured against the without-project scenario	data not available	4.1.2 4.4.1
Water	Total number of people who are expected to experience increased water quality and/or improved access to drinking water because of project activities, measured against the without-project scenario	data not available	4.1.2 4.4.1

[5] Employed in project activities means people directly working on project activities in return for compensation (financial or otherwise), including employees, contracted workers, sub-contracted workers, and community members that are paid to carry out project-related work.

[6] Full-time equivalency is calculated as the total number of hours worked (by full-time, part-time, temporary, and/or seasonal staff) divided by the average number of hours worked in full-time jobs within the country, region, or economic territory (adapted from the UN System of National Accounts (1993) paragraphs 17.14[15.102];[17.28])

[7] Livelihoods are the capabilities, assets (including material and social resources), and activities required for a means of living (Krantz, Lasse, 2001. *The Sustainable Livelihood Approach to Poverty Reduction*. SIDA). Livelihood benefits may include benefits reported in the Employment metrics of this table.

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
	Number of women who are expected to experience increased water quality and/or improved access to drinking water because of project activities, measured against the without-project scenario	data not available	4.1.2 4.4.1
Well-being	Total number of community members whose well-being[8] is expected to improve because of project activities	data not available	4.1.2 4.4.1
	Number of women whose well-being is expected to improve because of project activities	data not available	4.1.2 4.4.1
Biodiversity conservation	Expected change in the number of hectares managed significantly better by the project for biodiversity conservation,[9] measured against the without-project scenario	51,063.62 ha is the total area of the involved properties.	2.1.5 3.2.1
	Expected number of globally Critically Endangered or Endangered species[10] benefiting from reduced threats as a result of project activities,[11] measured against the without-project scenario	data not available	5.1 5.1.1 5.1.2

The data regarding community benefits is still not available, as stakeholder consultation is in progress, it should be determined after the first monitoring period.

[8] Well-being is people's experience of the quality of their lives. Well-being benefits may include benefits reported in other metrics of this table (e.g. Training, Employment, Livelihoods, Health, Education and Water), and may also include other benefits such as strengthened legal rights to resources, increased food security, conservation of access to areas of cultural significance, etc.

[9] Managed for biodiversity conservation in this context means areas where specific management measures are being implemented as a part of project activities with an objective of enhancing biodiversity conservation, e.g. enhancing the status of endangered species

[10] Per IUCN's Red List of Threatened Species or national lists (ICMBio)

[11] In the absence of direct population or occupancy measures, measurement of reduced threats may be used as evidence of benefit

2 GENERAL

2.1 PROJECT GOALS, DESIGN, AND LONG-TERM VIABILITY

2.1.1 SUMMARY DESCRIPTION OF THE PROJECT (G1.2)

The REDD Carbonflor is a multi-activity grouped project, located in Brazil, in the Amazon and Cerrado biomes. The project is classified in scope 14 - AFOLU (Agriculture, Forestry and Other Land Uses) and falls into the category Reducing Emissions from Deforestation and Degradation (REDD) in the scopes of planned (APD) and unplanned (AUDD) deforestation.

The REDD Carbonflor´s main goal is to reduce global greenhouse gas emissions (GHG) through the conservation of native vegetation in the Amazon and Cerrado biomes. The project is based on the conservation of the remaining forest cover of properties under pressure from deforestation and degradation.

Information generated by the National Institute for Space Research ("INPE") on monitoring forest cover in the Cerrado and Amazon biomes points to increasing deforestation rates since 2012. For the Cerrado Biome, annual deforestation rate was of 7,905.16 km2[12] in 2021 (August 1st, 2020, to July 31st, 2021), a 7,9% increase from the previous datapoint, 2020. For the Amazon biome, deforestation reached 13,235 km^2 in 2021 (August 1st, 2020, to July 31st, 2021). This represents a 21,97% increase from the previous datapoint, 2020.[13]

Such matter becomes even more relevant considering that these biomes have the highest deforestation rates in the country. The increases in deforestation observed in 2021 in the Cerrado and Amazon corroborate the progress of deforestation activity in natural forests in Brazil, which leaves us in close point to reach the imbalance of the natural systems[14], which affects the provisions of energy, water, and food security in Brazil and worldwide.

Given the high rates of deforestation in these two biomes, the project seeks landowners who have properties in the Cerrado and Amazon who choose not to deforest their properties in the legally permitted portions (APD), as well as guarantee the protection of permanent preservation areas (APP) and legal reserve (RL) of their properties (AUDD), which have also been the target of illegal deforestation and degradation over the last few decades.

In this way, REDD Carbonflor will promote the conservation of natural forests and aims to obtain positive net benefits for communities and biodiversity. Thus, in addition to reducing carbon emissions, the project will promote benefits in maintaining the biodiversity of fauna and flora, providing a safe habitat for local fauna, increasing water retention, protecting water resources, and maintenance of the region's microclimate. Regarding the communities, the benefits will be achieved through actions of social engagement, education, training and capacity building, and support for local infrastructure.

In this context, ECCON will be responsible, as the proponent of the project, for the development of all stages, implementation in the different instances, and monitoring of the parameters of climate, community, and biodiversity of REDD Carbonflor. The other entities involved in the project are the landowners, who, through the signing of a contract and letter of intent, attest to their commitment to keeping the areas of their properties conserved in the long term, which will allow for them to support the activities of the projects to be developed.

[12] https://www.gov.br/inpe/pt-br/assuntos/ultimas-noticias/nota-tecnica-prodes-cerrado-2021

[13] https://www.gov.br/inpe/pt-br/assuntos/ultimas-noticias/divulgacao-de-dados-prodes.pdf

[14] Lovejoy and Nobre, 2019 - https://tinyurl.com/yp6tx5eu

It is important to highlight that the carbon credit revenue generated by REDD Carbonflor will contribute to conservation, by making the activity more attractive to rural producers supported by the project, therefore the maintenance of the "standing forest" will be a competitive alternative to other land uses (i.e., agricultural or livestock production), which are a threat to conversion of native vegetation in the current scenario.

Carbonflor REDD activities began in 2021, with a 30-year crediting period, from October 6th, 2021, to October 5th, 2051. PAI 01 is the first project instance. It is in the Cerrado and will avoid the emission of 253,923.05 tCO_2e during the 30 years and with an annual average reduction in greenhouse gas emissions of 8,191.07 tCO_2e (not accounting for leakage and buffer). PAI 02 is the second project instance, with the Letter of intent signed on October 28th 2022, it will avoid the emission of 1,809,852.82 tCO_2e during the 30 years and with an annual average reduction in greenhouse gas emissions of 58,382.35 tCO_2e (not accounting for leakage and buffer). PAI 03, which had its intention letter signed on November 18th 2021, will avoid the emission of 1,038,278.28 tCO_2e during the 30 years and with an annual average reduction in greenhouse gas emissions of 33,493.85 tCO_2e (not accounting for leakage and buffer)

2.1.1.1 CLIMATE BENEFITS

The foreseen activities for the project include:

In PAI 01

i. Avoid planned deforestation in areas of the Cerrado biome, corresponding to an area of 2,083.90 ha, avoiding the emission of 234,425.41 tCO_2e over a period of 30 years, with an annual average estimate of 7,562.11 tCO_2e.

ii. Containment of unplanned deforestation in APP and RL areas (1,295.80 ha) of the property, avoiding the deforestation of 195.68 ha and associated emissions of 19,497.65 tCO2e in a period of 30 years, with an annual average estimate of 628.96 tCO_2e.

In PAI 02

i. Avoid planned deforestation in areas of the Amazon biome, corresponding to an area of 1,950.35 ha, avoiding the emission of 1,005,291.50 tCO_2e over a period of 30 years, with an annual average estimate of 32,428.76 tCO_2e.

ii. Containment of unplanned deforestation in APP and RL areas (6,954.17 ha) of the property, avoiding the deforestation of 1,583 ha and associated emissions of 804,561.32 tCO2e in a period of 30 years, with an annual average estimate of 25,953.59 tCO_2e.

In PAI 03

i. Avoid planned deforestation in areas of the Cerrado biome, corresponding to an area of 3,361.87 ha, avoiding the emission of 961,311.29 tCO_2e over a period of 30 years, with an annual average estimate of 31,010.04 tCO_2e.

ii. Containment of unplanned deforestation in APP and RL areas (5,540.82 ha) of the property, avoiding the deforestation of 415.3 ha and associated emissions of 76,966.98 tCO_2e in a period of 30 years, with an annual average estimate of 2,482.81 tCO_2e.

In this context, the project aims to avoid the emission of a total of 3,102,054.14 tCO_2e during the project's crediting period of 30 years (not accounting for leakage and buffer), seeking and inserting new areas and owners willing to conserve native vegetation on their properties.

2.1.1.2 COMMUNITY BENEFITS

The REDD Carbonflor project will seek CCB certification, and for such it will involve communities in decision-making related to community benefits. After consultation and workshops with the community it will be possible to determine, through a participatory process, their priorities, which benefits will be generated by the project and where they will occur in the landscape. First, we will consider all the marginalized and vulnerable groups within the community complexity, by identifying organizations already working with those groups and what kind of support do they need to continue or improve their social work locally. Later, other areas of action will be analyzed, such as the local campaigns for health and educational issues, always taking the community representatives as the main leaders of all the proposed actions.

The projects will only be confirmed after the stakeholder consultation and workshops with participatory building and decision-making processes.

Some of the examples of benefits to the Community may be:

- *Vulnerable groups*: hygiene and basic needs kits for young mothers living in poor conditions / equipment for the families that work in the local landfill / equipment and learning materials for adults' literacy and others.

- *Children*: distribution of oral hygiene kits / environmental education events such as a public open-air cinema or events and lectures in the schools to discuss environmental issues and others.

- *Education*: programs for improvement and support on educational level, such as structural improvements for schools or actions for teachers with distribution of equipment and training / access to internet and computers, improvement or implementation of technology labs and others.

- *Jobs and income*: management tools and courses to stimulate entrepreneurship / professional courses in the areas with more available jobs locally and others.

- *Health*: structural improvements in health facilities / distribution of equipment and basic needs items / support for local campaigns such as vaccination or other local needs and others.

2.1.2 PROJECT SCALE

Table 3. Scale of the project.

Project Scale	
Project	Yes
Large project	No

2.1.3 PROJECT PROPONENT (G1.1)

Table 4. Identification, contact, and responsibility of the proponents of the Carbon Project.

Organization name	ECCON Soluções Ambientais
Contact person	Yuri Rugai Marinho
Title	Project Developer
Address	St. Dr. Fernandes Coelho, 64, Cj 31, Pinheiros, Municipality of São Paulo, State of São Paulo, Brazil, CEP 05423-911

Telephone	+55 11 97603-2514
Email	yuri@ecconsa.com.br

2.1.4 OTHER ENTITIES INVOLVED IN THE PROJECT

The other entities involved in the implementation of REDD Carbonflor are the owners of the project activity instances.

For PAI 01:

Organization name	Serra Farm – PAI 01 Maria Cecilia de Camargo Penteado Maria Christina de Camargo Penteado Renata Mussi de Camargo Penteado Soares
Contact person	Marília de Camargo Penteado Passos; Renata Mussi de Camargo Penteado Soares
Title	Owners of properties composing PAI 01
Address	St. Cecilia Feres Zogbi, 484, house 45, Municipality of Campinas, State of São Paulo
Telephone	55 21 981166961
Email	mariliacppassos@gmail.com; remussi.soares@gmail.com

For PAI 02:

Organization name	Seringal Bom Destino Farm – PAI 02 COIMMA INCORPORAÇÕES IMOBILIÁRIAS LTDA
Contact person	Murilo Dancieri Silveira
Title	Owners of properties composing PAI 02
Address	Via Marginal José Dansieri, nº 605 – Distrito Industrial – Dracena/SP
Telephone	55 11 95066-7092
Email	murilo.silveira@coimma.com.br

For PAI 03:

Organization name	Bodoquena Farm – PAI 03 CNPJ: 01.991.834/0001-79 - FAZENDA BODOQUENA LTDA
Contact person	David Canassa
Title	Owners of properties composing PAI 03

Address	St. Manuel Bandeira, 291, 1º floor, Vila Leopoldina,, municipality of São Paulo, São Paulo state
Telephone	+55 11 94457 2546
Email	david.canassa@reservasvotorantim.com.br

2.1.5 PHYSICAL PARAMETERS (G1.3)

2.1.5.1 ACCESIBILITY

2.1.5.1.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

The Serra Farm has a total area of 4,091.58 hectares (Figure 1). The property is in the southern portion of Niquelândia, a municipality in the state of Goiás, Brazil (Figure 1). The property is located 45 km south of the urban area of Niquelândia and 232 km from the state's capital, Goiânia. Niquelândia shares borders with another nine municipalities: Campinaçu and Colinas do Sul (north), São João D'Aliança (east), Águas Frias de Goiás (southeast), Mimoso de Goiás and Vila Propício (south), Barro Alto and Santa Rita do Novo Destino (southwest) and Uracu (west). Access to the municipality of Niquelândia is only by road.

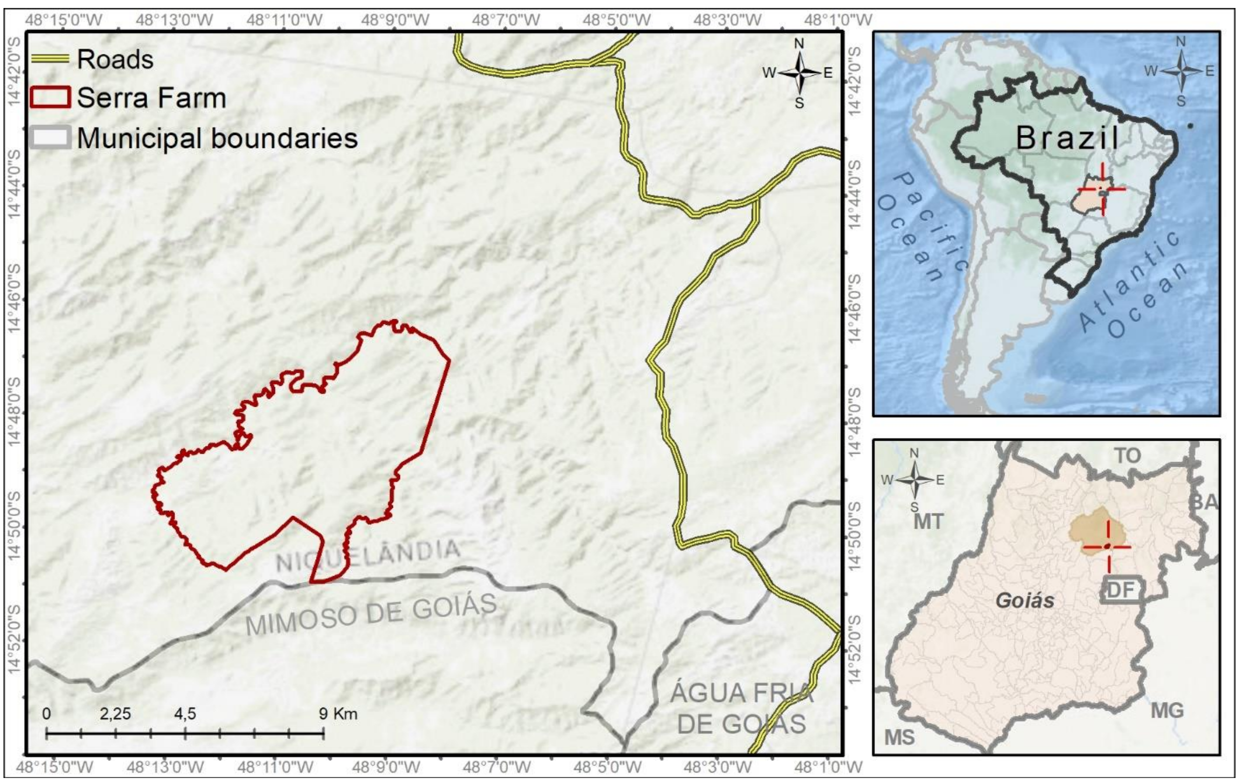

Figure 1. Illustration of the PAI. The left Panel shows the limits of the Serra Farm (PAI 01). Upper right panel shows the location of Goiás state in Brazil. The lower right panel shows the limits of Niquelândia and the cross indicates the location of the Serra Farm.

2.1.5.1.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

The Bom Destino Farm has a total area of 10,063 hectares (Figure 2). The property is in the western portion of Rio Branco, a municipality which is the capital of the state of Acre, Brazil (Figure 2). The Farm is approximately 75 km west of the urban area of Rio Branco. The municipality of Rio Branco shares borders with another 7 municipalities: Bujari (north), Porto Acre (northeast), Senador Guiomard and Capixaba (east), Xapuri (south), Brasiléia (southwest), and Sena Madureira (west). The access to the municipality of Rio Branco is only by road.

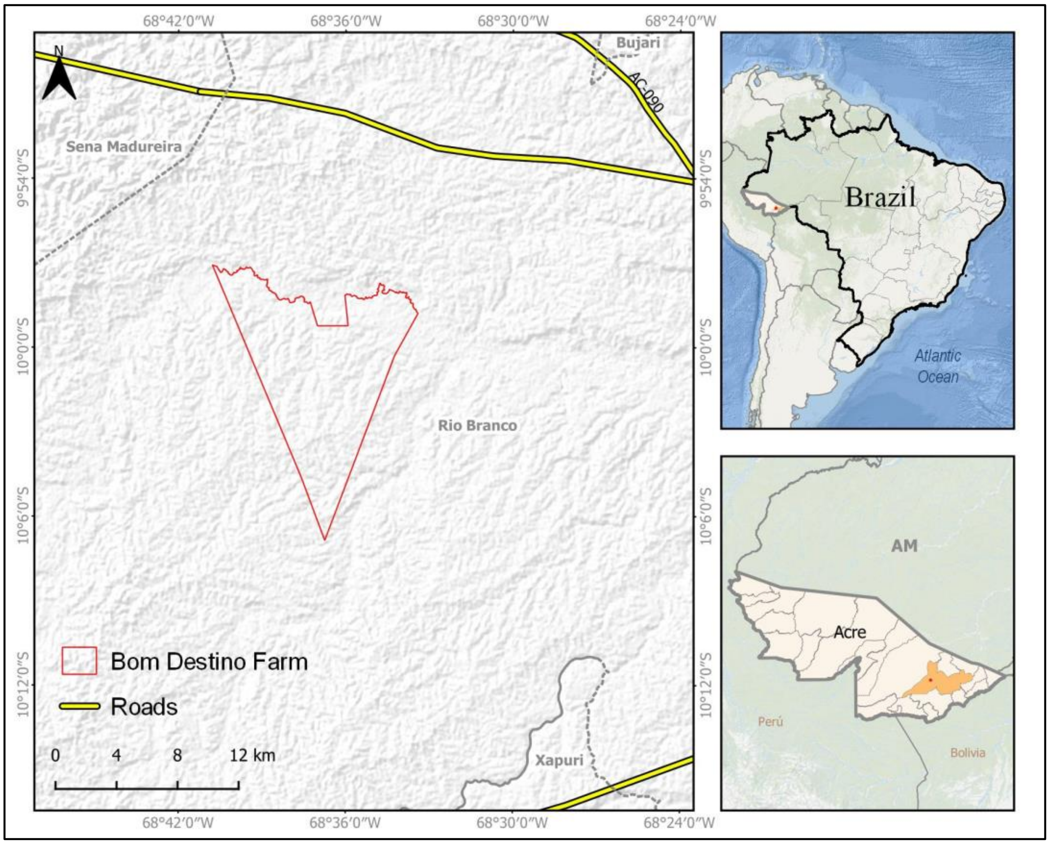

Figure 2. Illustration of the PAI. The left panel shows the limits of the Bom Destino Farm (PAI02). Upper Right panel shows the location of Acre state in Brazil. The lower right panel shows the limits of Rio Branco, and the red point indicates the location of the Bom Destino Farm.

2.1.5.1.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

The Bodoquena Farm has a total area of 36,909 hectares (Figure 3). The property is in the western portion of Miranda, a municipality of the state of Mato Grosso do Sul, Brazil (Figure 3). The Farm is approximately 40 km northwest of the urban area of Miranda. Miranda shares borders with 5 other municipalities: Aquidauana (northeast), Anastácio (southeast), Bonito (south), Bodoquena (south), and Corumbá (west). The access to the municipality of Miranda is only by road.

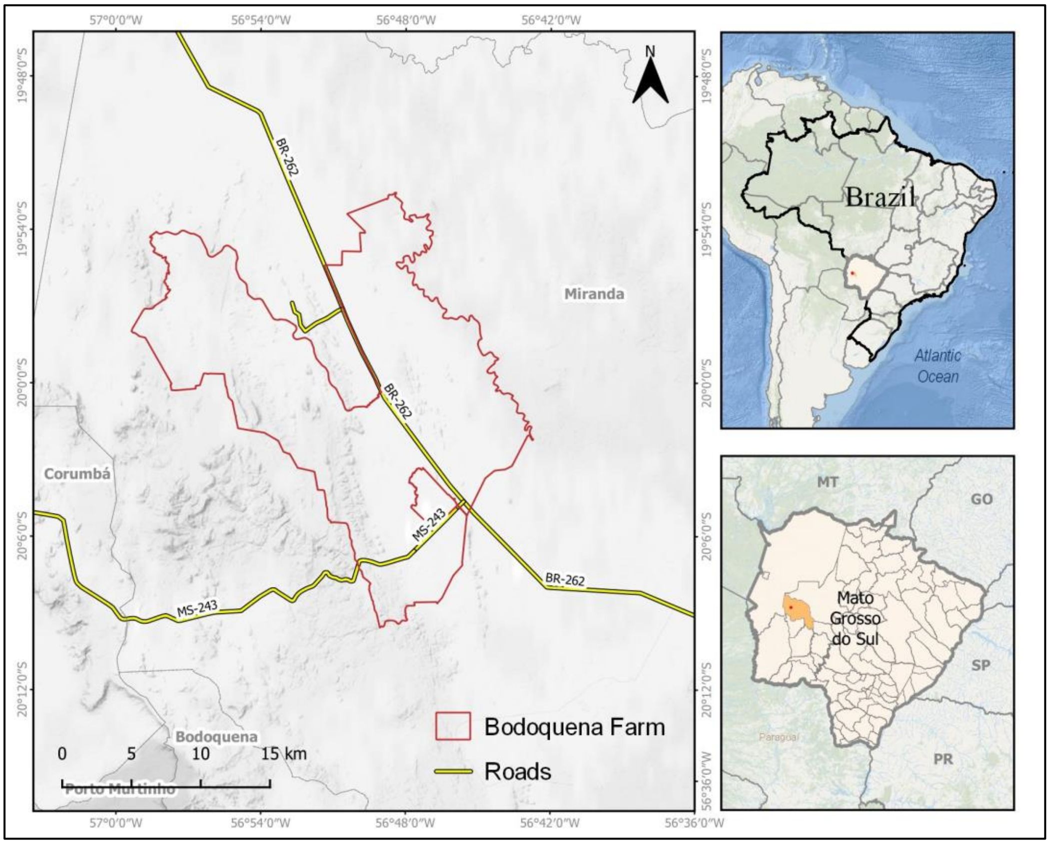

Figure 3. Illustration of the PAI. The left panel shows the limits of the Bodoquena Farm (PAI03). Upper Right panel shows the location of Mato Grosso do Sul state in Brazil. The lower right panel shows the limits of Miranda, and the red point indicates the location of the Bodoquena Farm.

2.1.5.2 GEOLOGY

2.1.5.2.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

According to the Geology of the State of Goiás and Federal District obtained from Explanatory Text of the Geological Map of the State of Goiás and Federal District, the municipality of Niquelândia has 12 geological units that characterize the region, such as Debris Lateritic Coverage; Barreirinho Granite, Araxá Group; Niquelândia Mafic-Ultramafic Complex (João Caetano Unit); Niquelândia Mafic-Ultramafic Complex; Paranoá Group; Rio Maranhão Complex; Metavulcanosedimentary Sequence; Serra da Mesa Group; Serra dos Borges; Traíras Formation and Uruaçu Granulitic Complex (Figure 4).

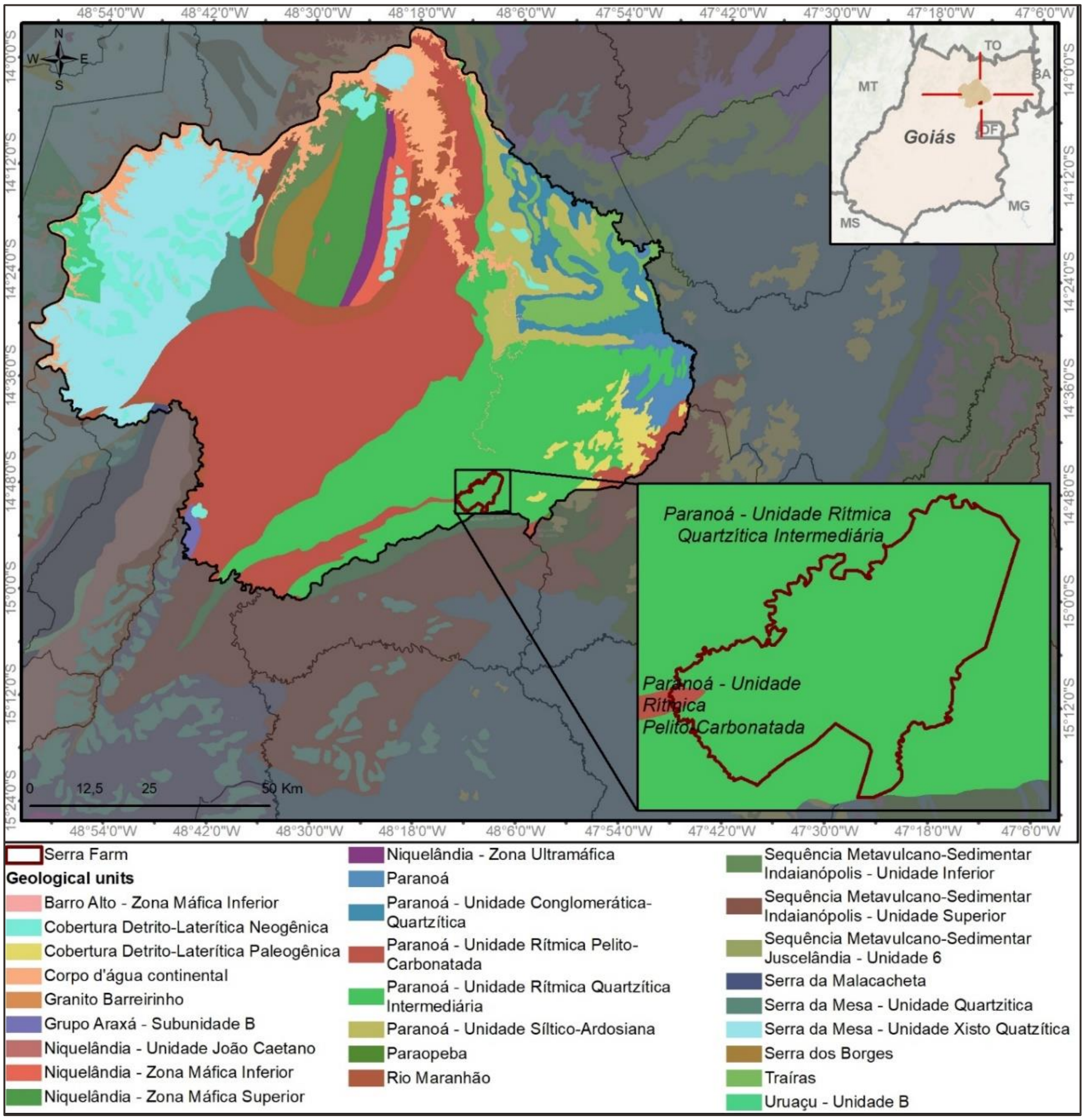

Figure 4. Niquelândia Geology Map. Source: IBGE/BDIA

The main unit in Niquelândia is called the Paranoá Group, which is a depositional system composed of a thick psamo-pelitic succession and by an important contribution of carbonate rocks. The group is exposed in extensive areas of Goiás, and it occurs from the Federal District to the south of Tocantins State. The unit is grouped into four megacycles that are, from bottom to top: Lower Rhythmic Quartzitic Conglomeratics Unit; Siltic-Ardosian Unit; Intermediate Quartzitic Rhythmic Unit; and Pelite-carbonated Rhythmic Unit (CPRM)[15].

The Serra da Mesa Group and Niquelândia Mafic-Ultramafic Complex are two other major units occurring in Niquelândia. The Serra da Mesa Group is composed of metasedimentary rocks that occur in the northern part of Goiás and sustain the homonymous mountain range. The type-section of the unit is in the Serra da

[15] See: http://www.cprm.gov.br/publique/Geologia/Geologia-Basica/Estado-de-Goias-399.html

Mesa Mountain range, a region of rugged terrain of north-south general direction and with a maximum apparent thickness of 1,700 meters.

The Niquelândia Mafic-Ultramafic Complex has a north-south orientation, with approximately, 40 km of length and 15 km wide, and is limited to the south and north by transient faults (east-west) and to the west and east by zones of contractile shear with the Juscelândia Sequence and with the gneisses of Maranhão River Diorite-Granodiorite Complex, respectively. The complex is divided into an Inferior Mafic Zone, Superior Mafic Zone and Ultramafic Zone.

2.1.5.2.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

The Figure 5 below shows that the municipality of Rio Branco is composed of 5 geological units (Neo-Pleistocene Detritus-Laterite Coverage; Holocene Alluvial Deposits; Solimões, Holocene Terraces; and Pleistocene Terraces), being Solimões Unit the main one.

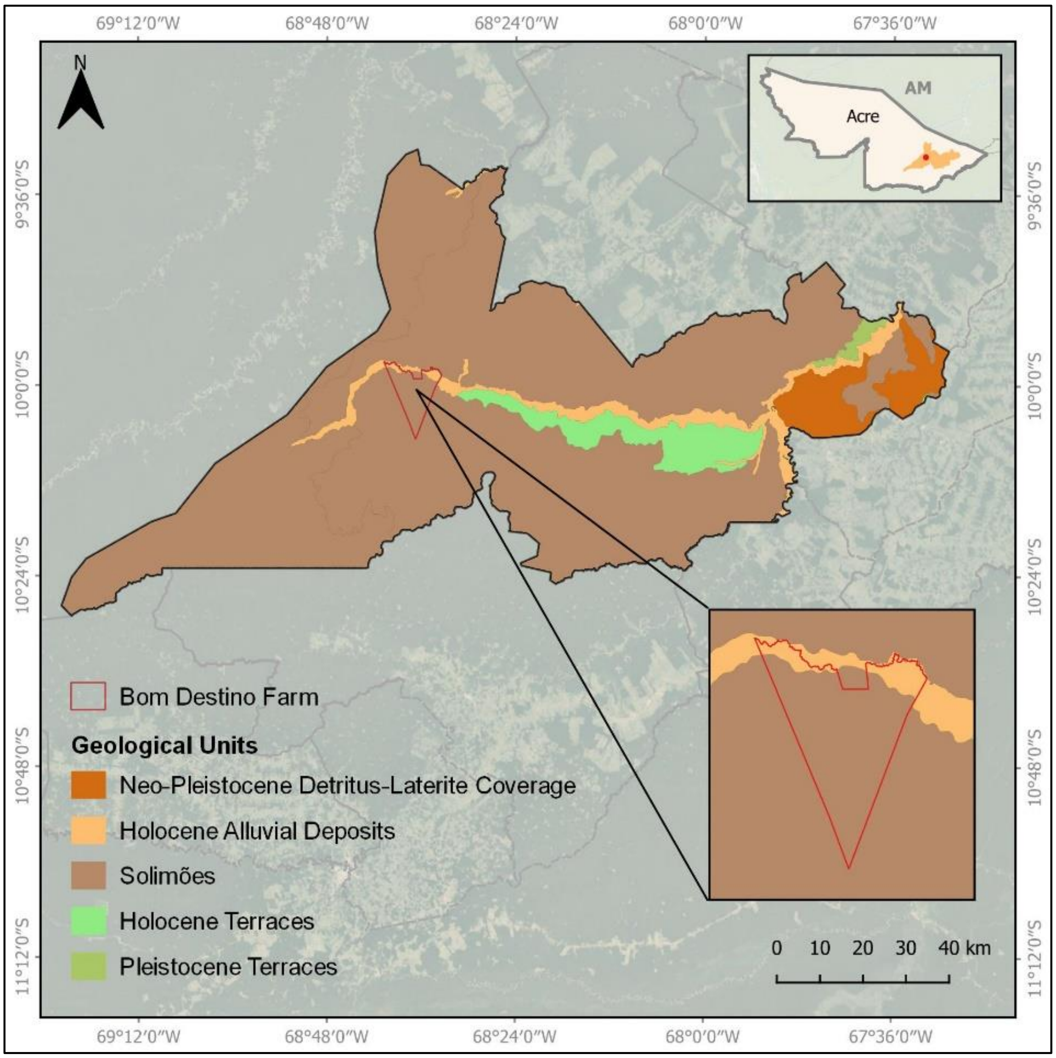

Figure 5. Rio Branco Geology Map. Source: IBGE/BDIA[16].

[16] Accessed on: https://bdiaweb.ibge.gov.br/#/consulta/geologia

According to the Description of Units obtained from IBGE and according to the Geological-geotechnical evaluation from the city of Rio Branco – Acre obtained from the Mineral Resources Research Company (CPRM), Solimões Unit is the most extensive of the Amazon region units, occupying almost the entire region of the rivers Solimões, Amazonas and Acre, extending across the border to Colombian, Peruvian and Bolivian territories. It is constituted predominantly by laminated claystones and/or massives with color range from brownish brown, reddish to dark gray, with some occurrences of intercalations of silty and sandy layers. The rocks of Solimões Formation occur in several exposures mainly along the Acre River, close to the water treatment plant – (“ETA” in Portuguese), also on the stretch of the Acre River between the Terceira Ponte and 2 km above the mouth of the Rola River. Going down the Acre River from the harbor, there are important outcrops of this formation at the mouth of the São Francisco River, hillside of the Panorama. They are also observed in road along the ring road construction.

Besides the Solimões Unit, the Bom Destino Farm is also characterized by the Holocene Alluvial Deposits that accompanies the Espalha River in the Farm region. According to the same sources, this unit is composed by Sandstone, quartz sand, gravel, silt, clay and, locally, peat. It has coarse to conglomeratic deposits, representing channel residues, sandy deposits relative to point bars, pelitic deposits representing those from overflow and fluvio-lacustrine, and eolian deposits when reworked by the wind. The most expressive accumulations occur in the plains of the larger rivers, especially those with meandering and sinuous courses, such as the Solimões and its tributaries on the bank right.

2.1.5.2.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

The Figure 6 below shows that the municipality of Miranda is composed of 6 geological units (Bocaina Formation; Cerradinho Formation; Cuiabá Group; Holocene Alluvial Deposits; Pantanal Formation; and Puga Formation), with the Pantanal Formation and the Cuiabá Group being the main units in this municipality.

The Pantanal Formation has subdivisions, of which the Alluvial Deposits Facies and the Alluvial Terraces Facies can be seen in Figure 6 the large area in the central portion of the map corresponds to the Alluvial Terraces Facies and there is a small area of Alluvial Deposits Facies at the northwestern portion of the map. In the Bodoquena Farm all 6 geological units are present, but most of the property is in the Cuiabá Group.

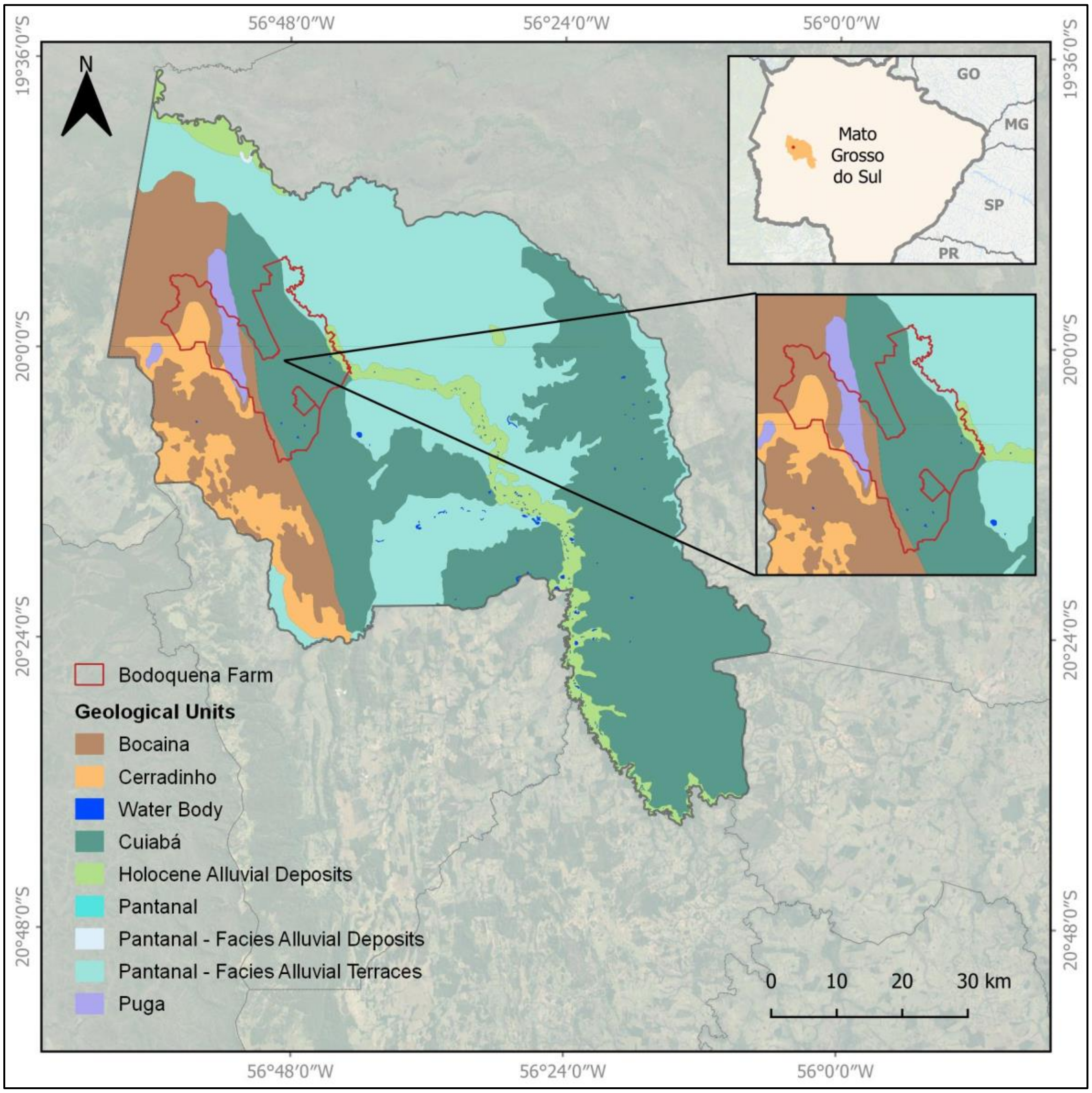

Figure 6. Miranda Geology Map. Source: IBGE/BDIA[17].

All the information in the following paragraphs was obtained in the Description of Units from IBGE[18] and the document "Geology and mineral resources of the state of Mato Grosso do Sul" from the Mineral Resources Research Company (CPRM)[19].

The Cuiabá Group is found mainly in the southwestern portion of Mato Grosso do Sul and southern portion of Mato Grosso. This unit has metasedimentary and metavolcanic-sedimentary rocks, and has an association of pelitic, psammitic and psephytic sediments. It is composed of quartz, quartzite, marble, granite, gneiss, metagrauvaca, phyllite, and schist. The best exposures of the Cuiabá Group occur along

[17] Accessed on: https://bdiaweb.ibge.gov.br/#/consulta/geologia
[18] Accessed on: https://bdiaweb.ibge.gov.br/#/consulta/geologia
[19] Geology and mineral resources of the state of Mato Grosso do Sul. Accessed on: https://rigeo.cprm.gov.br/handle/doc/10217

the highways from Aquidauana to Guaicurus and from Aquidauana to Bonito, in addition to those located on the edge of the Paraná Watershed.

The Cerradinho Formation is part of the Corumbá Group, and is composed of sandstone, arkose, siltstone, shale, marl, limestone, dolomite, thin silexite beds and eventual conglomerates. The lower portion of this unit rests on an erosive unconformity on granitoids of the Rio Apa Complex and is composed of conglomerates, sandstones, and arkoses, discreetly stratified, sometimes with asymmetrical undulated marks. The intermediate and upper portions are composed of limestone and dolomite, with intercalations of siltstone, marl, and sandstone.

The Bocaina Formation is composed of a sequence of limestones, dolomites and, subordinately, marbles. A study in this unit revealed laminated dolomites, followed by dolomites with plane-parallel bedding, sometimes with interbedded silexites, and dolomites with bulbous and columnar stromatolites. The Bocaina Formation is marked by intense dolomitization and silicification, which becomes predominant towards the top.

The Puga Formation is composed of diamictites, paraconglomerates, sandstones, siltstones, and shales. The paraconglomerates contain blocks and pebbles of quartzite, limestone, gneiss, amphibolite, granite and rhyodacite. The layers are gray at the bottom and purple at the top, and the matrix varies from sandy to clayey.

Pantanal Formation is the name given to the alluvial deposits composed of muds, sands, and clays from recent deposition in the Pantanal in Mato-Grosso State. It is composed of sandy and silt-clay sediments, with little gravel, deposited in alluvial fans, and by ferruginous laterites. This Formation is divided in three sub-units called Colluvial Deposit Facies, Alluvial Deposits Facies, and the Alluvial Terraces Facies. Of the three, only the Alluvial Terraces Facies is present in the Bodoquena Farm. This sub-unit has sandy-clayey sediments, partially unconsolidated and laterized, from the alluvial plain.

The Holocene Alluvial Deposits are predominantly composed of sand, subordinately gravel, silt-clay lenses, and peat. In the coarser fractions, concentrations of heavy minerals such as rutile, gold, zircon, and diamond may occur. They are distributed mainly in the floodplains and along the channels of the larger drainages with low gradient.

2.1.5.3 GEOMORPHOLOGY

2.1.5.3.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

According to IBGE data, the municipality of Niquelândia has eight different types of geomorphological units (Figure 7). The main geomorphological unit in the municipality is Superfícies Intermontanas Uruaçu – Ceres, which occupies approximately 37.1% of the area of the municipality. The altimetry of this unit varies between 450 and 600 meters. The overview is of a very regular and homogeneous flat surface with a low degree of drainage depth. Considering all the existing units in the municipality, the altimetry variation is from 370 to 1200 meters.

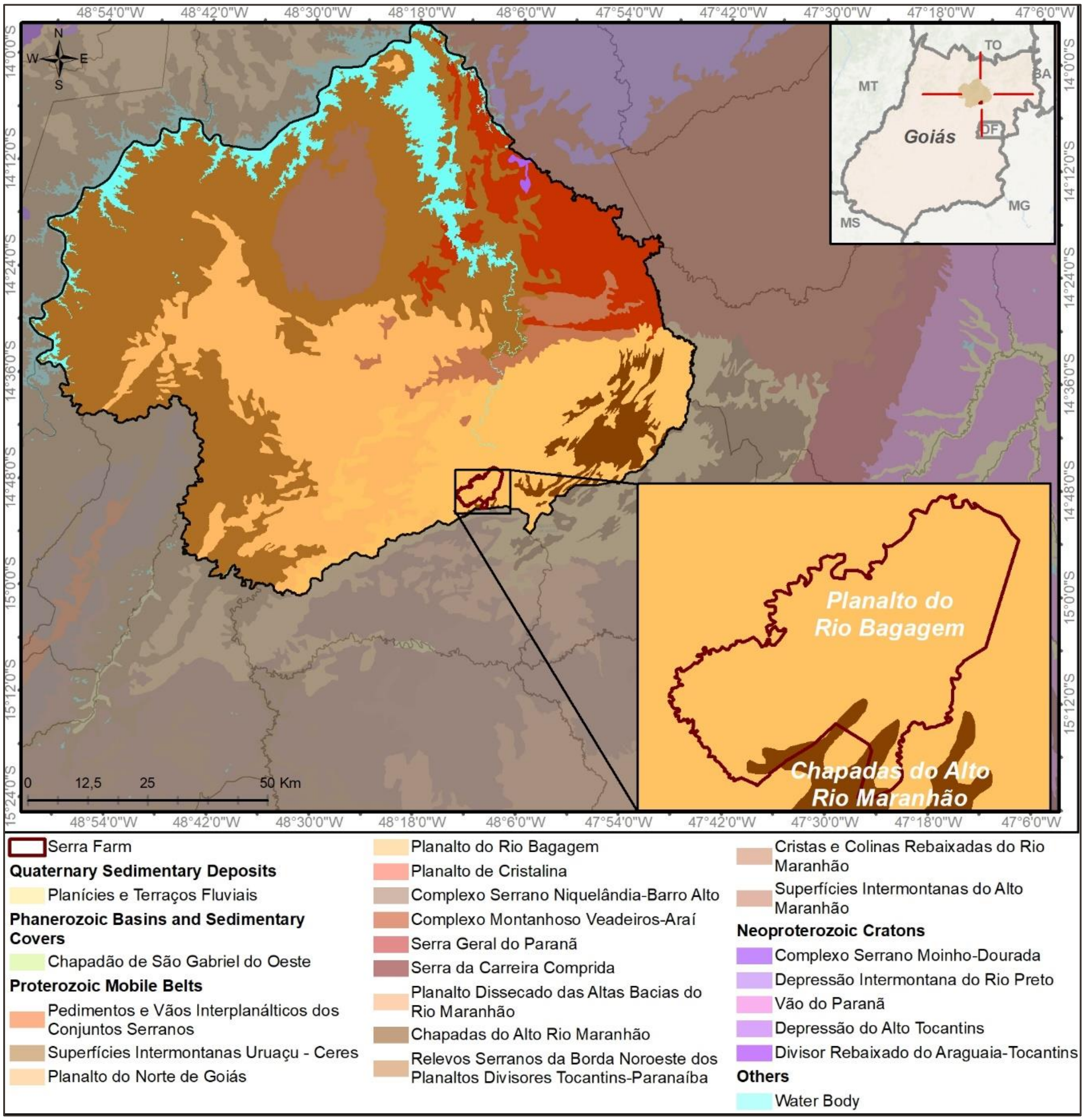

Figure 7. Niquelândia Geomorphological Map. Source: IBGE/BDIA

2.1.5.3.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

The municipality of Rio Branco is comprised of 5 Geomorphological Units such as Amazon Plain; Endimari Depression - Abunã; Iaco Depression - Acre; Juruá Depression - Iaco; Branco River Depression (Figure 8), being the last one the main unit in the municipality. The Bom Destino Farm encompasses mainly the Rio Branco Depression, with a portion of Amazon Plain Unit alongside de Espalha River in the Farm northern border.

According to the Description of Units obtained from IBGE[20], the Rio Branco Depression is characterized by a very dissected relief, with convex tops and very high drainage density, presenting median slopes in the center-north region, decreasing towards the south, where it becomes gently undulating.

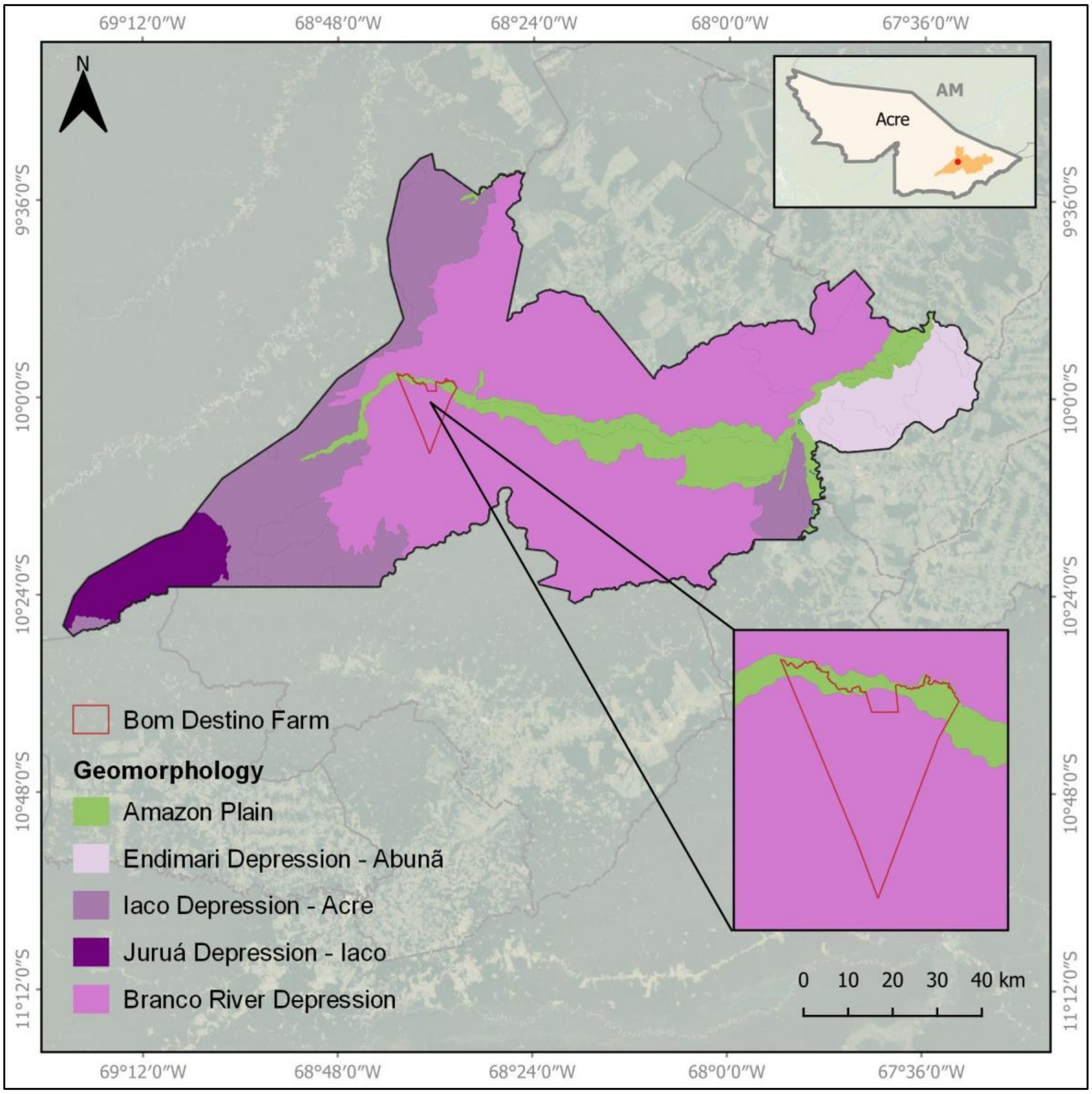

Figure 8. Rio Branco Geomorphological Map. Source: IBGE/BDIA[21].

2.1.5.3.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

The municipality of Miranda is composed of 6 Geomorphological Units: Serrano Alignments of Eastern Bodoquena, Bodoquena Septentrional Depression, Pantanal of Miranda-Aquidauana, Pantanal of Negro-Taboco, Middle Paraguaçu Pediplain, and Serra da Bodoquena (Figure 9). The main units in Miranda are

[20] Accessed on: https://bdiaweb.ibge.gov.br/#/consulta/geomorfologia
[21] Accessed on: https://bdiaweb.ibge.gov.br/#/consulta/geomorfologia

Serrano Alignments of Eastern Bodoquena, Bodoquena Septentrional Depression, Pantanal of Miranda-Aquidauana, and Serra da Bodoquena. In the Bodoquena Farm the main units are Bodoquena Septentrional Depression and Serra da Bodoquena, with a small portion of Pantanal of Miranda-Aquidauana in the northeastern area.

According to the Description of Units obtained from IBGE[22], the Serra da Bodoquena extends for approximately 200 kilometers in the north-south direction and has altitudes ranging from 400 to 750 meters. In the interior of the mountain complex there are segments of escarpments, delimiting deep valleys and constituting canyons. It is characterized by dissected forms with a convex top and by preserved reliefs, but also presents karstic forms related to limestone lithologies. In this unit there is a predominance of Rendzina Soils, with some “Podzólicos Vermelho-Escuros latossólicos”.

The Bodoquena Septentrional Depression is composed of extensive flattened surfaces resulting from the pediplanation process. In the western part of the unit, the resumption of erosion initiated a process of dissection of the flattening surface, while in the eastern part the flattening surface penetrated the interior of Serra da Bodoquena, opening an interplanaltic depression. The drainage, constituted by the Salobra river and its tributaries, is directed to the Pantanal of Miranda-Aquidauana. The predominant soils are “Terra Roxa Estruturada Similar Latossólica” and “Vertissolos”.

In the Pantanal of Miranda-Aquidauana, the fluvial plains of the Aquidauana and Miranda rivers are composed of “Gleis Pouco Húmicos eutróficos” soils. In the eastern part of the unit, the development of “Planossolos Solódicos” soils and a narrow strip of “Vertissolos” soils, on the limits with the Paraguay River, was recorded. To the west, “Vertissolos” develop, which are followed by “Planossolos Solódicos eutróficos”.

[22] Accessed on: https://bdiaweb.ibge.gov.br/#/consulta/geomorfologia

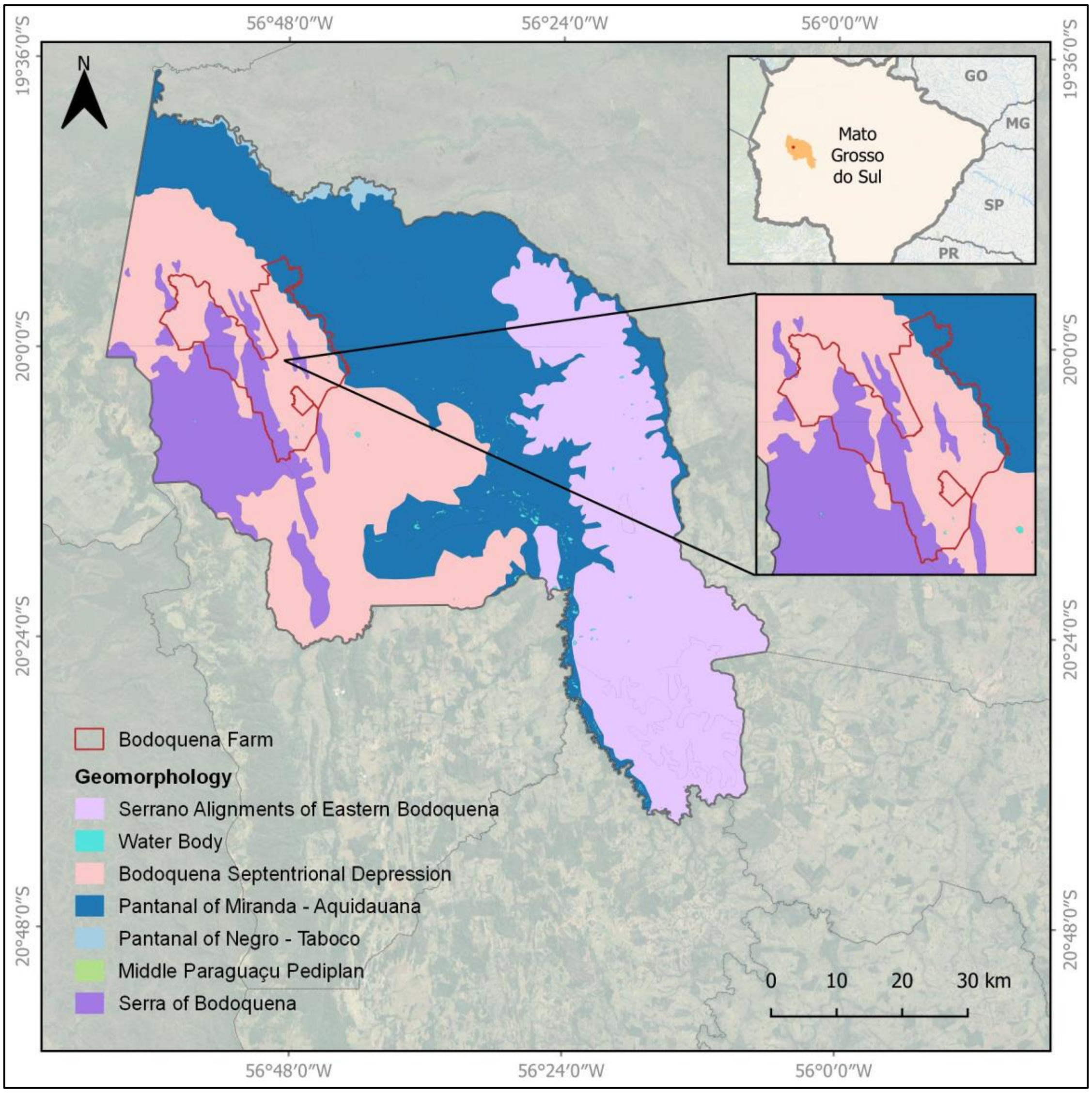

Figure 9. Miranda Geomorphological Map. Source: IBGE/BDIA[23].

2.1.5.4 PEDOLOGY

2.1.5.4.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

The predominant soil type in Niquelândia is the Cambisol, which, according to Brazilian soil classification system (Figure 10), is constituted by mineral material with an incipient B horizon underlying to any of superficial horizon, except for the hystical ones with 40 cm or more in thickness, or chernozemic A horizon, when incipient B horizon presents clay with high activity and high saturation by bases. Plinthite and/or petroplinthite, glei horizon and vertic horizon, if present, does not meet the requirements for plinthosols, Gleisol and Vertisol, respectively. The Ferralsol is also a predominant soil type in the region and is characterized as soil constituted by mineral material, which presents a latosolic B horizon preceded by any

[23] Accessed on: https://bdiaweb.ibge.gov.br/#/consulta/geomorfologia

type of A horizon within 200 cm of the soil surface or within 300 cm, if the A horizon is more than 150 cm thick[24].

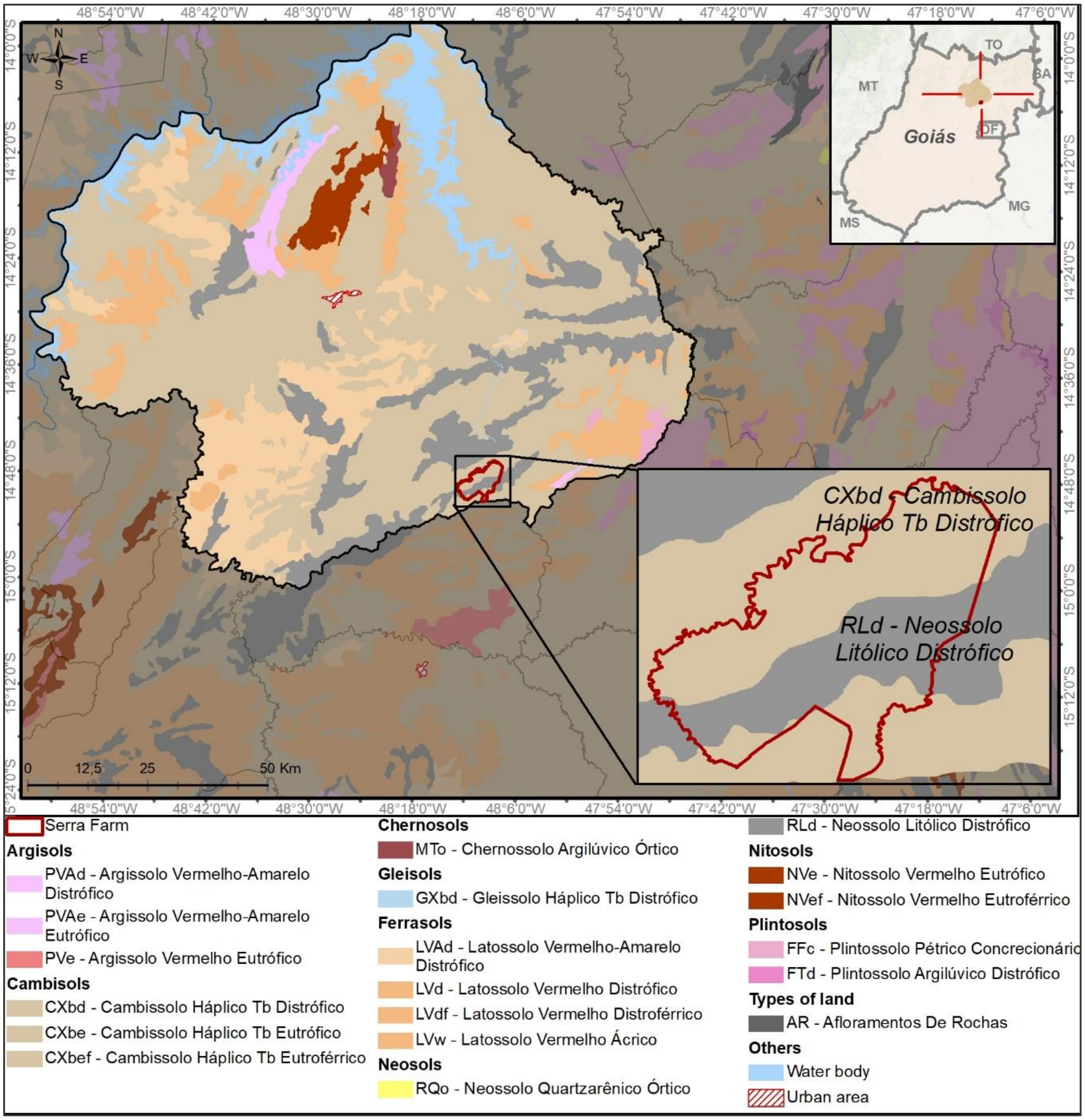

Figure 10. Niquelândia Soil Map. Source: IBGE/BDIA

2.1.5.4.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

As shown in Figure 11 below, the predominant soil type in the municipality of Rio Branco is the “Argissolo”, which, according to the Brazilian soil classification system SiBCS[25], are soils composed by mineral material,

[24] https://www.embrapa.br/solos/sibcs/solos-do-brasil
[25] Accessed on: Solos do Brasil - Portal Embrapa

presenting a textural B horizon immediately below the A or E, with low activity clay or with high activity clay, provided that is combined with low base saturation or with aluminum character in most of B horizon.

The Bom Destino Farm encompasses Ta Aluminic Red-Yellow Argisol and Haplic Ta Eutrophic Gleysol. According to the Description of Soils obtained from IBGE[26], Ta Aluminic Red-Yellow Argisol are soils with 2.5YR or redder over the most of the first 100cm of the B horizon (including BA). Soils with high activity clay and with aluminum character in most of the B and/or C horizons (including BA or CA) within the 100 cm from the surface of the ground. The Haplic Ta Eutrophic Gleysol are a grouping of soils with expressive gleization, are soils not distinguished in the preceding classes, they show high clay activity and base saturation greater than 50%.

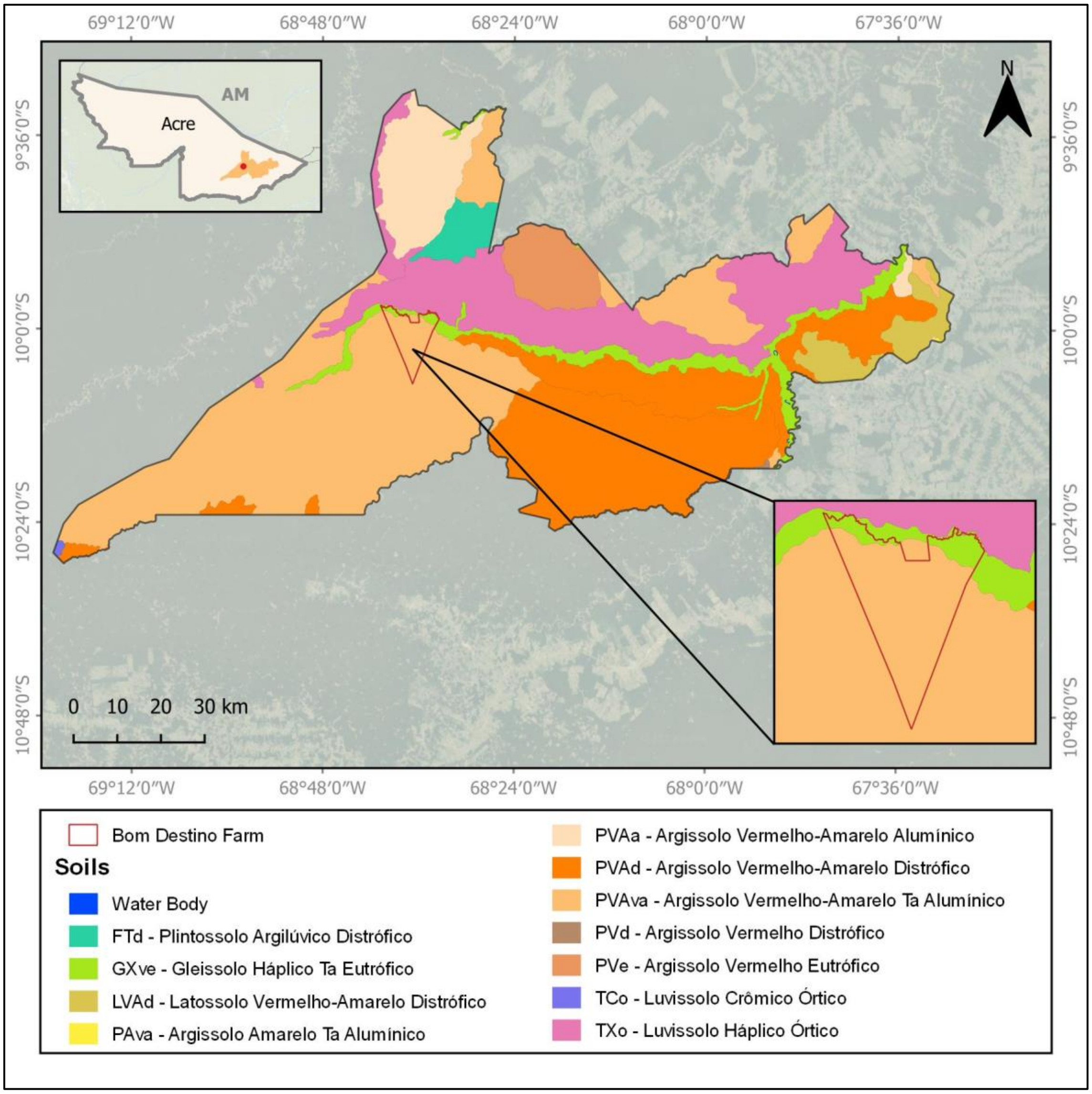

Figure 11. Rio Branco Soil Map. Source: IBGE/BDIA[27].

[26] Accessed on: https://bdiaweb.ibge.gov.br/#/consulta/pedologia

[27] Accessed on: https://bdiaweb.ibge.gov.br/#/consulta/pedologia

2.1.5.4.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

As shown in Figure 12 below, the soil in Miranda is very diverse, presenting mainly "Vertissolo", "Planossolo", and "Argissolo". According to the Brazilian soil classification system SiBCS[28], "Vertissolos" are soils made up of mineral material with a vertic horizon between 25 and 100 cm deep and insufficient textural ratio to characterize a textural B. In addition, there is an absence of material with lithic contact, petrocalcic horizon or duripan within the first 30 cm of depth. Also according to SiBCS, "Planossolos" are soils made up of mineral material with an A or E horizon followed by a flat B horizon. The flat horizon without sodic character loses taxonomic precedence to the plinthic horizon. The same source defines "Argissolos" as soils composed by mineral material, presenting a textural B horizon immediately below the A or E horizons, with low activity clay or with high activity clay, provided that it is combined with low base saturation or with aluminum character in most of the B horizon.

The Bodoquena Farm is composed of "VXo – Vertissolo Háplico Órtico", "VGk - Vertissolo Hidromórfico Carbonático", "NVe - Nitossolo Vermelho Eutrófico", "MDo - Chernossolo Rêndzico Órtico", and "FTe - Plintossolo Argilúvico Eutrófico".

Regarding the "VXo – Vertissolo Háplico Órtico" it is said that the Vertissolos are soils that have restricted development as a result of expansion and contraction phenomena, generally associated with the high activity of clays, which confers great capacity for movement of the material constituting the soil. The Vertissolo Háplico soils normally have good fertility, but have limitations in handling, as they are very hard when dry, forming compact clods, and very plastic and very sticky when wet, adhering to agricultural implements. Most of these soils are used with good quality natural pastures.[29]

Regarding The "VGk - Vertissolo Hidromórfico Carbonático" it is said that the Vertissolos are soils that have restricted development as a result of expansion and contraction phenomena, generally associated with the high activity of clays, which confers great capacity for movement of the material constituting the soil. The Vertissolo Hidromórfico soils are poorly permeable and waterlogged during the rainy season, and their drainage is restricted due to slow permeability. They present calcium carbonate without affecting the development of most plants[30].

Regarding the "NVe - Nitossolo Vermelho Eutrófico" it is said that the Nitossolos are soils constituted by mineral material, non-hydromorphic, being defined by the presence of a subsurface diagnostic nitic B horizon in sequence to any type of A horizon. They have low clay activity and may present an allitic characteristic immediately below the A horizon or within the first 50 cm of the B horizon. The Nitossolo Vermelho soils present red and dark red colors, are clayey and very clayey, show strongly developed block structure, and are derived from basic and ultrabasic rocks, with little noticeable differentiation of horizons, while also presenting high fertility. They present a high risk of erosion due to the uneven terrain to which they are associated[31].

Regarding the "MDo - Chernossolo Rêndzico Órtico" it is said that the Chernossolos are soils with not very advanced development, originating from rocks rich in calcium and magnesium and with the presence of smectite minerals that confer high clay activity and eventual accumulation of calcium carbonate, promoting

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[28] Accessed on: Solos do Brasil - Portal Embrapa
[29] Accessed on : https://www.embrapa.br/en/agencia-de-informacao-tecnologica/tematicas/solos-tropicais/sibcs/chave-do-sibcs/vertissolos/vertissolos-haplicos
[30] Accessed on: https://www.embrapa.br/en/agencia-de-informacao-tecnologica/tematicas/solos-tropicais/sibcs/chave-do-sibcs/vertissolos/vertissolos-hidromorficos
[31] Accessed on: https://www.embrapa.br/en/agencia-de-informacao-tecnologica/tematicas/solos-tropicais/sibcs/chave-do-sibcs/nitossolos/nitossolos-vermelhos

an approximately neutral or moderately acidic to strongly alkaline reaction, with enrichment in matter organic. The Chernossolo Rêndzico soils have a dark surface layer rich in organic matter and high levels of nutrients that give them high natural fertility, over a layer of mineral material rich in calcium carbonate. However, the risk of erosion can be high depending on the relief. There is also a possibility of micronutrient deficiencies due to the alkaline effect (high pH)[32].

Regarding the "FTe - Plintossolo Argilúvico Eutrófico" it is said that the Plintossolo soils are soils made up of mineral material, with a plinthic or concretionary horizon, all originating from the localized segregation of iron, which acts as a cementing agent. They are strongly acidic, with high base saturation. There are also soils with sodic properties. The Plintossolo Argilúvico soils have a horizon or layer of clay accumulation below the surface A horizon. They have low fertility and variable drainage, and temporary or prolonged excess water may occur during the year.[33]

[32] Accessed on: https://www.embrapa.br/en/agencia-de-informacao-tecnologica/tematicas/solos-tropicais/sibcs/chave-do-sibcs/chernossolos/chernossolos-rendzicos
[33] Accessed on: https://www.embrapa.br/en/agencia-de-informacao-tecnologica/tematicas/solos-tropicais/sibcs/chave-do-sibcs/plintossolos/plintossolos-argiluvicos

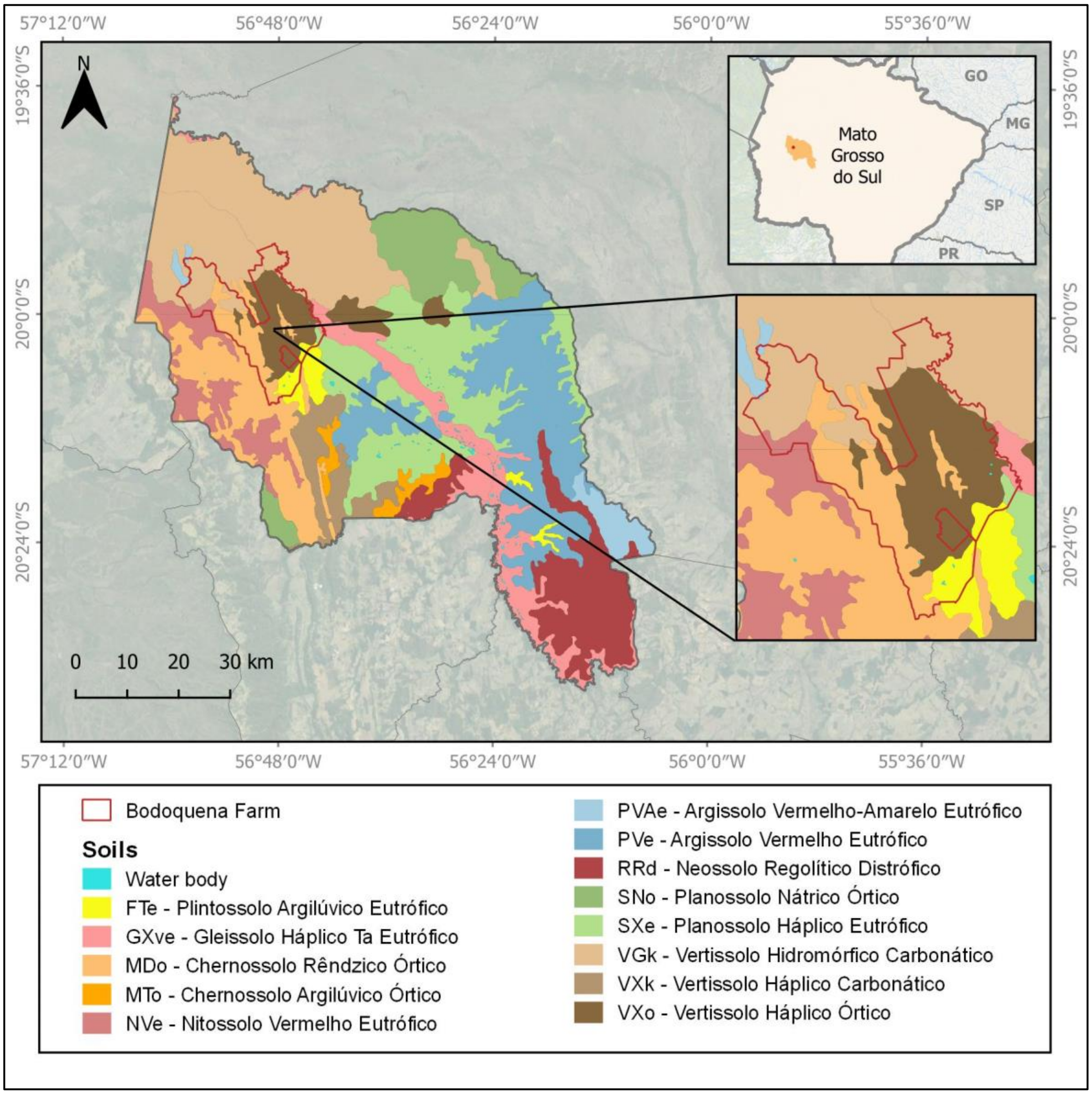

Figure 12. Miranda Soil Map. Source: IBGE/BDIA[34].

2.1.5.5 TOPOGRAPHY

2.1.5.5.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

According to the digital elevation model obtained in INPE's TopoData platform, the altitude in the Niquelândia region is, in average, 662 meters, not exceeding 1293 meters in the southeastern portion of the municipality, where the highest altitudes are located (Figure 13).

[34] Accessed on: https://bdiaweb.ibge.gov.br/#/consulta/pedologia

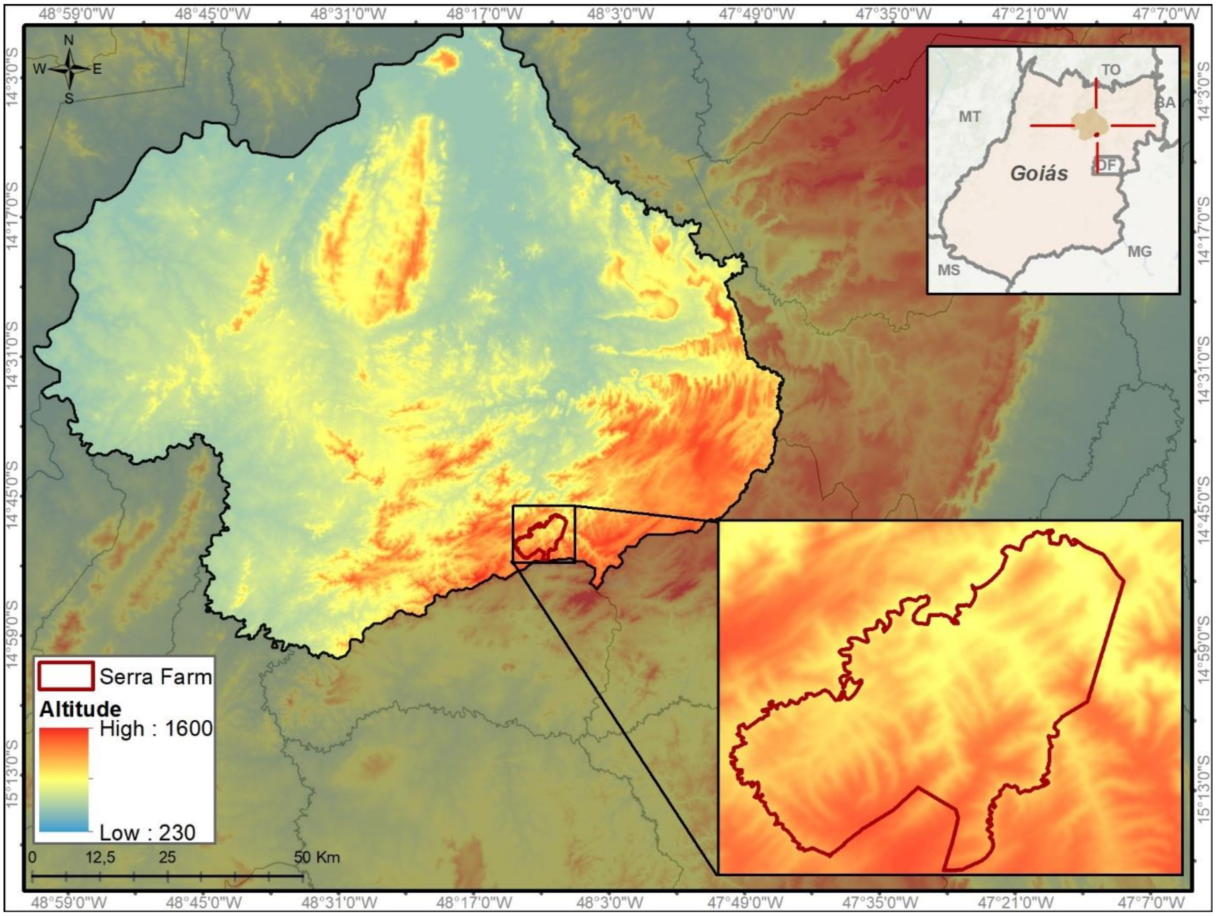

Figure 13. Niquelândia Altitude Map (meters). Topodata/INPE

2.1.5.5.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

According to the digital elevation model obtained in INPE's TopoData Platform[35], the altitude in the Rio Branco region is, in average, 208 meters, not exceeding 338 meters in the southwest portion of the municipality, where the highest altitudes are located (Figure 14).

[35] Accessed on: https://www.webmapit.com.br/inpe/topodata/

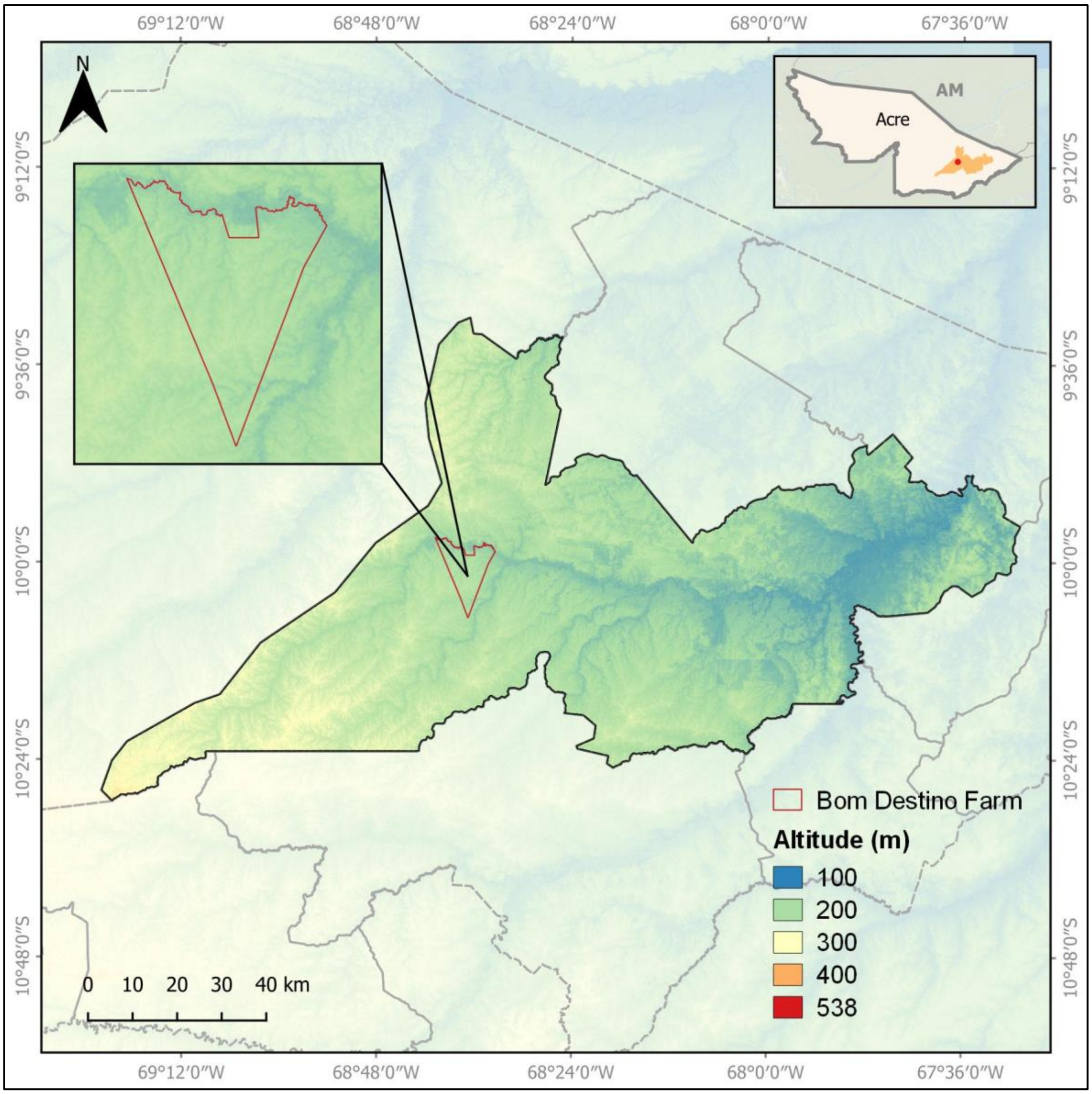

Figure 14. Rio Branco Altitude Map (meters). Topodata/INPE.

2.1.5.5.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

According to the digital elevation model obtained in INPE's TopoData Platform[36], the altitude in the Miranda region is, in average, 161 m, reaching a maximum of 743 m in the southwest portion of the municipality, where the highest altitudes are located (Figure 15). The high altitude is due to Serra da Bodoquena, a mountain range to the southwest of the municipality.

[36] Accessed on: https://www.webmapit.com.br/inpe/topodata/

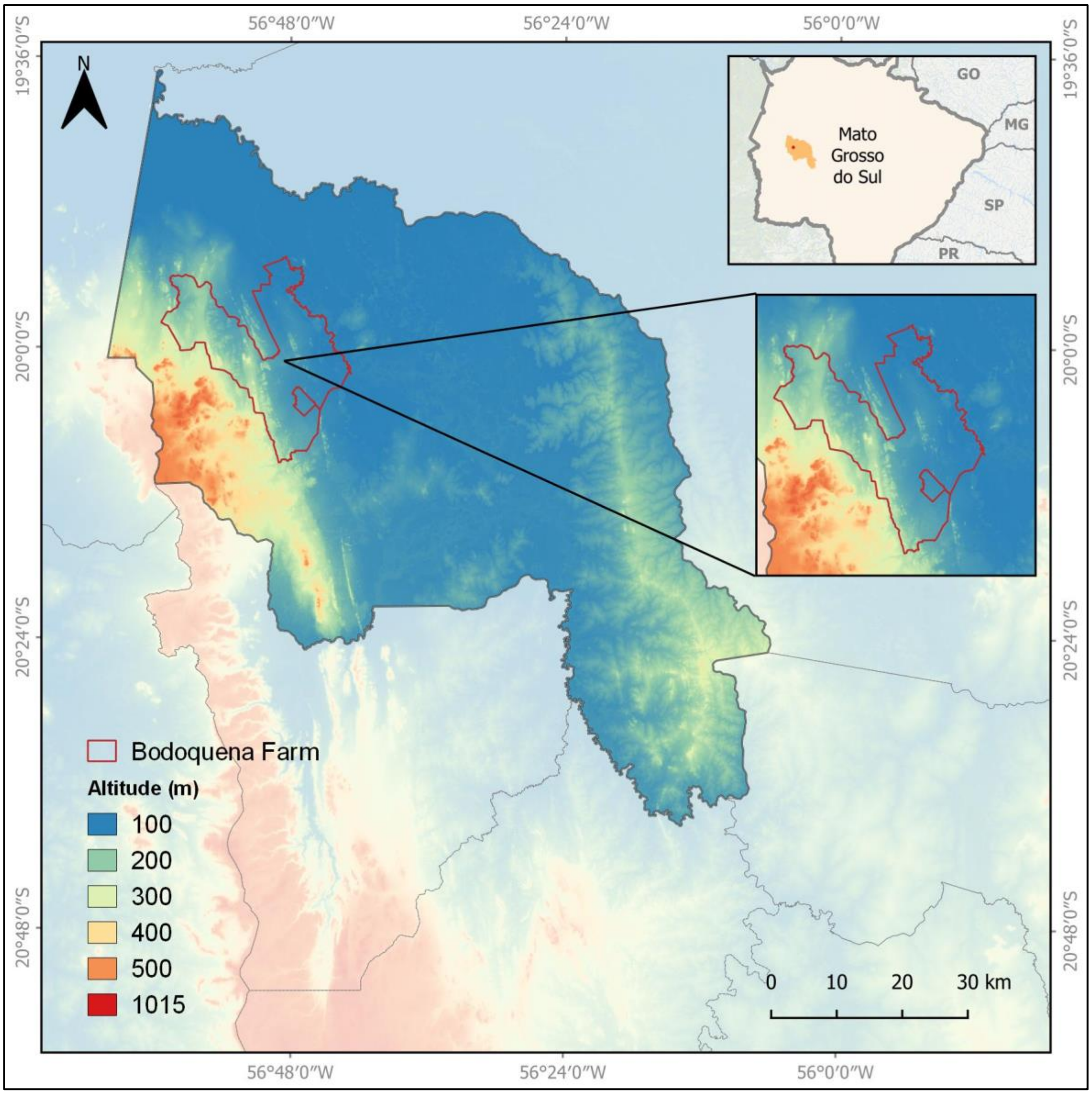

Figure 15. Miranda Altitude Map (metres). Topodata/INPE.

2.1.5.6 CLIMATE

2.1.5.6.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

The municipality of Niquelândia is in a tropical zone classified as tropical central Brazil, according to the climate Map of Brazil (IBGE, 2006)[37]. The data shows that the majority of Niquelândia is covered by hot temperatures, on average, above 18°C in all months, is a semi moist area and has 4 to 5 dry months. A small part is characterized by mild temperatures, with an average between 15°C and 18°C in at least one month. Figure 16 below, shows the distribution of the climatic aspects that affect the region.

[37] Accessed on: https://www.ibge.gov.br/geociencias/downloads-geociencias.html

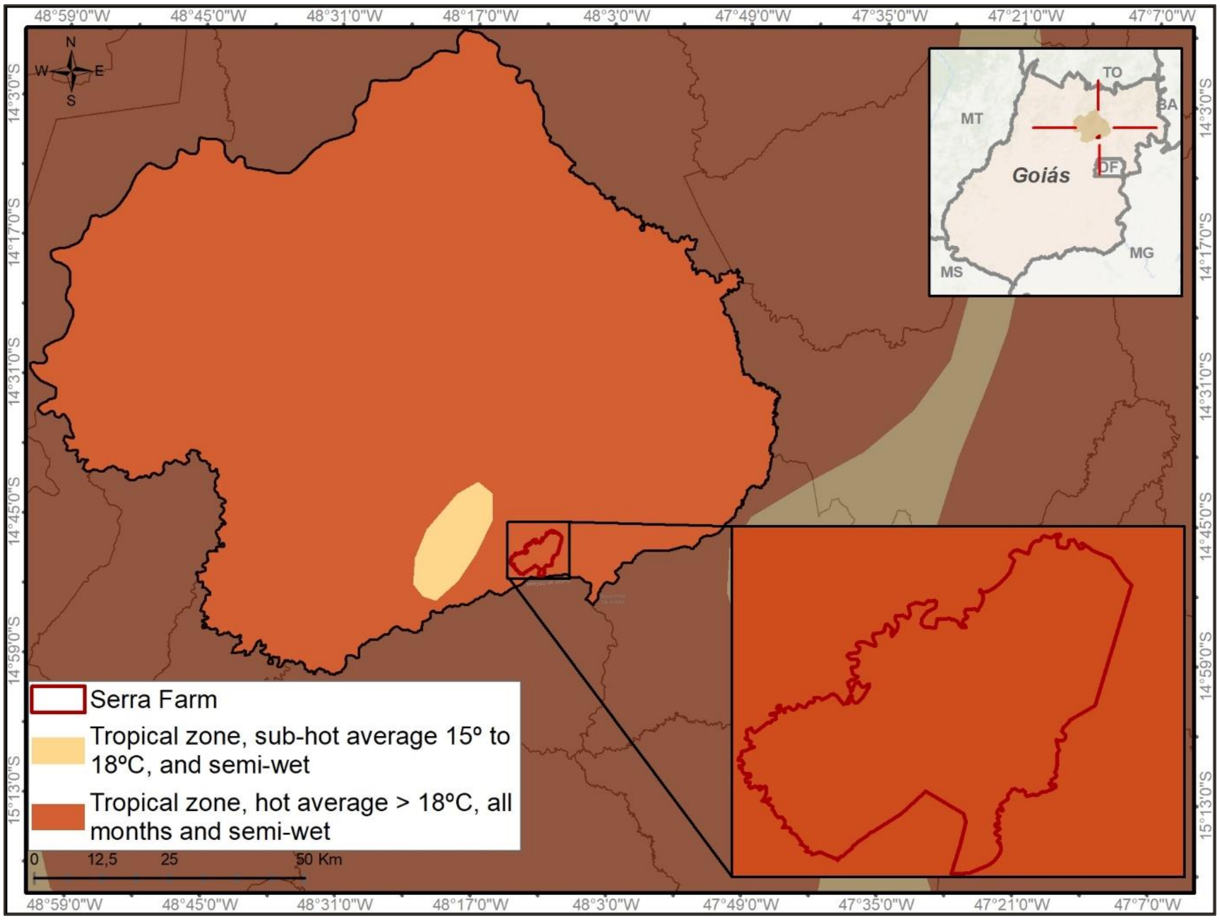

Figure 16. Niquelândia Climate Map. Source: IBGE

According to seasonal data regarding average temperatures and precipitation from 1981 to 2010, obtained from National Institute of Meteorology (INMET)[38], Niquelândia has an average temperature of 20 to 24 °C in summer and an average of 18 to 22 °C in winter. Regarding precipitation, Niquelândia has an average of 1339,4 mm of annual rain, according to the data from Formosa Station, regarding the period of 1991-2020, as shown in Figure 19.

[38] Accessed on: https://portal.inmet.gov.br/

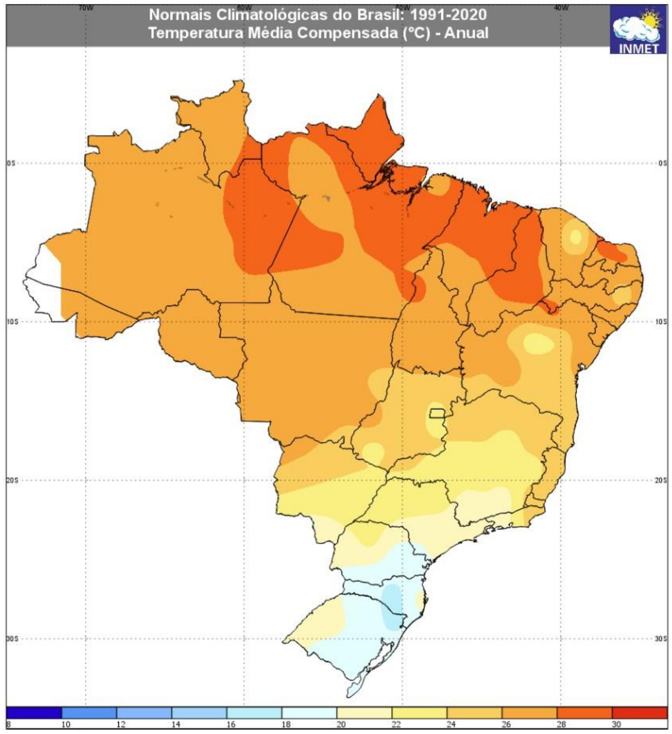

Figure 17. Average annual temperature (1991-2020). Source: INMET

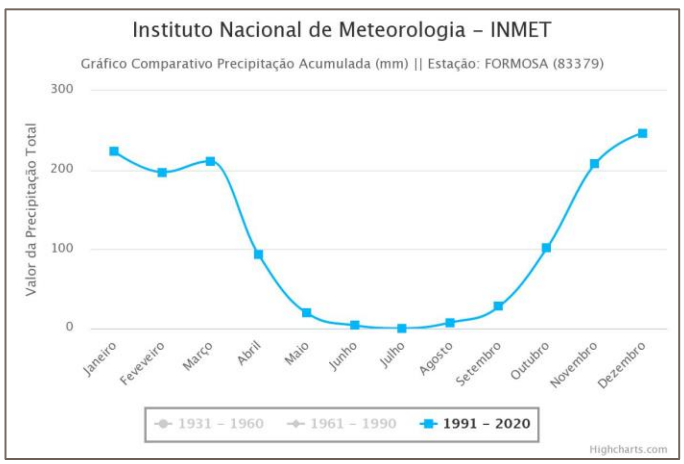

Figure 18. Average monthly precipitation (1991-2020) – Niquelândia Station. Source: INMET

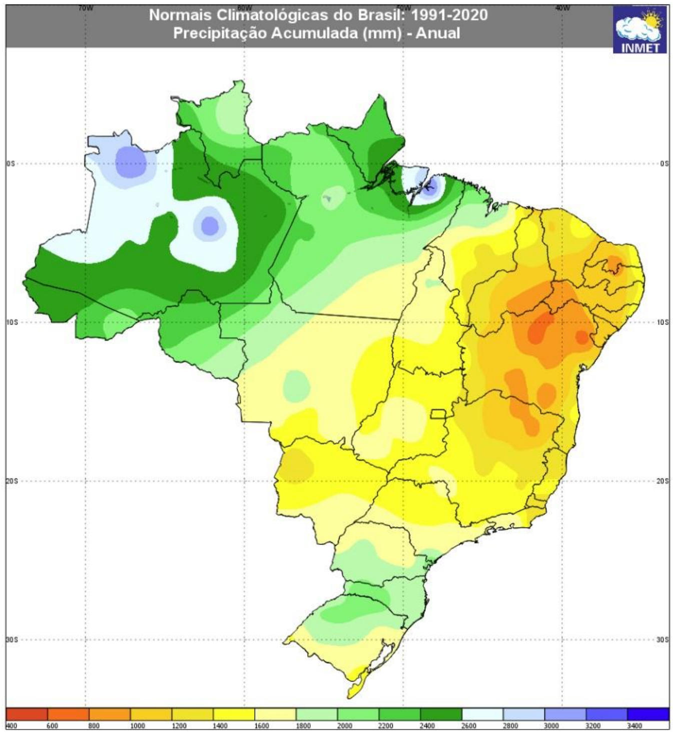

Figure 19. Average accumulated annual precipitation (1991-2020). Source: INMET

2.1.5.6.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

The municipality of Rio Branco is placed in the Equatorial Zone, according to the Climate Map of Brazil (IBGE, 2006)[39]. The data shows that all Rio Branco municipality is covered by this zone characterized by hot temperatures, in average, greater than 18ºC for all year, and as a humid area, with three dry months. Figure 20 shows the distribution of the climatic aspects that affect the region.

[39] Accessed on: https://www.ibge.gov.br/geociencias/downloads-geociencias.html

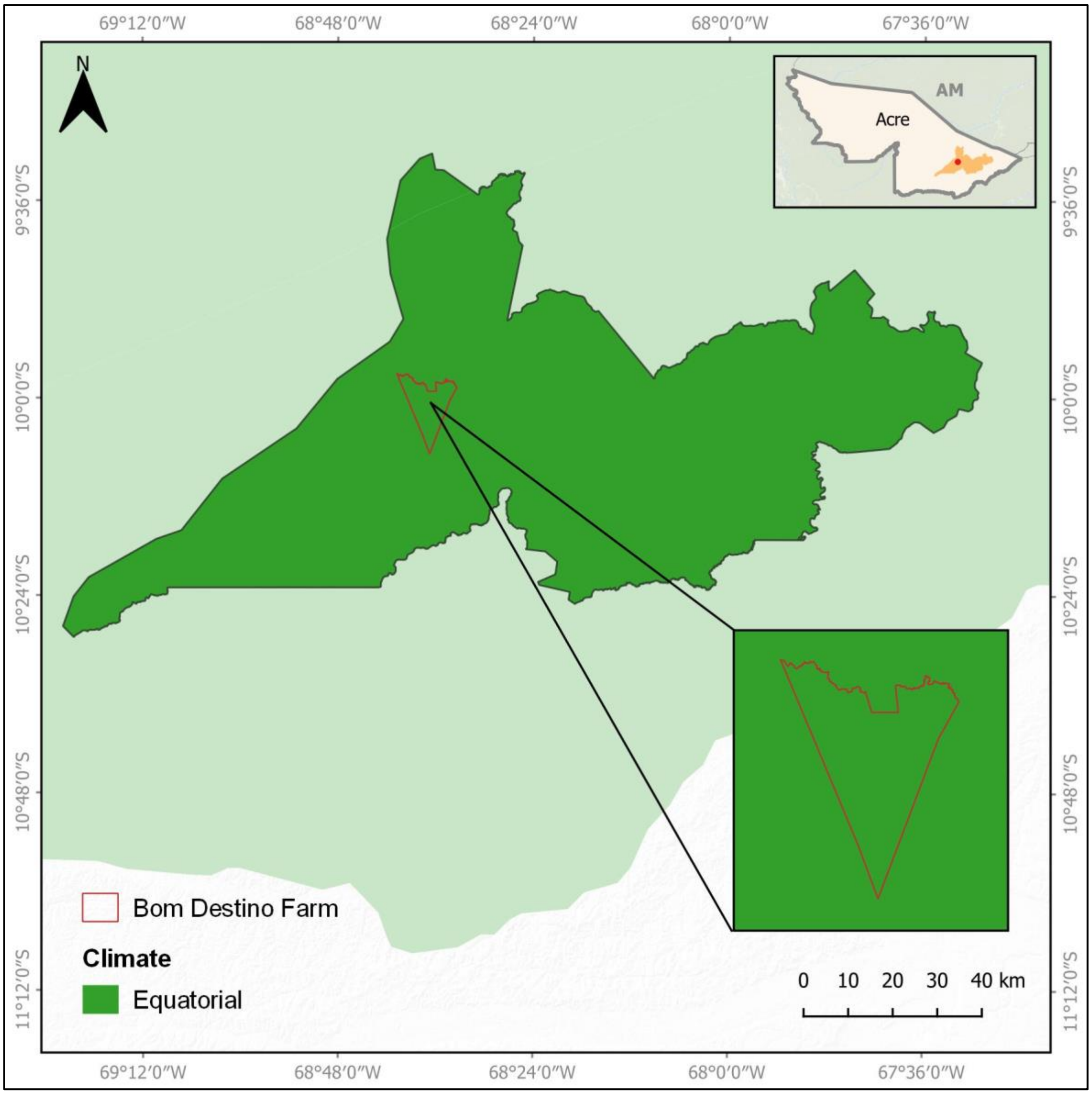

Figure 20. Rio Branco Climate Map. Source: IBGE.

According to the data regarding average temperatures and precipitation from 1991 to 2020, obtained from National Institute of Meteorology (INMET)[40], Rio Branco has an average temperature of 26 to 28ºC annually, as shown in Figure 21. Regarding precipitation, Rio Branco has an average of 2010,6 mm of annual rain, according to the data from Rio Branco Station, regarding the period of 1991-2020, as shown in Figure 22. The accumulated annual precipitation is shown in Figure 23.

[40] Accessed on: https://portal.inmet.gov.br/

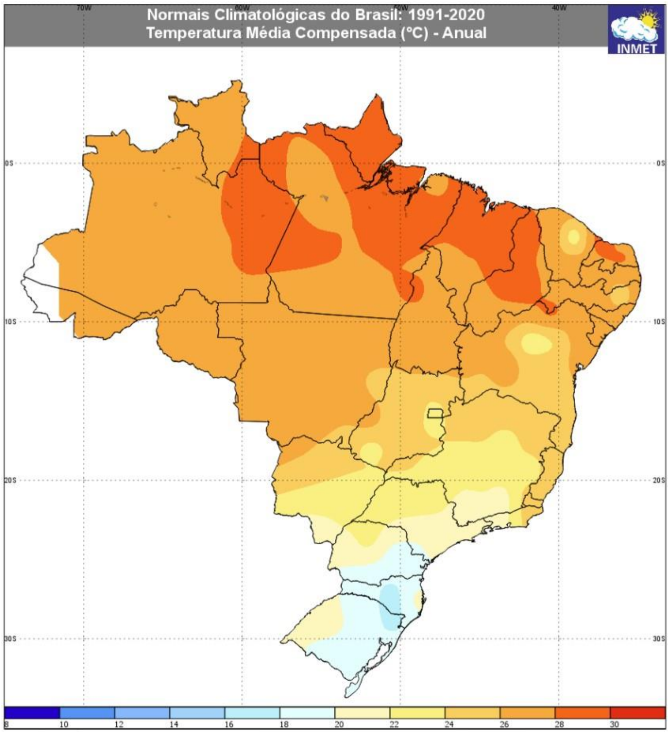

Figure 21. Average annual temperature (1991-2020). Source: INMET

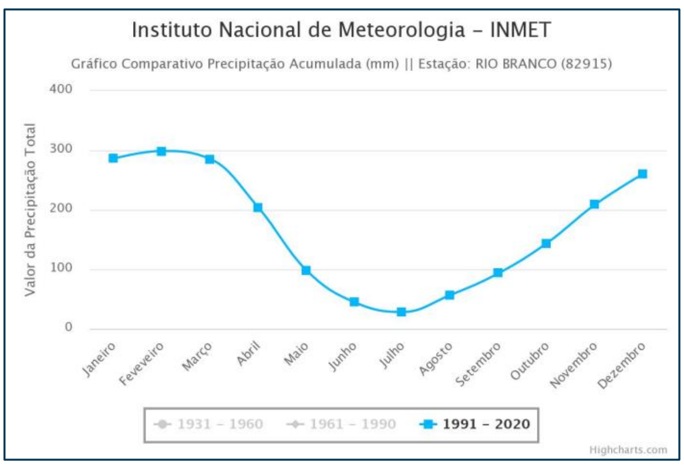

Figure 22. Average monthly precipitation (1991-2020) – Rio Branco Station. Source: INMET

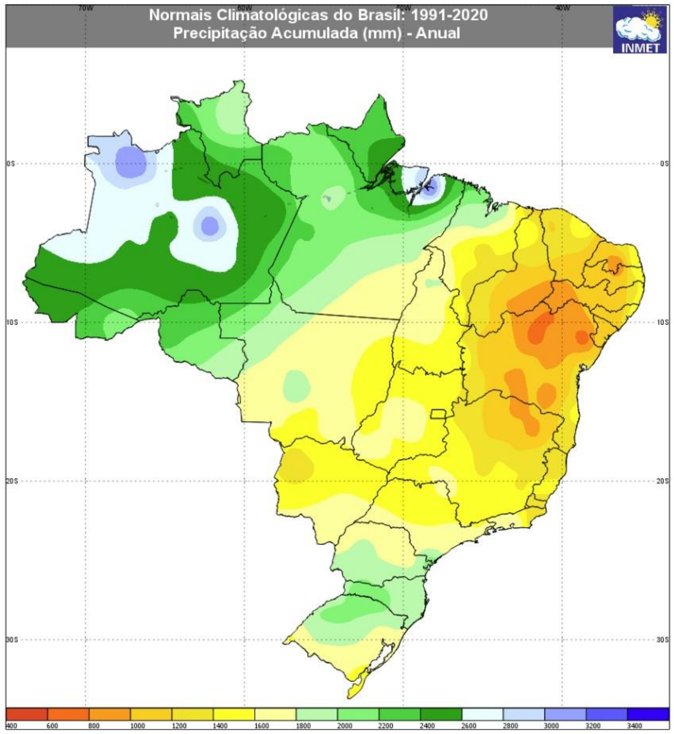

Figure 23. Average accumulated annual precipitation (1991-2020). Source: INMET

2.1.5.6.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

The municipality of Miranda is placed in the Tropical Central Brazil, according to the Climate Map of Brazil (IBGE, 2006)[41]. The data shows that all of Miranda is covered by this zone characterized with hot temperatures, on average, greater than 18ºC for all year, and as a humid area, with 3 dry months. Figure 24 below shows the distribution of the climatic aspects that affect the region.

[41] Accessed on: https://www.ibge.gov.br/geociencias/downloads-geociencias.html

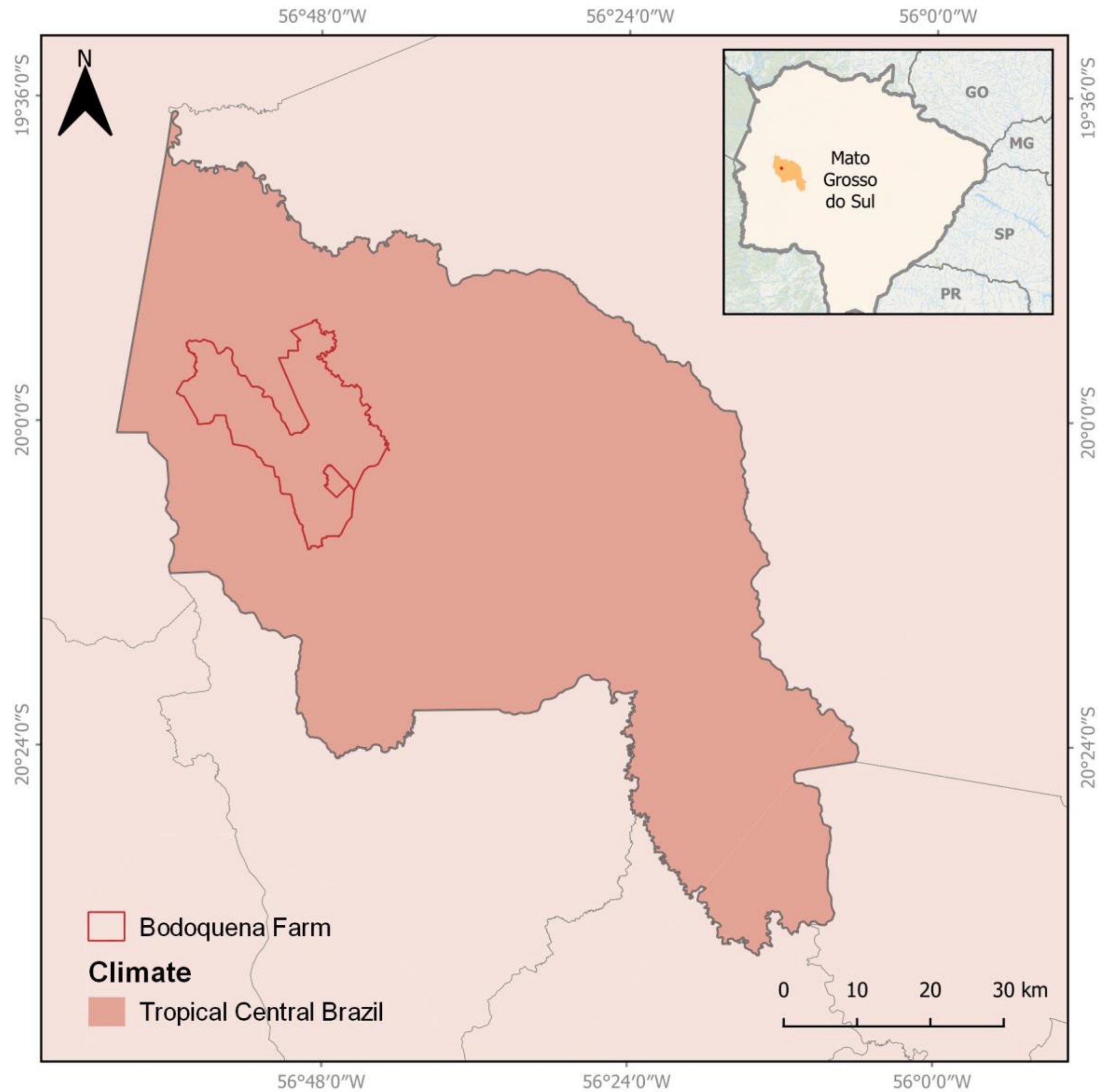

Figure 24. Miranda Climate Map. Source: IBGE.

According to the data regarding average temperatures and precipitation from 1991 to 2020, obtained from National Institute of Meteorology (INMET)[42], Miranda has an average temperature of 24 to 26ºC annually, as shown in Figure 25. Regarding precipitation, Miranda has an average of 1085,2 mm of annual rain, according to the data from Nhumirim Station, regarding the period of 1991-2020, as shown in Figure 26. The accumulated annual precipitation is shown in Figure 27.

[42] Accessed on: https://portal.inmet.gov.br/

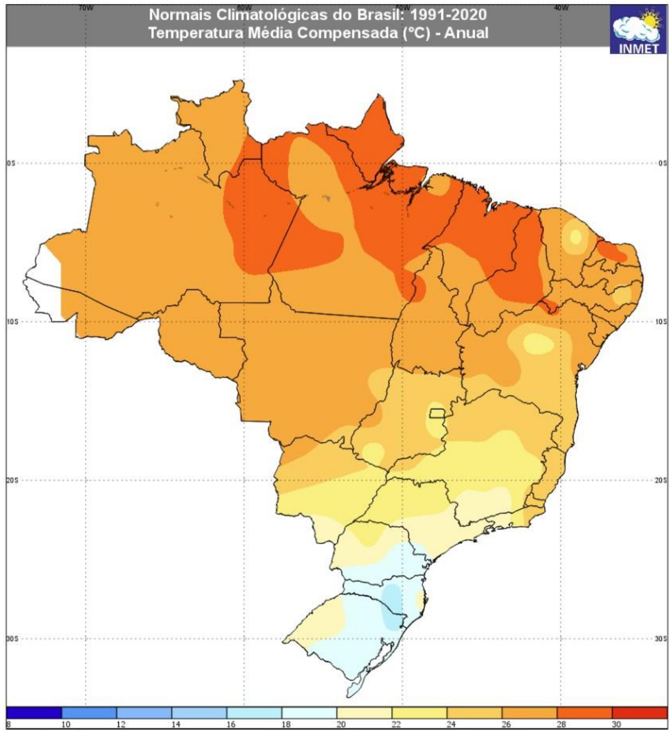

Figure 25. Average annual temperature (1991-2020). Source: INMET[43]

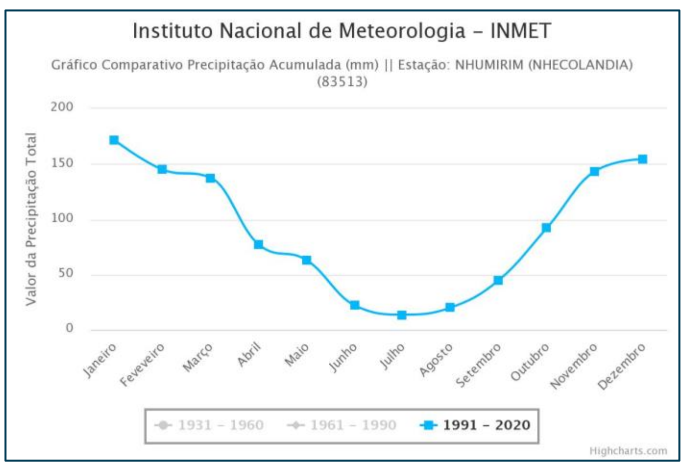

Figure 26. Average monthly precipitation (1991-2020) – Nhumirim Station. Source: INMET[44]

[43] Accessed on: https://portal.inmet.gov.br/
[44] Accessed on: https://portal.inmet.gov.br/

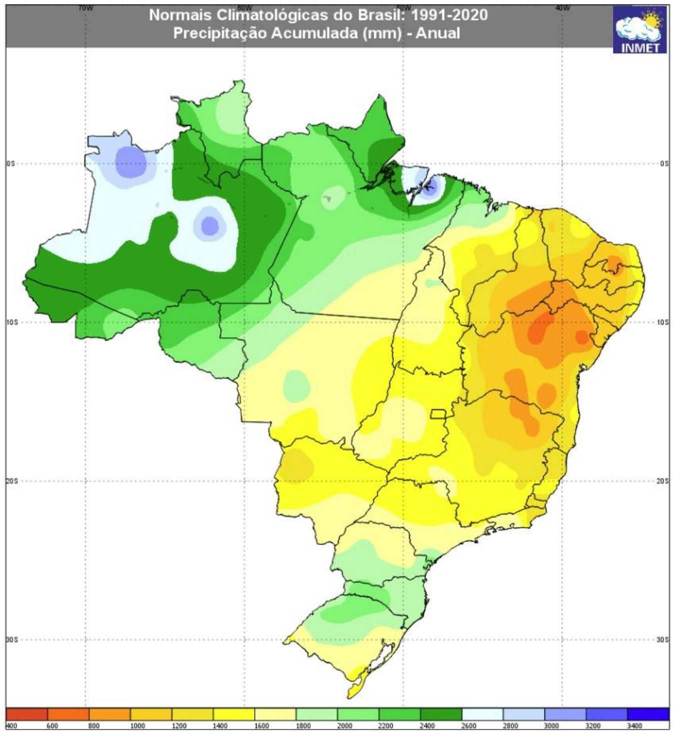

Figure 27. Average accumulated annual precipitation (1991-2020). Source: INMET[45]

2.1.5.7 HYDROGRAPHY

2.1.5.7.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

The municipality of Niquelândia is located within the Watershed of Tocantins – Araguaia which follows the direction of its main rivers - Tocantins and Araguaia - that unite and converge into the Atlantic Ocean in Pará, north of Brazil. The Tocantins River has full extension of approximately 2,400 km and it is formed in central Brazil in the Plateau of Goiás, near to Brazil's capital, Brasilia. It has drainage area of 306,310 km², before the confluence with Araguaia, and 764,996 km² at the river mouth.

Along its length, the river has several hydroelectric plants such as: Serra da Mesa, Cana Brava, Peixe-Angical, Luís Eduardo Magalhães (Lajeado) e Tucuruí (ANA)[46]. The municipality of Niquelândia is located near the region of origin of the river. The watershed of Tocantins- Araguaia is divided into several sub-basins. Presents the sub-basins that are part of Niquelândia limits and the layout of the watershed Tocantins-Araguaia (Figure 28).

[45] Accessed on: https://portal.inmet.gov.br/

[46] https://www.to.gov.br/semarh/plano-da-bacia-hidrografica-do-rio-tocantins-e-araguaia/13qdka1qq2w5

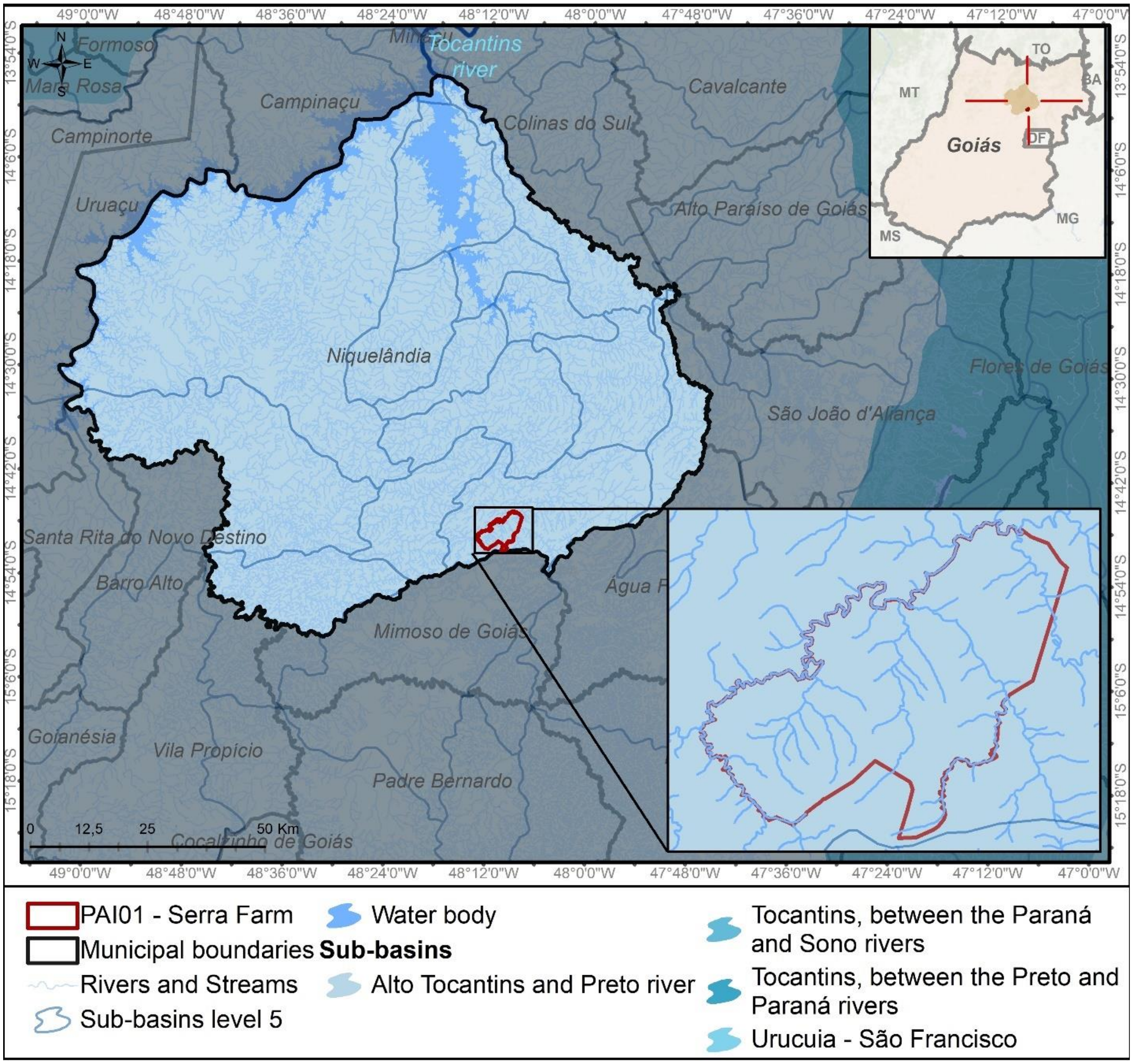

Figure 28. Niquelândia Hydrography Map.

2.1.5.7.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

The municipality of Rio Branco is located within the Amazon Watershed, one of the greatest in the world, having an area of over six million km and encompassing nine countries in South America and in Brazil, seven states: Acre, Amapá, Amazonas, Mato Grosso, Pará, Rondônia, Roraima. The Amazon Watershed's main rivers are the rivers Amazon, Solimões, Madeira, Xingu, and Negro.[47]

This Watershed follows the direction of the Amazon River, which has an extension of over 6,900 km. The waters of the Amazon River begin in Peru, entering Brazil in the state of Amazonas, at which point it is called Solimões River, being properly called Amazon River after it reaches the city of Manaus. The Amazon River's mouth is in the Atlantic Ocean, in the state of Pará (Figure 29).

[47] Accessed on: http://margemdireita.ana.gov.br/

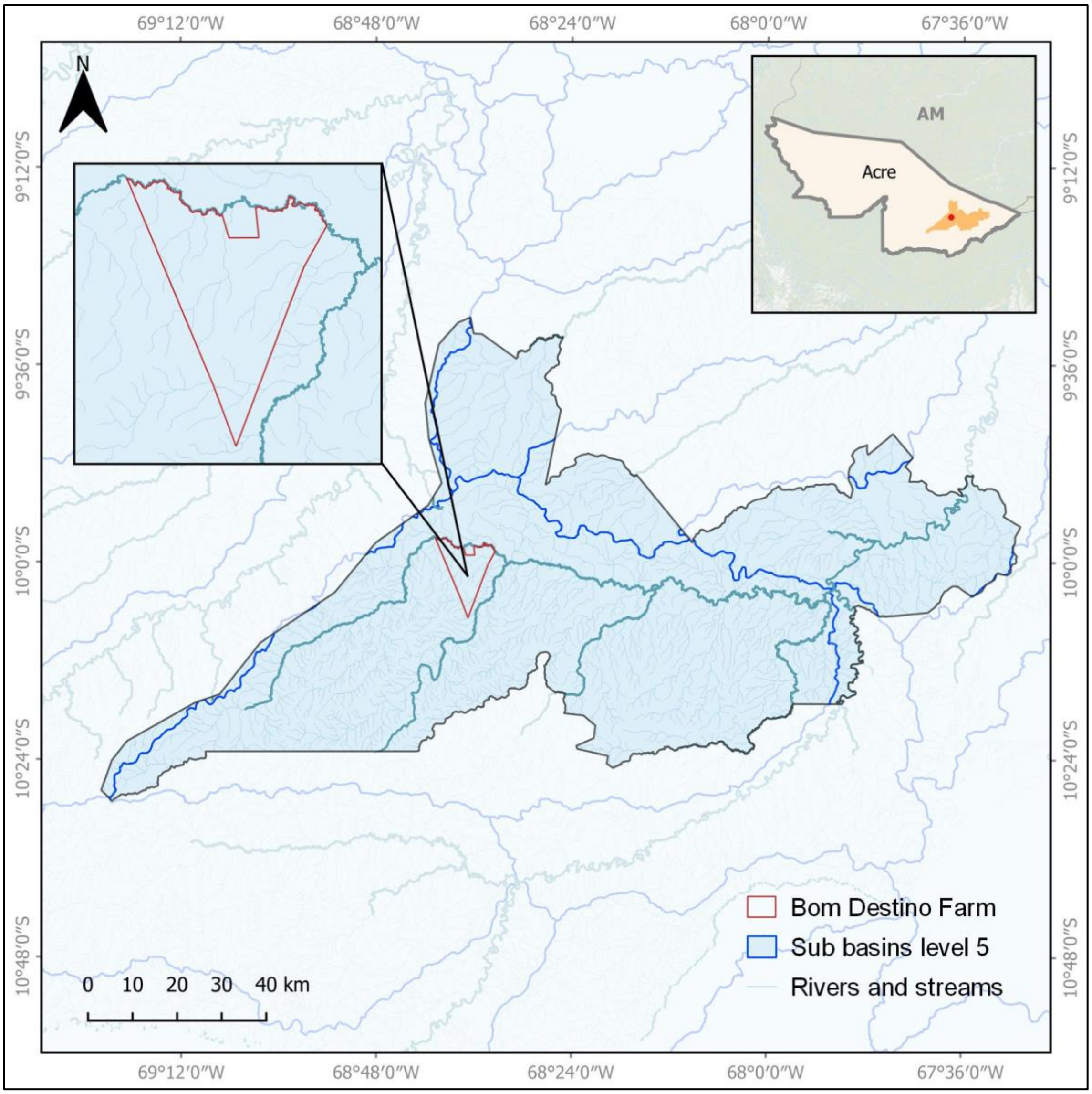

Figure 29. Rio Branco Hydrography Map.

2.1.5.7.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

The municipality of Miranda is located within the Paraguay Hydrographic Region, which has an area of 362,380 km², 48% of which is in the state of Mato Grosso and 52% in Mato Grosso do Sul and is home to around 2.4 million people. Its main river is the Paraguay River, which runs from north to south, between the Amazon and Cerrado Biomes before entering the Pantanal, where it runs until it exits Brazil and enters Paraguay. This river has an extension of 2,621 km, beginning in the Chapada dos Parecis and ending at the Apa River.[48] Other important rivers in this Hydrographic Region are the Jauru, Sepotuba, Cuiabá, São Lourenço, Correntes, Taquari, Negro, Miranda, Aquidauana, and Apa rivers.

The main river in Miranda is the Miranda River, which flows from southeast to northwest, passing by the northeastern border of Bodoquena Farm and flowing into the Paraguay River in the municipality of

[48] Accessed on: http://prhParaguay.ana.gov.br/mop/html/01_02_AreaAbrangenciaPIRH.html

Corumbá. Inside the Bodoquena Farm the following rivers can be found: the Bodoquena Stream in the northwest and the Rodrigues Stream in the southeast.[49] The general hydrography in the municipality of Miranda is shown in Figure 30.

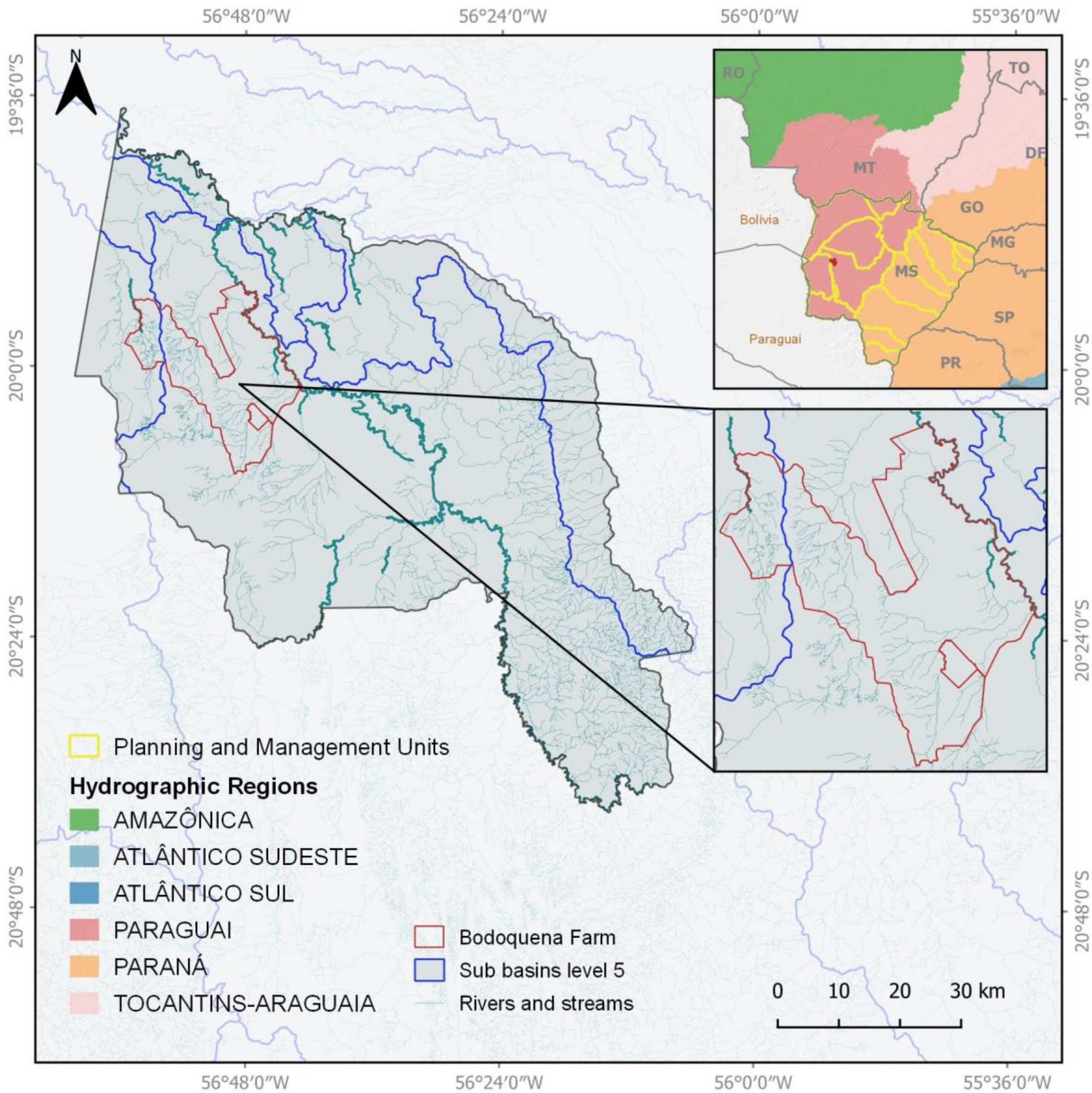

Figure 30. Miranda Hydrography Map.

2.1.5.8 VEGETATION COVER

2.1.5.8.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

According to IBGE, most vegetation classes are Wooded Savanna, Forested Savanna and Savanna Park, while the majority land uses are Agriculture, Livestock and secondary vegetation, as shown in Figure 31.

[49] Accessed on: https://www.pinms.ms.gov.br/portal/home/item.html?id=1c82c27edf1e4705b7c60251b0b45df4

The Technical Manual of Brazilian Vegetation from IBGE[50] describes the vegetation classes as the following:

Wooded Savanna (Portuguese: Savana Arborizada) is either natural or anthropized formation subgroup characterized by presenting a thin nanophanerophytic physiognomy and a continuous gramoid hemicryptophytic physiognomy, liable to annual fire. The dominant synusias form more open physiognomies (Campo Cerrado), sometimes with the presence of a dense scrub, Cerrado properly said. The floristic composition, despite being similar to the Forested Savanna, has dominant species that characterize the environments according to the geographic space occupied.

Forested Savanna (Portuguese: Savana Florestada) is a formation subgroup with typical physiognomy and characteristic restricted to leached sandstone areas with deep soil, occurring in an eminently tropical climate seasonal. It presents woody synusias of micro and nanophanerophytes, tortuous with irregular branching, provided with perennial or semideciduous sclerophyte macrophytes, rigid corticosterous exfoliated rhytidoma or softly suberous cortex, with organs of underground reserve or xylopods, whose heights vary from 6 to 8 m.

Savana Park (Portuguese: Savana Parque) is a formation subgroup consisting essentially of a graminoid stratum, integrated by hemicryptophytes and geophytes of natural or anthropic floristic, interspersed with isolated nanophanerophytes, with typical connotation of an English Park (Parkland). The Savana Park of anthropic nature is found throughout the country, sometimes featuring lithosolic fields and/or rocks[51].

[50] https://www.terrabrasilis.org.br/ecotecadigital/pdf/manual-tecnico-da-vegetacao-brasileira.pdf
[51] https://www.terrabrasilis.org.br/ecotecadigital/pdf/manual-tecnico-da-vegetacao-brasileira.pdf

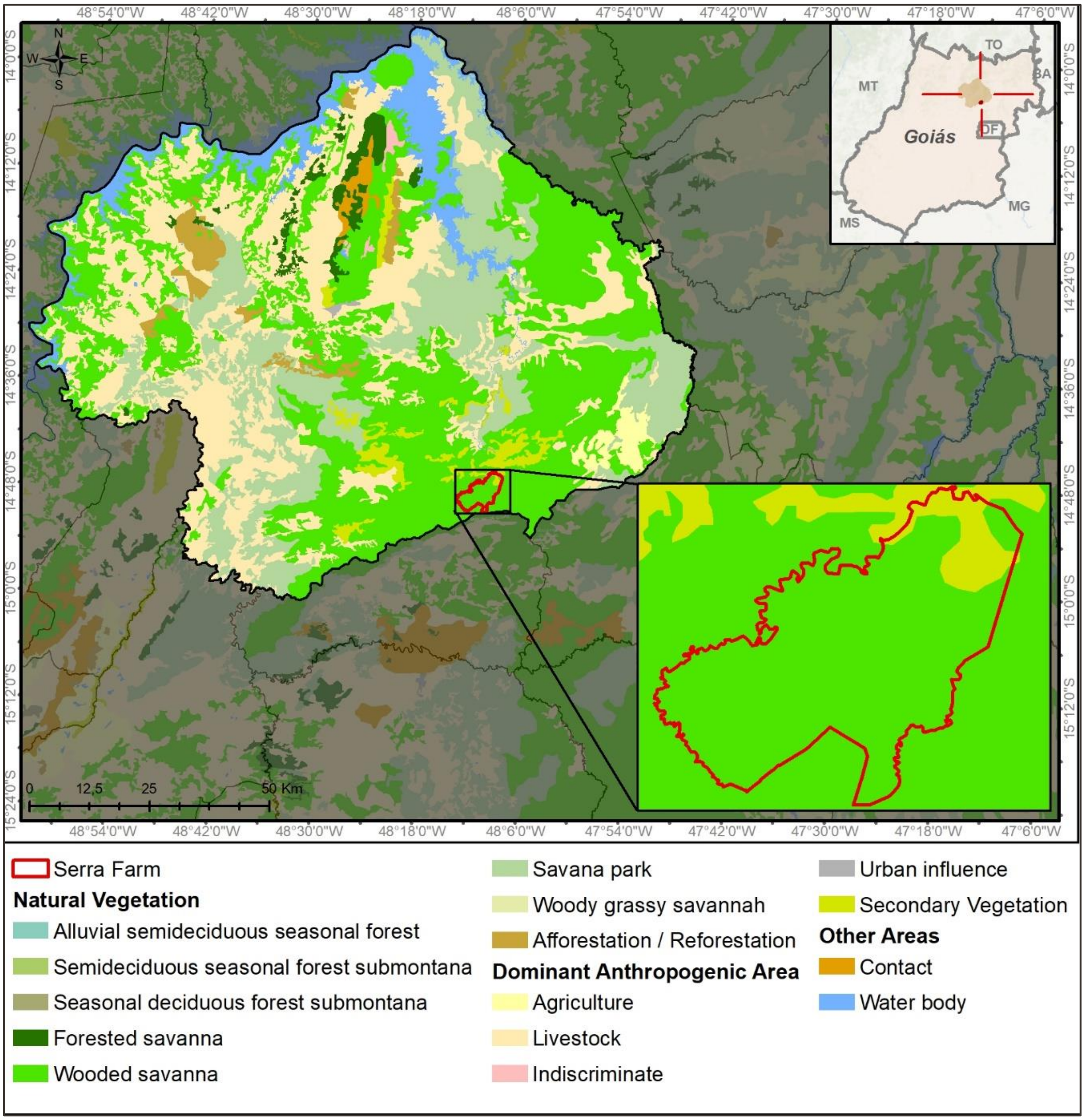

Figure 31. Niquelândia Vegetation Classes Map. Source: IBGE

2.1.5.8.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

According to IBGE[52], the vegetation classes encompassed by Rio Branco are Alluvial Open Ombrophilous Forest, Lowland Open Ombrophilous Forest, Lowland Dense Ombrophilous Forest, Livestock and secondary vegetation, as shown in Figure 32. The main class in the municipality is Lowland Open Ombrophilous Forest comprising almost the entire area of Bom Destino Farm.

[52] Accessed on: https://bdiaweb.ibge.gov.br/#/consulta/vegetacao

The Technical Manual of Brazilian Vegetation from IBGE[53] describes the vegetation classes as the following:

Lowland Dense Ombrophilous Forest: It is a formation that generally occupies the coastal plains, capped by Pliopleistocene plateaus of the Barreiras Group. Occurs from the Amazon, extending across the Northeast Region to the vicinity of the São João River, in the State of Rio de Janeiro. Such plateaus present a very typical flora, characterized by ecotypes of the genera *Ficus, Alchornea, Handroanthus* and by the *ochlospecie Tapirira guianensis Aubl*.

Lowland Open Ombrophilous Forest: This formation, placed between 4° North latitude and 16° South latitude, at altitudes ranging from 5 to 100 m, presents a predominance of faciation with palm trees. In the states of Piauí and Maranhão it can be considered as a "babassu forest", covering sandstone terrains from the Cretaceous, in the Maranhão-Piauí Basin. In this region, this formation was subjected to intense forest devastation, caused by the expansion of agricultural frontiers. Gradually it was replaced by the densification from *Attalea speciosa* Mart. ex Spreng. (babassu), originating the "babaçual (Portuguese)" that dominates entirely the landscape and forms part of the Secondary Vegetation. It is also found in its natural state, but, in this case, in association with other angiosperms, in isolated communities in the States of Maranhão and Pará, always located below of 100 m altitude.

Alluvial Open Ombrophilous Forest: Formation established along the watercourses, occupies periodically or permanently flooded plains and terraces, which in the Amazon constitute physiognomies of lowland forests or igapó forests, respectively. It has predominant floristic composition and ecological characteristics, similar to the Alluvial Dense Ombrophilous Forest, only in physiognomy it stands out for presenting a large number of large palm trees that, not infrequently, form congregations. Sometimes it also stands out for the dominance of woody and herbaceous lianas, covering a rarefied strata of trees.

[53] Accessed on: https://www.terrabrasilis.org.br/ecotecadigital/pdf/manual-tecnico-da-vegetacao-brasileira.pdf

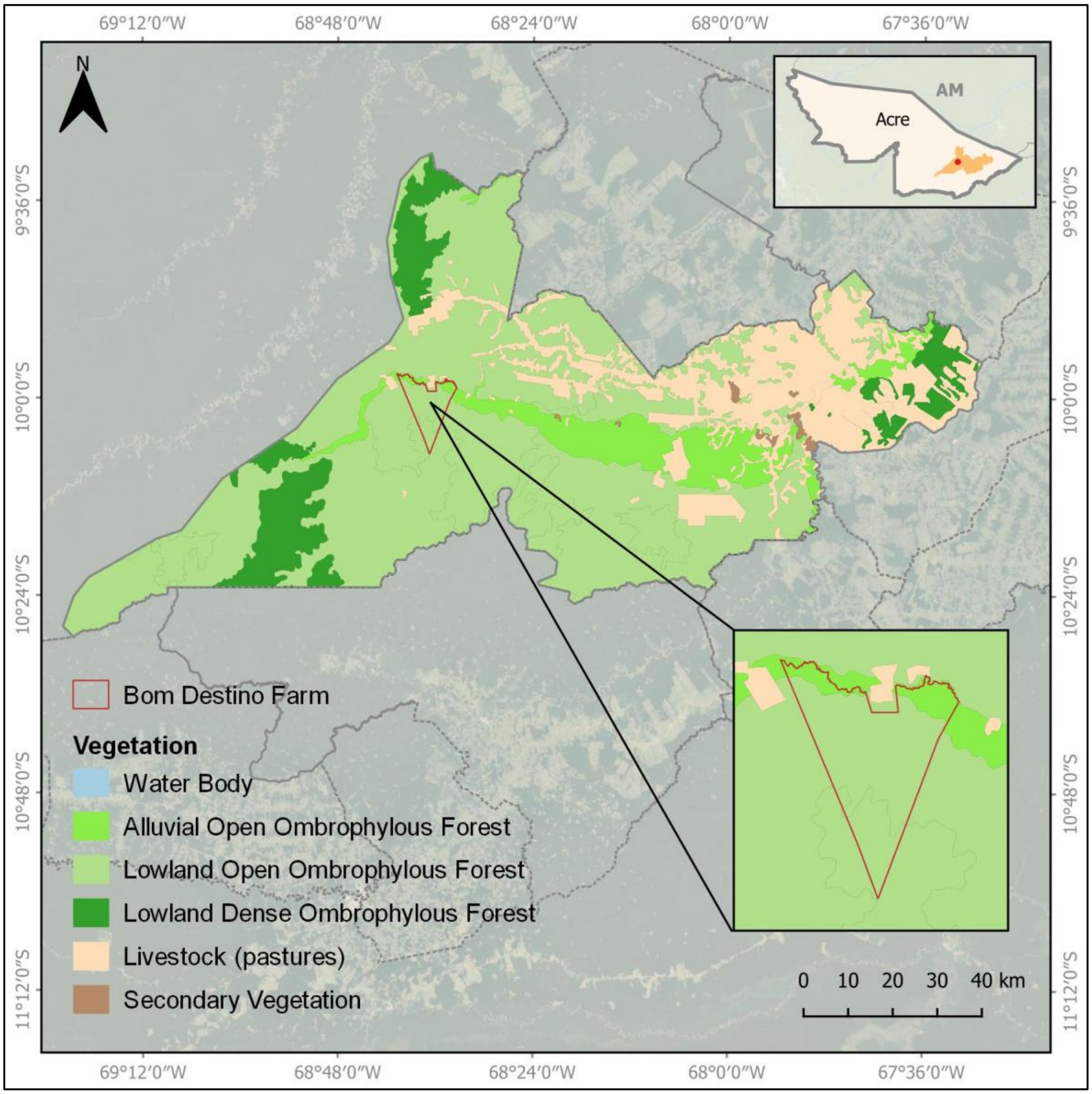

Figure 32. Rio Branco Vegetation Classes Map. Source: IBGE.

2.1.5.8.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

According to IBGE[54], the vegetation classes encompassed by Miranda are Submontane Seasonal Deciduous Forest, Seasonal Semi-deciduous Alluvial Forest, Wooded Savanna, Forested Savanna, Grassy-Woody Savanna, Savanna Park, and Steppic Park Savanna, agriculture, farming, livestock, urban influence, and ecotone, as shown in Figure 33. Livestock dominates most of the municipality´s area, while Forested Savanna and Savanna Park also have a significant presence. In Bodoquena Farm the main classes are livestock and Forested Savanna.

The Technical Manual of Brazilian Vegetation from IBGE[55] describes the vegetation classes as the following:

[54] Accessed on: https://bdiaweb.ibge.gov.br/#/consulta/vegetacao
[55] Accessed on: https://www.terrabrasilis.org.br/ecotecadigital/pdf/manual-tecnico-da-vegetacao-brasileira.pdf

Submontane Seasonal Deciduous Forest: In this formation, the largest disjunctions of deciduous forest are scattered. One of the places it can be found is in a narrow strip in the south of the State of Maranhão, between the Cerrado and the Open Ombrophylous Forest with babassu, where there is a medium-sized forest composed of deciduous trees with thin stems. It also appears in the south of the State of Bahia, with a deciduous physiognomy covering the limestone terrains of the Rio Pardo Basin, being a relatively tall forest. The forest on the interior slope of Serra da Mantiqueira, located in Minas Gerais, covers Precambrian lands. It consists of mesophanerophytes with evergreen foliage and sometimes macrophanerophytes. This formation can also be found in the lands on the southern slope of the Planalto das Missões, already considered there as “extra zonal areas”, as they are included in the subtropical space.

Seasonal Semi-deciduous Alluvial Forest: It is a formation found more frequently in the great Pantanal depression of Mato Grosso do Sul, always bordering the rivers of the Paraguay River Basin. The mesophanerophyte *Amburana acreana* (Ducke), commonly known as cherry tree, of great economic and timber value, is of Andean-Amazonian origin and has a wide and divergent South American dispersion, including the Pantanal of Mato Grosso do Sul. In this formation, several species of the genus *Handroanthus* exist in great abundance, in addition to the ecotypes *Calophyllum brasiliense* Cambess., *Tapirira guianensis* Aubl., *Inga sp*., *Podocarpus sellowii* Klotzsch ex Endl., *Cedrela lilloi* C. DC., and *Guarea guidonia* (L.) Sleumer.

Wooded Savanna: Subgroup of natural or anthropogenic formation that is characterized by presenting a sparse nanophanerophytic physiognomy and another continuous graminoid hemicryptophytic, subject to annual fire. The dominant synusiae form physiognomies that are sometimes more open (Campo Cerrado), sometimes with the presence of a dense scrub, proper Cerrado. The floristic composition, although similar to that of the Forested Savannah, has dominant species that characterize the environments according to the occupied geographic space.

Forested Savanna: Formation subgroup with typical and characteristic physiognomy restricted to leached sandstone areas with deep soils, occurring in an eminently seasonal tropical climate. It presents woody synusiae of micro and nanophanerophytes, tortuous with irregular branching, provided with perennial or semi-deciduous sclerophyte macrophytes, rigid exfoliated cortical rhytidome or softly suberous cortex, with underground reserve organs or xylopodia, whose heights vary from 6 to 8 m. In some places, it presents woody synusiae of meso and microphanerophytes with an average height greater than 10 m, being very similar, physiognomically, to Seasonal Forests, only differing from these in its floristic composition. It does not have a clear synusia of chamaephytes, but hemicryptophytic grass, interspersed with stunted woody plants and dwarf palm trees.

Grassy-Woody Savanna: Prevail in this physiognomy, when natural, lawns interspersed with stunted woody plants, which occupy extensive areas dominated by hemicryptophytes and which, little by little, when managed through fire or grazing, are replaced by geophytes that are distinguished by having underground culms, being therefore more resistant to trampling by cattle and fire.

Savanna Park: Formation subgroup consisting essentially of a graminoid stratum, made up of hemicryptophytes and geophytes of natural or anthropogenic floristics, interspersed with isolated nanophanerophytes, with a typical connotation of a Parkland. The Savanna Park of anthropic nature is found throughout Brazil, while the natural one sometimes occurs with features of lithosolic and/or rocky fields. In areas drenched in periodically flooded depressions, the natural typologies of Cerrado-de-Pantanal occur.

Steppic Park Savanna: This formation subgroup presents very typical physiognomic characteristics, with bushes and small trees, generally of the same species, and widely spaced distribution. It appears as a pseudo-ordering of woody plants on a dense carpet, mainly of herbaceous and grassy plants. This formation subgroup usually covers small depressions capped by vertisols, which in the rainy season are flooded because they do not have good drainage.

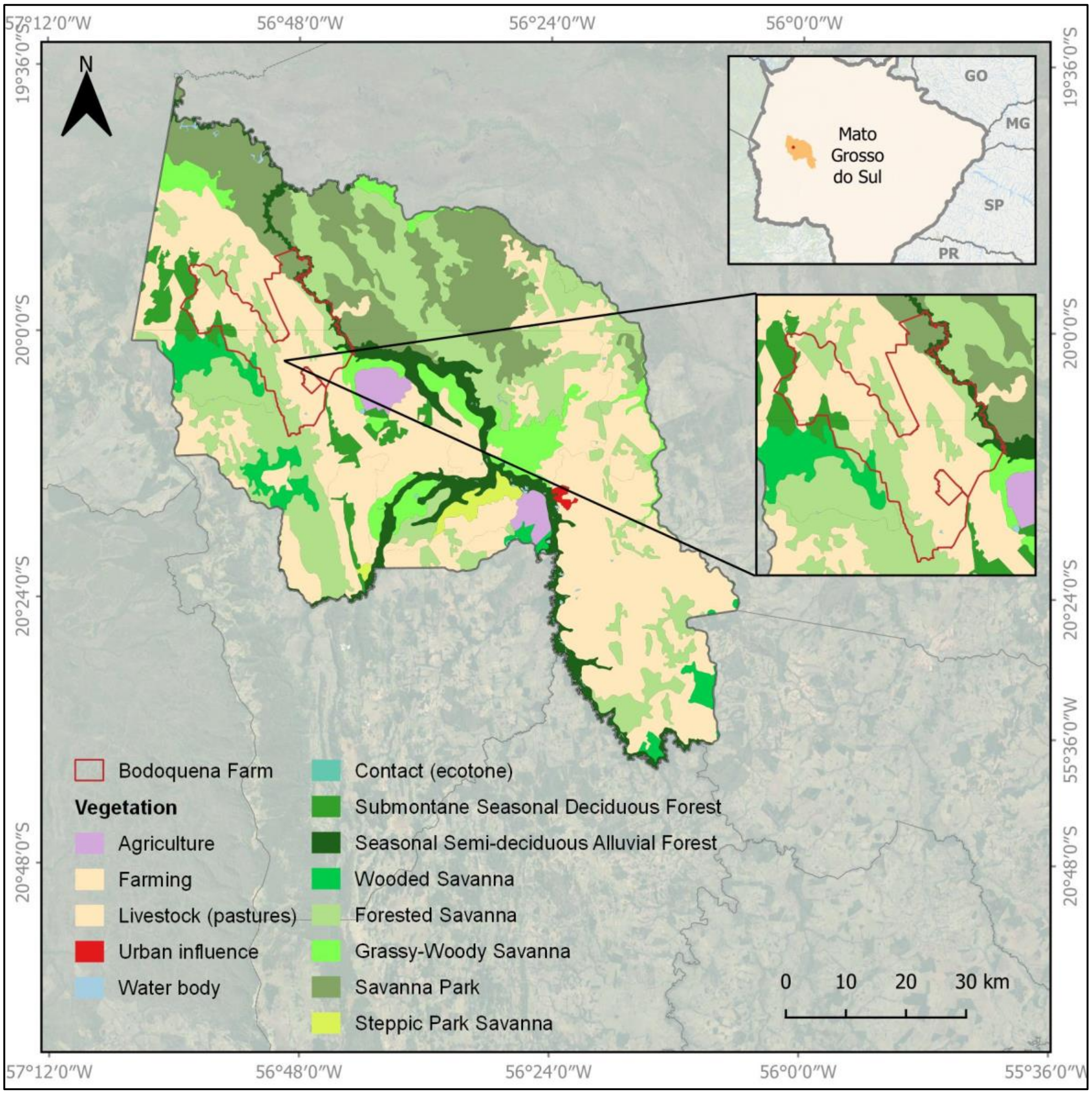

Figure 33. Miranda Vegetation Classes Map. Source: IBGE.

2.1.6 SOCIAL PARAMETERS (G1.3)

2.1.6.1 MAIN SETTLEMENTS

All settlement´s and quilombolas information in Brazil are provided by INCRA (National Institute for Colonization and Agrarian Reform)[56], the Conservation Units information updated from the Ministry of

[56] https://painel.incra.gov.br/sistemas/index.php

Environment[57] and Indigenous Territories from FUNAI[58] (National Foundation of Indigenous) and ISA[59] (Social and Environmental Institute).

2.1.6.1.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

The main settlements in the municipality of Niquelândia are: Acaba Vida, Salto para o Futuro, Rio Vermelho, José Martí, Conceição, Engenho do Bom Sucesso, Santa Rita do Broeiro, Água Limpa, Julião Ribeiro, and Aranha. The following Traditional Communities called quilombos[21] exist in Niquelândia: Rufino Francisco, Rafael Machado, Vargem Grande do Muquém, and Turiaçaba. The only settlement within a 20km radius of PAI 01 is the Acaba Vida community, with 59 registered families, according to INCRA database (Figure 34).

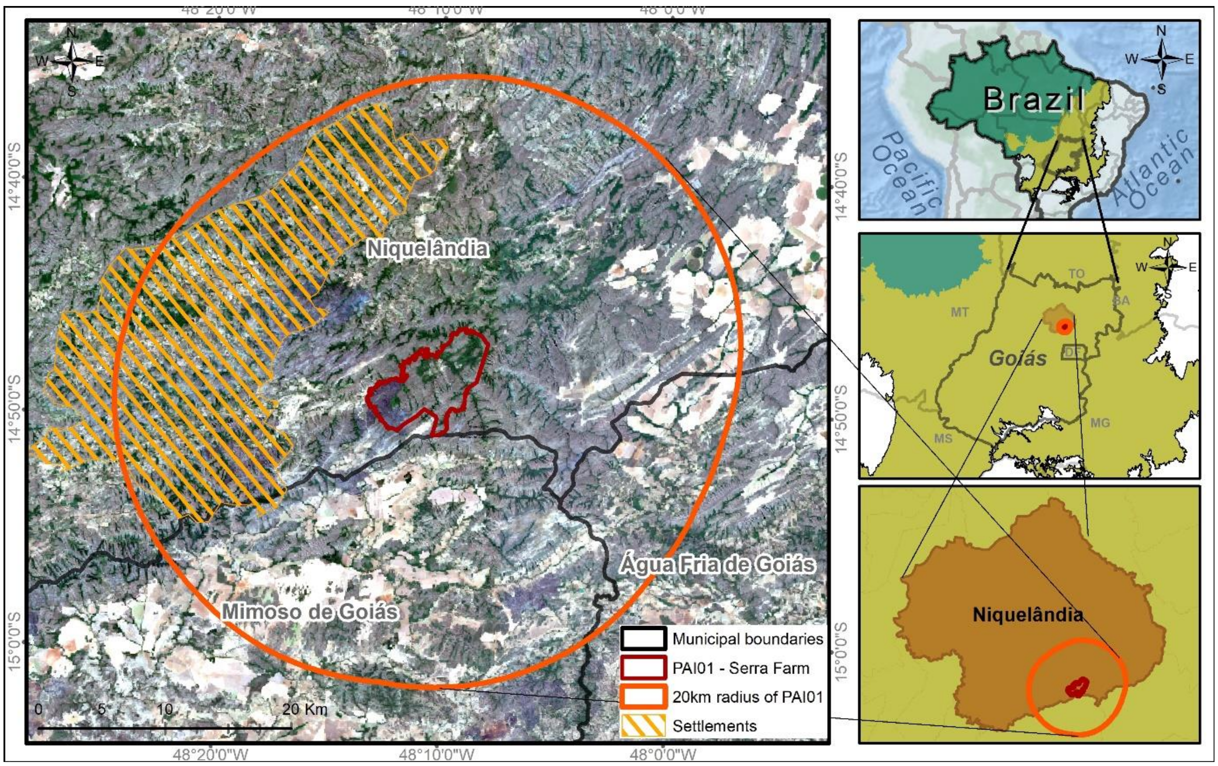

Figure 34. Main settlements around PAI 01 – 20km radius from project area.

2.1.6.1.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

The main settlements in the municipality of Rio Branco are: Nova Baixa Verde, Figueira, Vista Alegre, Carão, Benfica, Colibri, Baixa Verde, Boa Água, Gal. Moreno Maia, Casulo Hélio Pimenta, Casulo Geraldo Fleming, Polo Agroflorestal Wilson Pinheiro, Casulo Geraldo Mesquita, Itamaraty, Barro Alto, Polo Agroflorestal Dom Joaquim, Polo Agroflorestal Nilson Josuá. The settlements within 20km radius from PAI 02 are: Fiqueira (354 families) and Itamaraty (183 families), families registered by INCRA database. Also,

[57] Ministry of Environment. Available at: https://dados.mma.gov.br/dataset/unidadesdeconservacao
[58] National Foundation for Indigenous. Available at: https://www.gov.br/funai/pt-br/atuacao/terras-indigenas/geoprocessamento-e-mapas
[59] Socio-environmental Institute. Available at: https://mapa.socioambiental.org/pages/?lang=en

another settlement, called Oriente (105 families), of the neighbor municipality Sena Madureira, is within the 20km radius from PAI 02. No Traditional Communities such as quilombos and indigenous were found in the 20km radius of PAI 02. The Conservation Unit Extractivist Reserve (RESEX) Chico Mendes is also within the 20km radius from the PAI 02 (Figure 35).

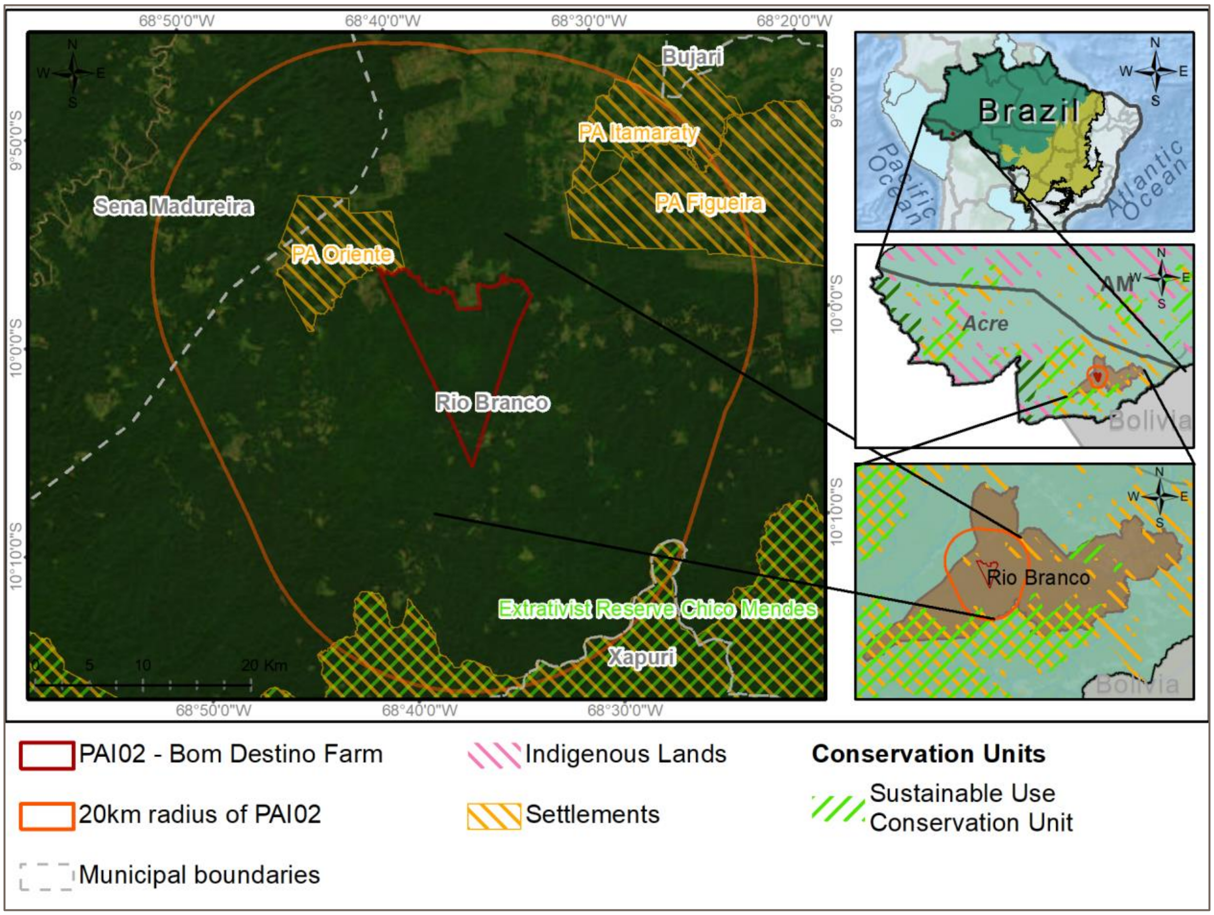

Figure 35. Main settlements around PAI 02 – 20km radius from project area.

2.1.6.1.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

The main settlements in the municipality of Miranda are: Tupâmbae and Bandeirante, both are farther away than the 20km radius from the pai 03 area. An indigenous traditional community was identified within the 20km radius from the PAI 03, the Kadiwéu people, with 1697 inhabitants according to ISA database[60]. However, their villages are very far away from the project area and only a small part of their territory is within the 20km distance from the project area (as shown in the map below), which demonstrates that they are not affected by the project´s activities and they are not connected to the project area in any identified ways, so they won´t be considered as a relevant community group for the stakeholders classification. A State Park called Pantanal do Rio Negro is also within the 20km radius from the PAI 03. The main stakeholders identified for this PAI are the farm´s workers, which are around 60 families living inside the farm (Figure 36).

[60] Socio environmental Institute. Available at: https://terrasindigenas.org.br/en/terras-indigenas/3712

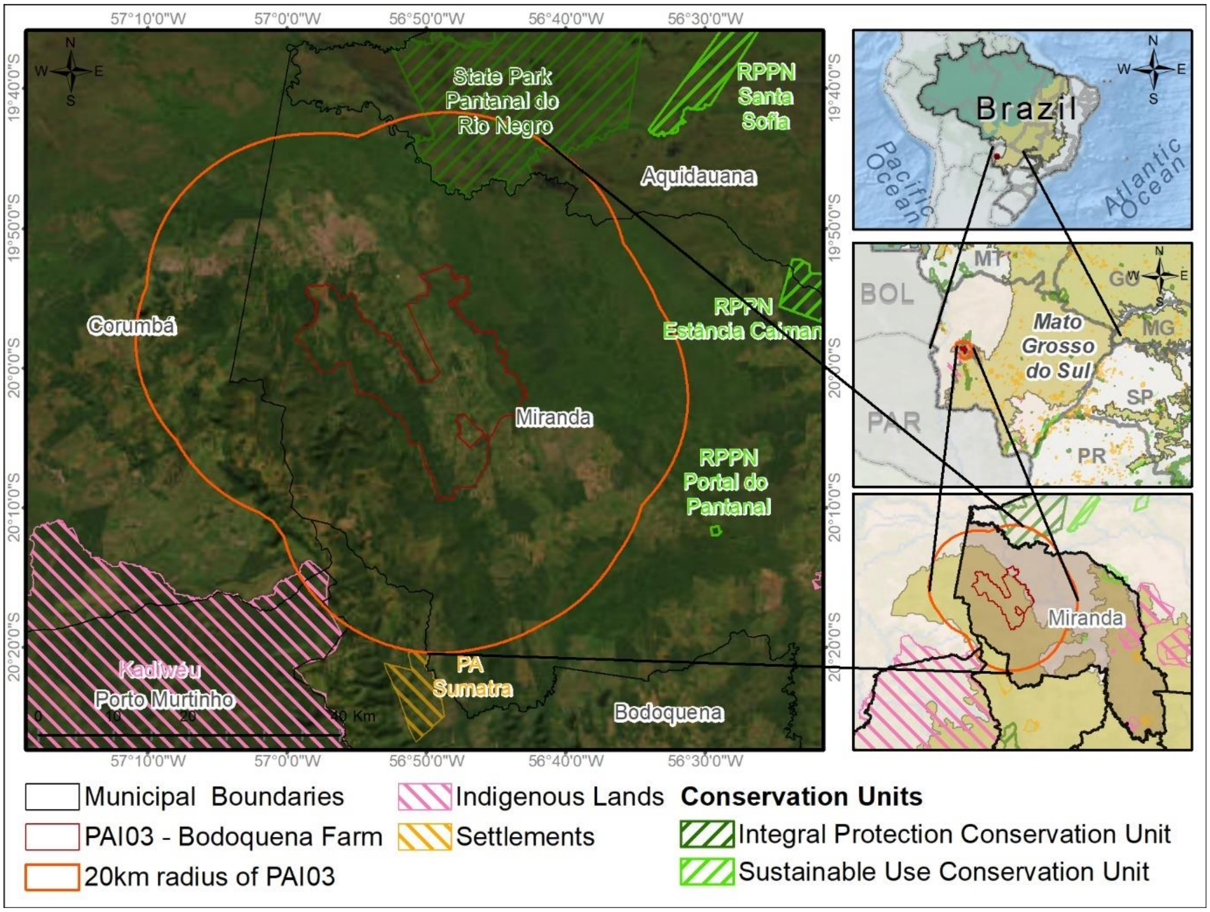

Figure 36. Main settlements around PAI 03 – 20km radius from project area.

2.1.6.2 LAND USE

In recent decades, the Cerrado and the Amazon were the biomes with the highest rates of deforestation and land use conversion in Brazil (Figure 34). From 2002 to 2018, the growth of agriculture in the Cerrado and the Amazon stands out[61]. In the Cerrado, the crop areas expanded more than 15.7 million hectares in the period, increasing the annual production value by R$ 77.4 billion. In the Amazon, the cultivated area expanded 5.7 million hectares, while the value of crop production more than tripled from R$ 10.7 billion in 2002 to R$ 35.3 billion in 2018 (in real terms). The Amazon biome also experienced expansion of pastureland which increased by 12 million hectares (Figure 34). Furthermore, the Amazon and the Cerrado experienced the most intense deforestation between 2002-2018. In the Amazon region, 17.7 million hectares were deforested, and in the Cerrado, 8,4 million hectares of native vegetation were removed (Figure 37).

[61] Horn & Baggio, 2011 *apud* Flach *et al.*, 2021

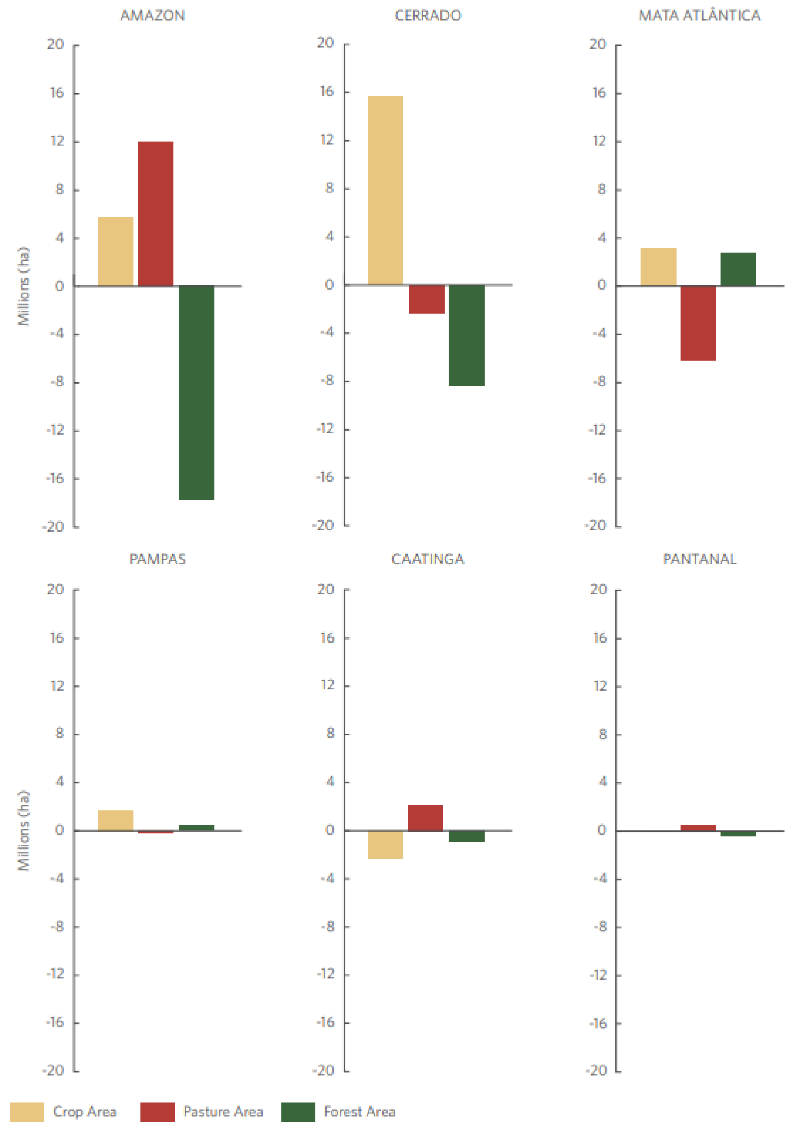

Figure 37. Dynamics of land use in the six Brazilian biomes (Amazon, Cerrado, Atlantic Rainforest, Pampas, Caatinga and Pantanal). For the 2002 to 2018 period, in beige, the expansion / retraction of crop areas, in red the expansion / retraction of pasture areas and in green the expansion / retraction of forest areas.

2.1.6.2.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

Confirming the land use for the municipality, the Figure 38 presents the distribution of types of land use across Niquelândia for the year of 2021 obtained in the MapBiomas platform. It is noted that the use for agriculture and cattle raising is well spread in the region, corresponding to, approximately, 31% of municipal land use, a category that has increased its reach over the years, exerting pressure on land and natural vegetation, which in turn, has resulted in deforestation over the years.

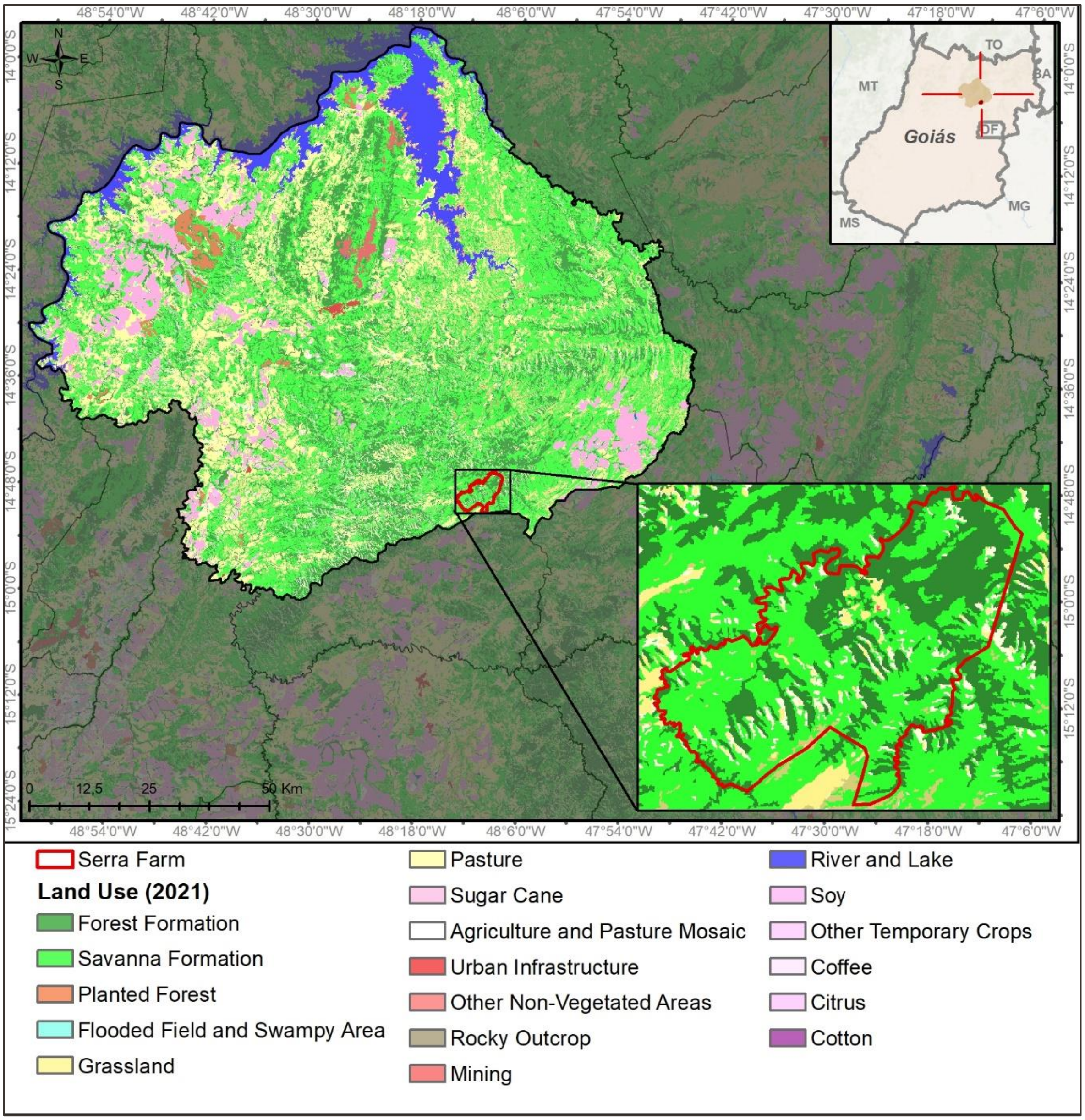

Figure 38. Distribution of types of land use across Niquelândia for the year of 2021.

The land use inside the PAI 01 comparison from 2012 to 2021 follows the same pattern as the municipality, demonstrating that pasture for cattle raising and mosaic of uses increased as the forest decreased its land cover (Figure 39).

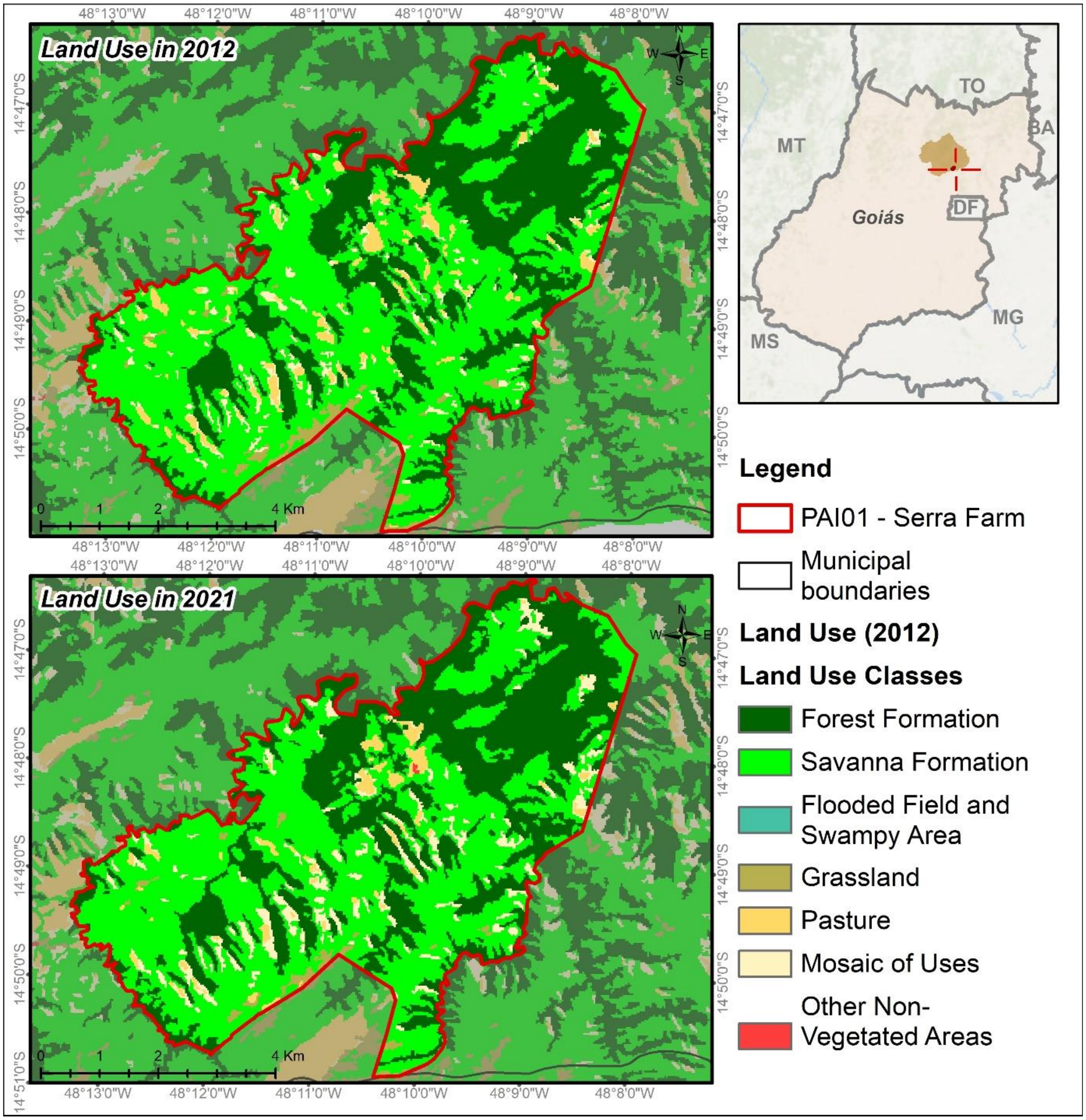

Figure 39. Comparison of the distribution of land use types in PAI 01 in 2012 and 2021.

2.1.6.2.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

Regarding the land use data from 2021 for the municipality of Rio Branco, the State Capital, cattle raising is the main activity corresponding to 30,7% of the land use. Following what was noticed in PAI 01, this category has grown 10% from 2013 to 2021, exerting pressure on land and natural vegetation, which in turn, has resulted in deforestation over the years (Figure 40).

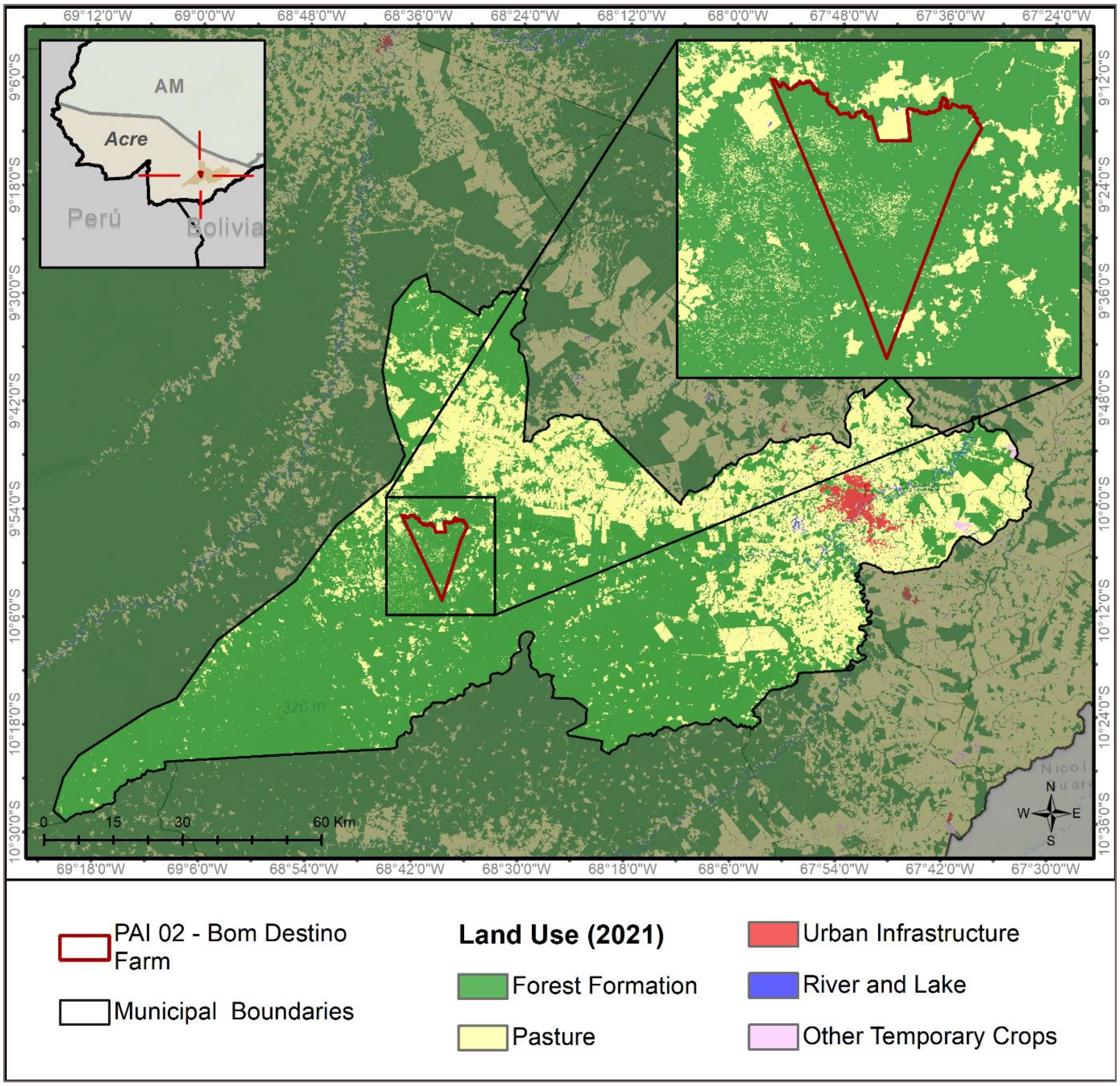

Figure 40. Distribution of types of land use across Rio Branco for the year 2021.

The land use inside the PAI 02 comparison from 2013 to 2021, follows the same pattern as the municipality, demonstrating that pasture for cattle raising increased as the forest decreased its land cover (Figure 41).

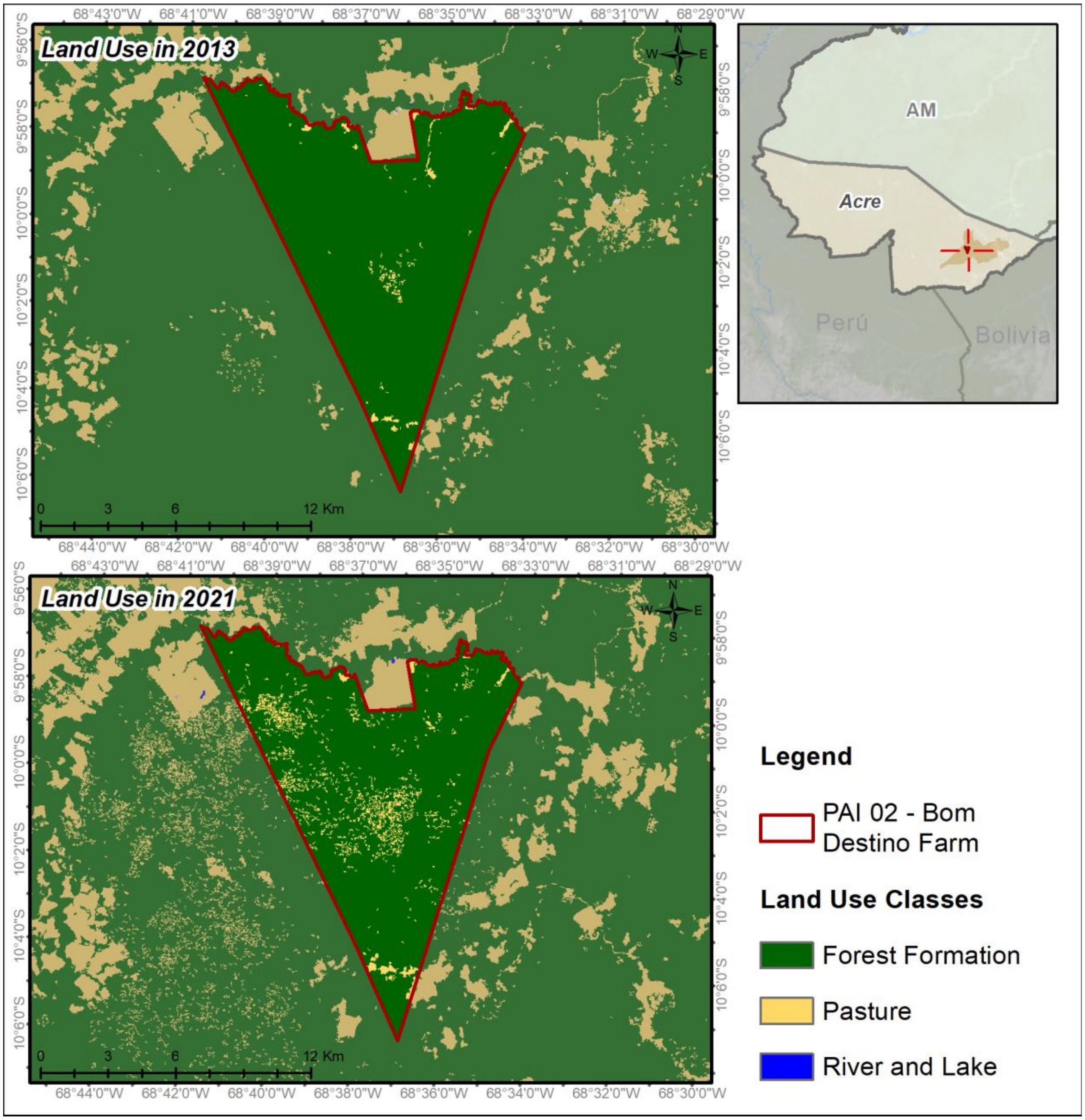

Figure 41. Comparison of the distribution of land use types in PAI 02 in 2013 and 2021.

2.1.6.2.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

Regarding the land use in the municipality of Miranda, agriculture and cattle raising are, once again, the main activities for the use of land. From 2013 to 2021 comparison, cattle raising decreased 2%, while the soy agriculture increased the same 2%, both activities together (adding other kinds of agriculture) corresponding to 37,5% of the land use (Figure 42).

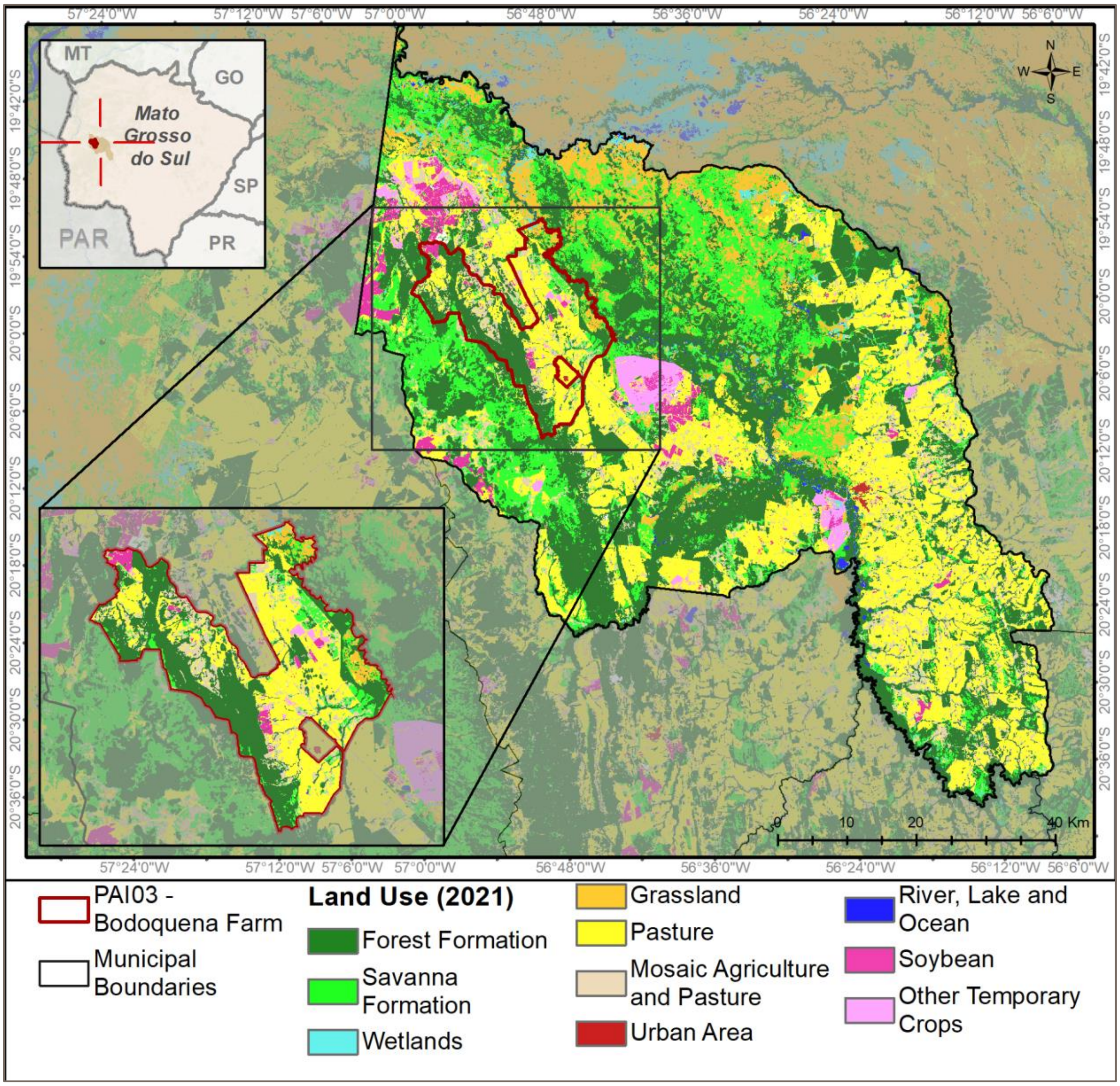

Figure 42. Distribution of types of land use across Miranda for the year 2021.

The land use inside the PAI 03 comparison from 2013 to 2021, follows the same pattern as the municipality, demonstrating that pasture for cattle raising increased as the forest decreased its land cover (Figure 43).

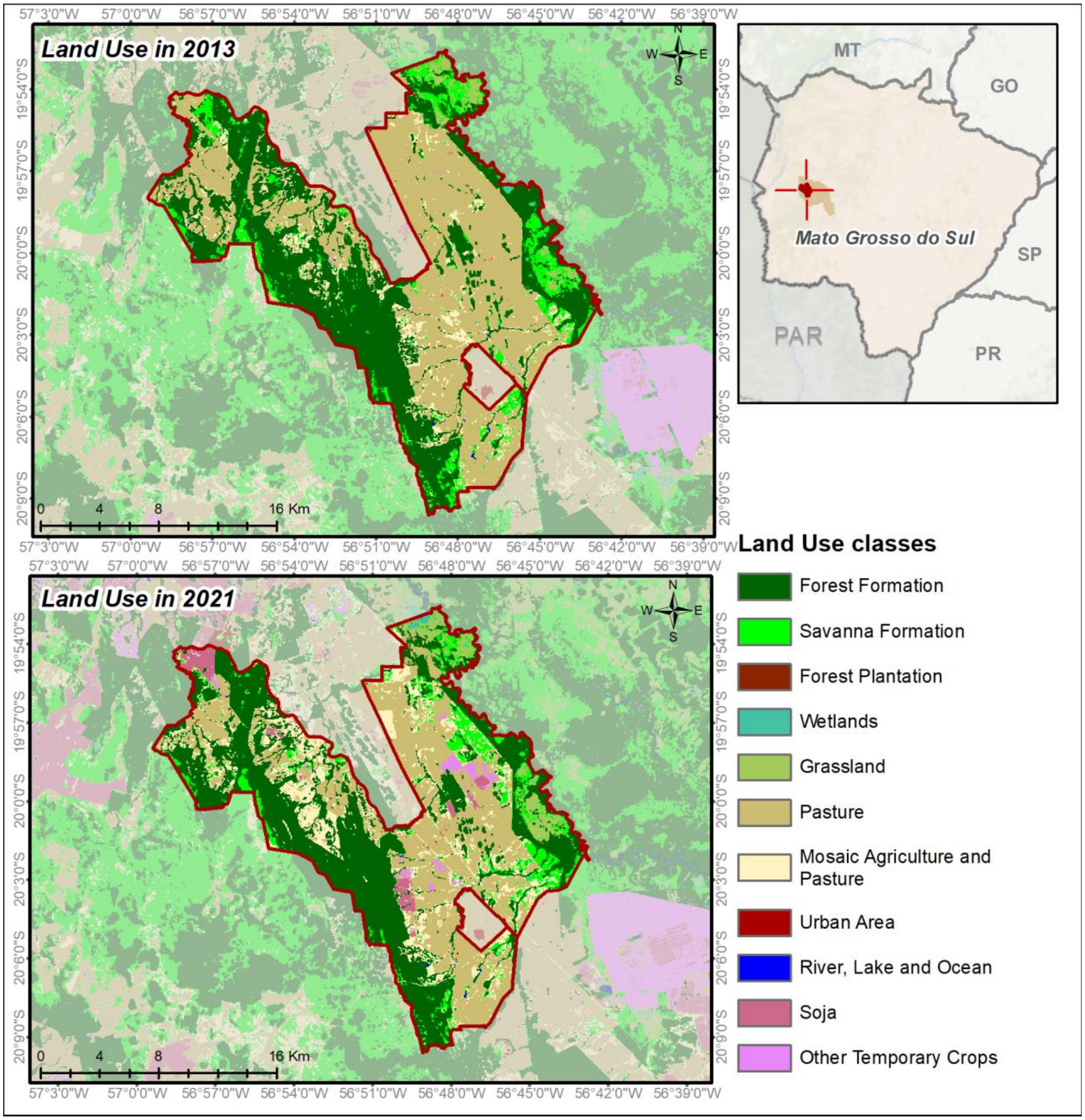

Figure 43. Comparison of the distribution of land use types in PAI 03 in 2013 and 2021.

2.1.6.3 ECONOMIC ACTIVITIES

The economic activities data are available at IBGE (Brazilian Institute of Geography and Statistics) Cities´ GDP[62] and the Agriculture Census[63] databases.

[62] Cities´ GDP – IBGE. Available at: https://www.ibge.gov.br/estatisticas/economicas/contas-nacionais/9088-produto-interno-bruto-dos-municipios.html?edicao=35881&t=resultados

[63] Agriculture Census – Table 5467/IBGE. Available at: https://mapasinterativos.ibge.gov.br/agrocompara/

2.1.6.3.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

Analyzing the income of Niquelândia, the main contribution comes from Industrial and Services sectors, nonetheless, the agriculture and cattle raising sector is growing in its contribution to the wealth of the municipality through the years. In livestock, cattle breeding predominates, but there is significant swine breeding. The annual per capita income in the region in 2020, was R$ 22.943,94 with a Human Development Index (HDI) of 0,715 in 2010. Figure 44, below, shows the distribution of GDP by sector from 2010 to 2020 for Niquelândia.

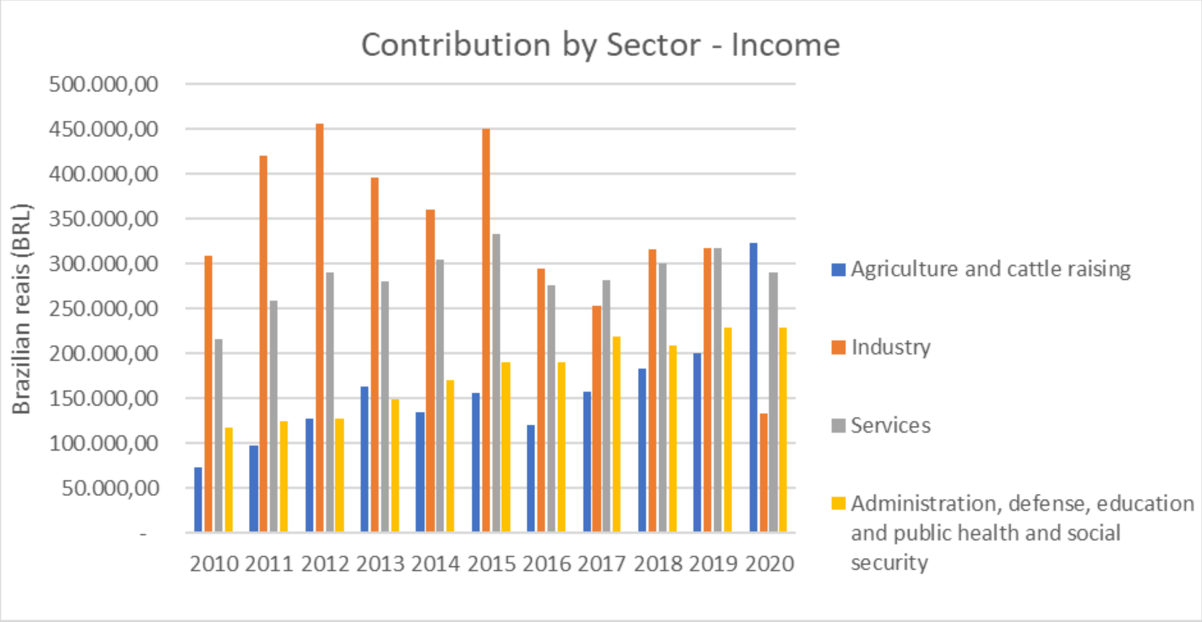

Figure 44. Income by sector in Niquelândia.

An additional analysis of the agricultural census of 2017 provided information regarding the use of land, according to groups and classes of economic activity, as shown in Figure 45. It is noted that livestock is responsible for most of the land use with 85.24%, followed by temporary crops with 13.34%. Therefore, it is verified that the change of land use for livestock purposes exerts pressure on use and occupation of land in the municipality, even if it's not the main contributor to Niquelândia's GDP.

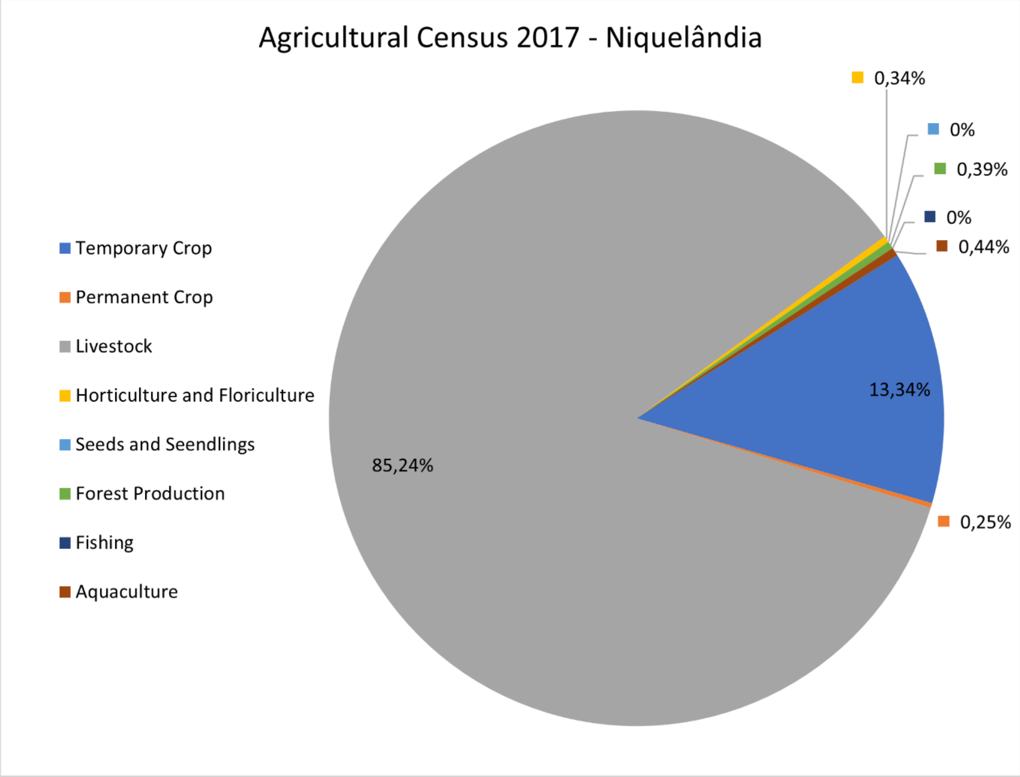

Figure 45. Agricultural Census of Niquelândia for 2017 - Land Use

Regarding extractivism, pequi (*Caryocar brasiliense*) is the only fruit produced in the municipality, with 160 tons per year. Timber extraction is mainly used to produce charcoal (65 tons), firewood (10 thousand cubic meters) and roundwood (280 cubic meters). In forestry, an area of 10 thousand hectares is used to produce eucalyptus, mainly for firewood (158 thousand cubic meters) and a small fraction is commercialized for roundwood (1,500 cubic meters). In Niquelândia there are several agricultural establishments, mainly producing corn, manioc, soy and sugar cane.

In 2019, the average monthly salary of formal workers was 2.3 minimum wages, ranking 31st in the state. The proportion of employed persons in relation to the total population was 13.0% (IBGE, 2010). Considering households with monthly income of up to half a minimum wage per person, which is less than R$550,00 / ~ USD 100 / per month, is 39% of the population, which shows over 15.000 inhabitants living in poverty conditions (Figure 46).

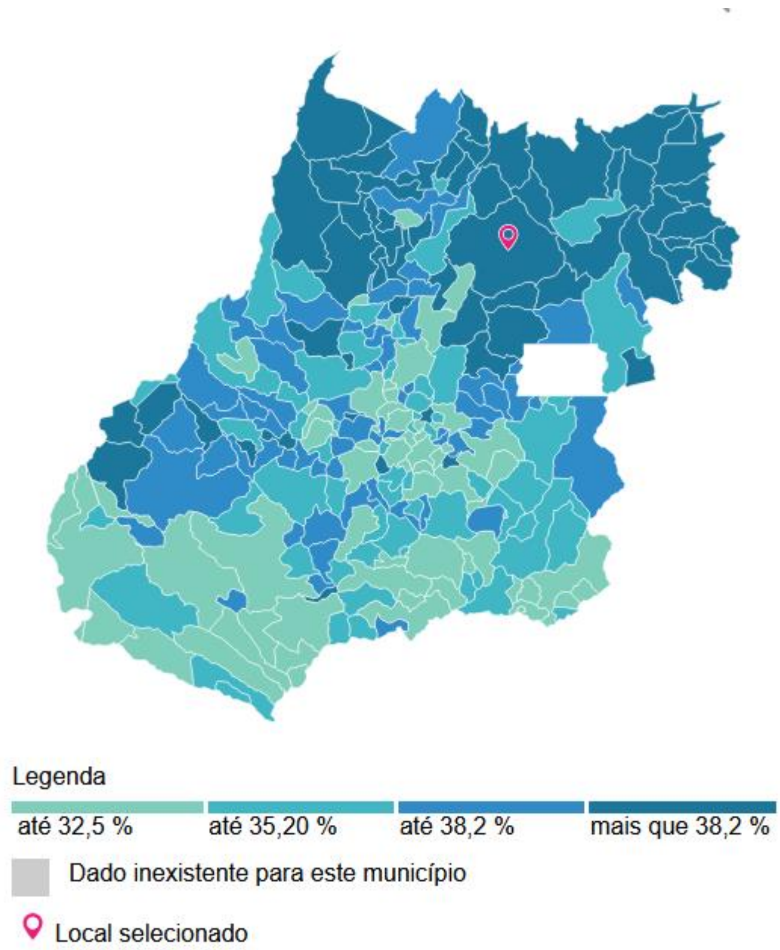

Figure 46. Population living with less than ½ minimum wage per person – Niquelândia/GO. Source: IBGE, 2010.

Regarding the economic active population, Niquelândia counts 62% of men and 38% of women of a total of 19.586 economic active population, compared to 16.109 inhabitants considered not economically active, with the same percentage distribution (62% men / 38% women).

From the group of economically active population, 40% are the less educated portion, with no education or less than the first 9 years of elementary formal education. The population with less than a high school degree is 61% of the economically active population.

Regarding the working people of Niquelândia, 76% are employees, 2% are employers and 22% are self-employed. Of the employees, 63% have formal jobs, 3% are public servers and 31% have informal jobs.

The most common jobs distributed among the working population are:

- *Agriculture, cattle raising, forestry, fisheries and aquaculture (78% men / 22% women)*
- *Construction (93% men/ 7% women)*
- *Trade, repair of motor vehicles and motorcycles (61% men / 39% women)*
- *Extractivist industries (93% men / 7 % women)*
- *Transformation industries (79% men / 21% women)*
- *Domestic services (13% men / 87% women)*
- *Education (13% men / 87% women)*

2.1.6.3.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

Analyzing the income of Rio Branco, the main contribution comes from Services sector. In Agriculture and Cattle Raising, the last one predominates corresponding to 55,89% of the income. In 2020 the annual per capita income was R$23.171,69 with a Human Development Index (HDI) of 0,727 in 2010. Figure 47 below, shows the distribution of GDP by sector from 2010 to 2020 for Rio Branco.

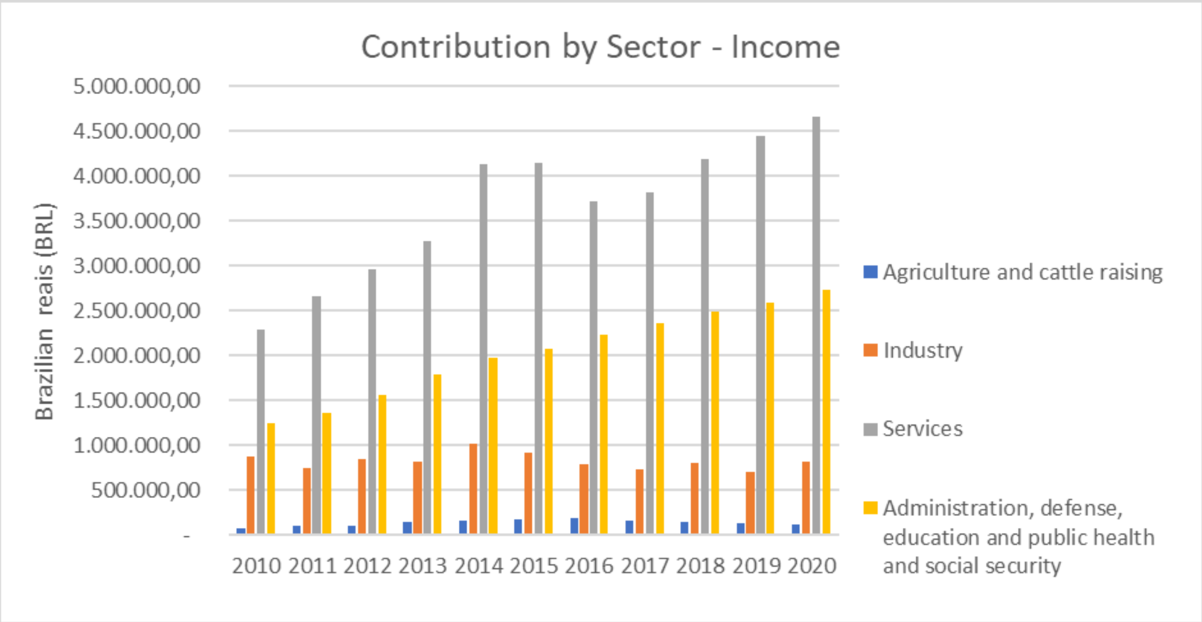

Figure 47. Income by sector in Rio Branco.

An additional analysis of the agricultural census of 2017 provided information regarding the use of land, according to groups and classes of economic activity, as shown in Figure 48. Regarding extractivism, manioc (*Manihot esculenta*) is the main agriculture production in the municipality, with 12.323 tons per year followed by corn with 8.608 tons per year. In Rio Branco there are several agricultural establishments, mainly producing banana, watermelon, sugar cane, cupuaçu and rice. In livestock, which is the largest land use, cattle raising counts 290.253 animals (data from 2017) with 2.299 farms. Milk production is also relevant with 3.737.000 liters per year.

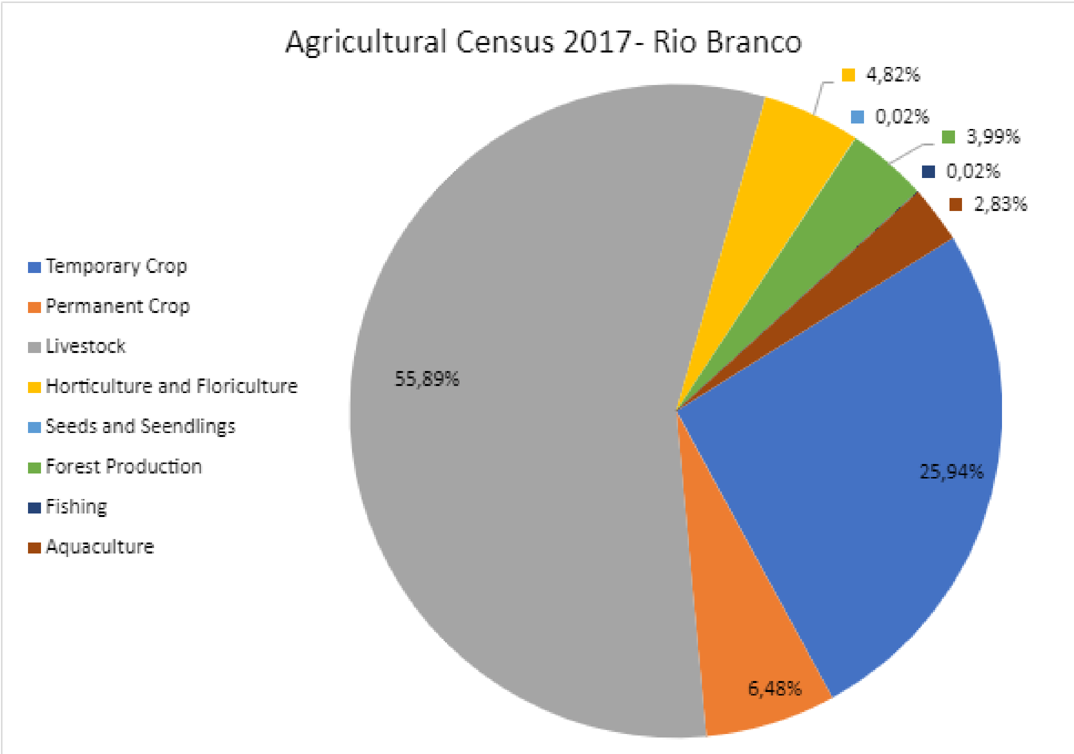

Figure 48. Agricultural Census of Rio Branco for 2017.

The average salaries in Rio Branco of the formal workers are 3 minimum wages (R$3.300 / ~ USD 660/ per month). Those numbers put Rio Branco as the 75º ranking position of the 5570 municipalities in Brazil and the 1º position from the 22 municipalities of the State of Acre.

The Gini Index (GI) regarding social inequity is 0,52 related to 0,539 of the national GI - which makes Brazil in the bottom 10 position ranking of equity in the World and being the only Latin-American country in the list with African countries. Only 24,8% of the population has formal jobs and 36,4% receives less than ½ a minimum wage, which is less than R$550,00 / ~ USD 100 / per month, demonstrating that over 100.000 people in Rio Branco are living under poverty conditions. As shown below, the percentage of people living with less than R$550,00 / ~ USD 100 / per month in the State of Acre reaches over 50% of the population in many regions (Figure 49).

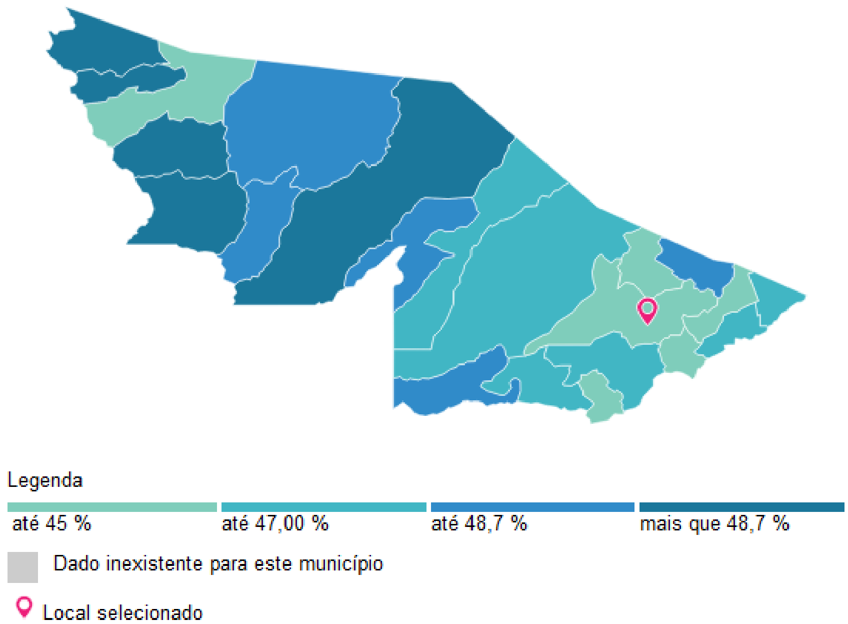

Figure 49. Population living with less than ½ minimum wage per person – Rio Branco. Source: IBGE, 2010.

Regarding the economic active population, Rio Branco counts 54% of men and 46% of women of a total of 154.285 economic active population, compared to 119.383 inhabitants considered not economically active (40% men / 60% women).

Of the group of economically active population, 34% are the less educated portion, with no education or less than the first elementary years of formal education. Population with less than high school degree is 52% of the economic active population.

Regarding the working people of Rio Branco, 79% are employees, 1% are employers and 20% are self-workers. Of the employees, 62% have formal jobs, 9% are public servers and 29% have informal jobs.

The most common jobs distributed by the working population are:

- *Trade, repair of motor vehicles and motorcycles (60% men / 40% women)*
- *Public administration, social insurance (37% men / 63% women)*
- *Construction (95% men/ 5% women)*
- *Domestic services (11% men / 89% women)*
- *Non-specific activity (60% men / 40% women)*
- *Education (24% men / 76% women)*
- *Agriculture, cattle grazing, forestry, fisheries and aquaculture (70% men / 30% women)*
- *Transformation industries (72% men / 28% women)*
- *Food and lodging (48% men / 62% women)*

2.1.6.3.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

Analyzing the income of Miranda, the main contribution comes from Services and Administration, defense, education, public health and social security sectors. Followed by Agriculture and Cattle Raising. In 2020 the annual per capita income was R$19.960,70 with a Human Development Index (HDI) of 0,632 in 2010. Figure 50 below, shows the distribution of GDP by sector from 2010 to 2020 for Miranda.

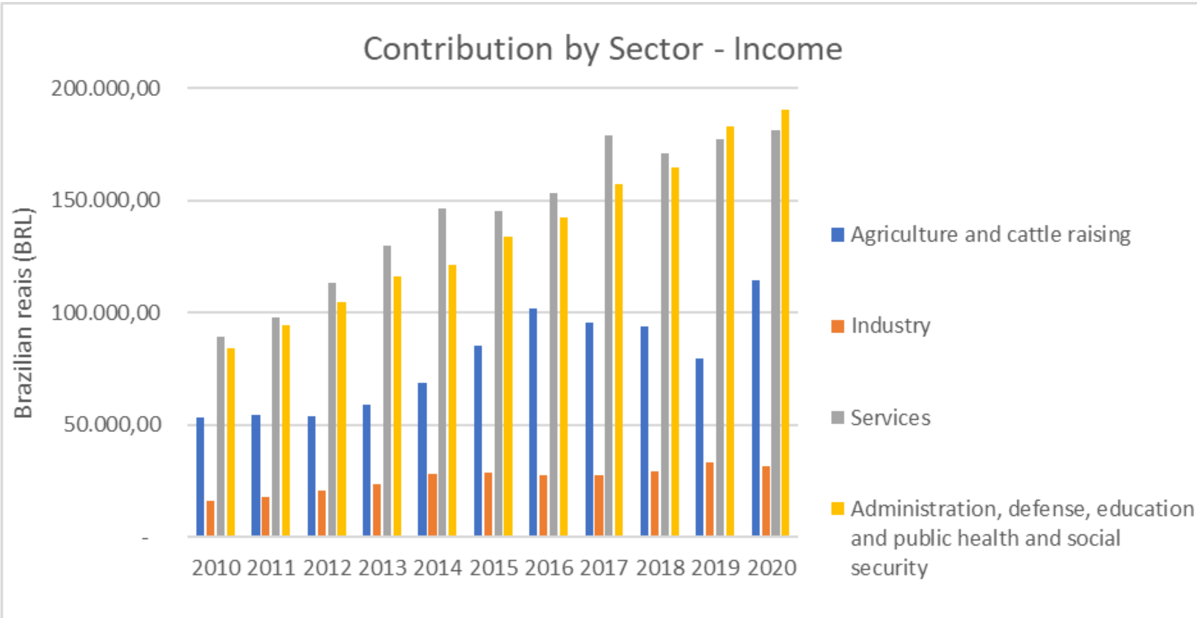

Figure 50. Income by sector in Miranda.

An additional analysis of the agricultural census of 2017 provided information regarding the use of land, according to groups and classes of economic activity, as shown in Figure 51. Regarding extractivism, soy and rice are the main agriculture products in the municipality, with 31.077 tons per year and 30.357 ton per year, respectively. In Miranda there are several agricultural establishments, mainly producing corn, manioc, sugar cane and watermelon. In livestock, which is the largest land use, cattle raising counts 311.693 animals (data from 2017) with 482 farms. Milk production is also relevant with 1.672.000 liters per year.

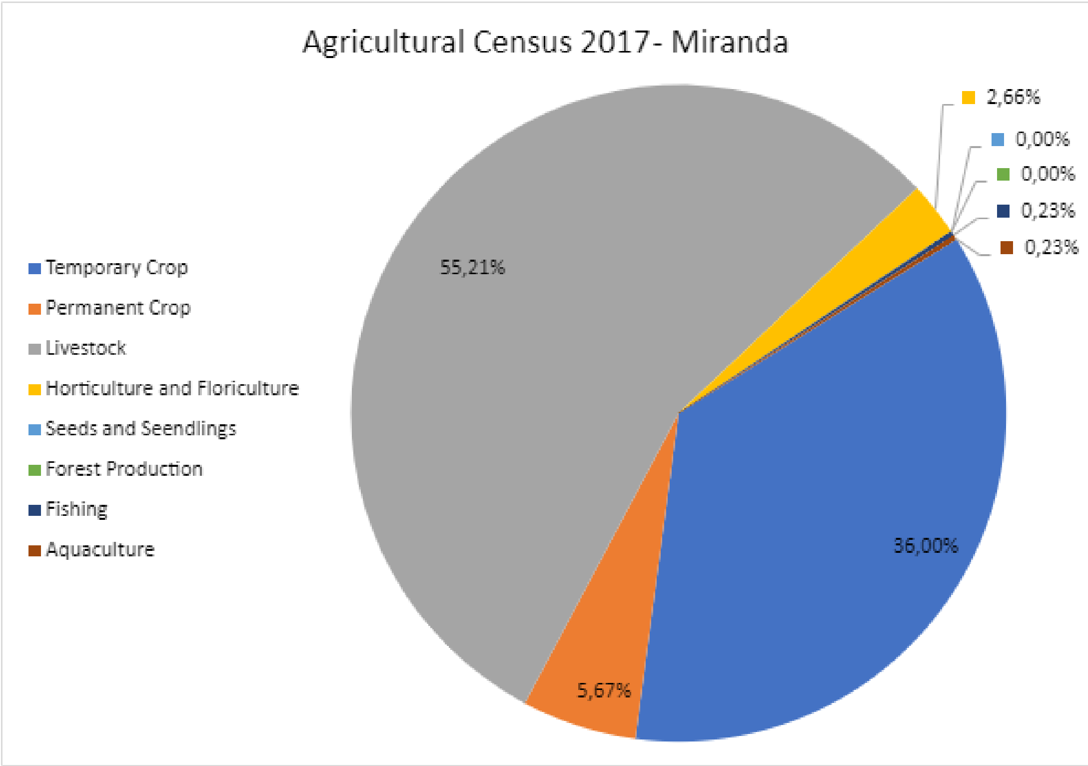

Figure 51. Agricultural Census of Miranda for 2017.

The average salaries in Miranda of the formal workers are 1,9 minimum wages (R$1.985,5 / ~ USD 400/ per month). Those numbers put Miranda as the 2558º ranking position of the 5570 municipalities in Brazil and the 67º position from the 79 municipalities of the State of Mato Grosso do Sul.

The Gini Index (GI) regarding social inequity is 0,45 related to 0,539 of the national GI - which makes Brazil in the bottom 10 position ranking of equity in the World and being the only Latin-American country in the list with African countries. Only 14,5% of the population has formal jobs and 40,7% receives less than ½ a minimum wage, which is less than R$550,00 / ~ USD 100 / per month, demonstrating that over 11.000 people in Miranda are living under poverty conditions (Figure 52). As shown below, the percentage of people living with less than R$550,00 / ~ USD 100 / per month in the State of Mato Grosso do Sul reaches over 40% of the population in many regions.

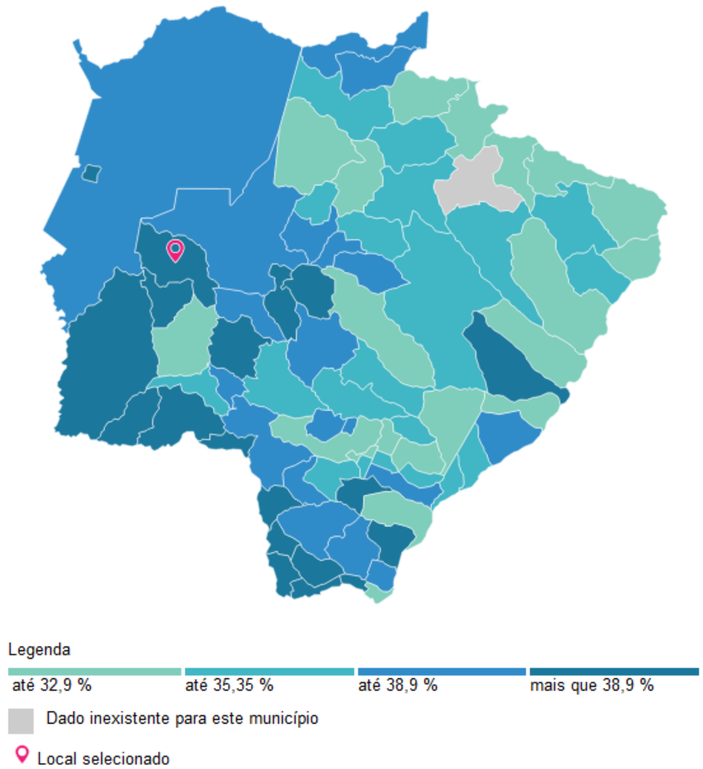

Figure 52. Population living with less than ½ minimum wage per person – Miranda. Source: IBGE, 2010.

Regarding the economic active population, Miranda counts 65% of men and 35% of women of a total of 10.747 economic active population, compared to 10.048 inhabitants considered not economically active (38% men / 62% women).

Of the group of economically active population, 54% are the less educated portion, with no education or less than the first elementary years of formal education. Population with less than a high school degree is 74% of the economic active population.

Regarding the working people of Miranda, 63% are employees, 0,6% are employers and 22% are self-workers. Of the employees, 54% have formal jobs, 9% are public servers and 37% have informal jobs.

The most common jobs distributed by the working population are:

- *Agriculture, cattle grazing, forestry, fisheries and aquaculture (80% men / 20% women)*
- *Trade, repair of motor vehicles and motorcycles (59% men / 41% women)*
- *Construction (98% men/ 2% women)*
- *Public administration, social insurance (64% men / 36% women)*
- *Education (28% men / 72% women)*
- *Domestic services (2% men / 98% women)*
- *Transformation industries (80% men / 20% women)*
- *Transportation, mail, shipping (97% men / 3% women)*

2.1.6.4 RELEVANT HISTORIC CONDITIONS

2.1.6.4.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

According to the City Hall of Niquelândia[64], in 1755 was founded the São José do Tocantins district and only in 1833 it became a village. The region was discovered by Manuel Rodrigues Tomar and Antônio de Souza Bastos, who found gold by the river Bacalhau in the Trairas area in 1735.

Later, on 1903-04, the name of the city was given by the geologist Freimund Heinrich Brockes, who was looking for minerals of commercial value in the region. After finding some minerals and analyzing them in the laboratory, he concluded that they were nickel ore. It then started to be widely explored, bringing wealth and fame to the region and in 1943 the municipality receives the name of Niquelândia (“land of nickel").

Mostly used for stainless steel production, the nickel is explored since 1957 by the Níquel Tocantins Company and since 1982 by the Anglo American Company with large factories that provide jobs and income for this remote and poor region of Brazil, representing millions of Brazilian Reais for Niquelândia in taxes. According to Anglo American[65], during their implementation it was hard to find enough qualified workers for the factory locally and they had to bring people from Minas Gerais State to cover their employment needs, adding new residents to Niquelândia and opening the connection with families from other State to come to this region.

In 2016 the Níquel Tocantins Company closed its factory and marked a great impact in the community by firing 800 direct employees[66], affecting at least 8.000 inhabitants of the city considering indirect jobs and the families that were dependent on each formal worker of the company (which back then had around 30.000 inhabitants). The taxes for the municipality were also deeply affected with the company´s closure, diminishing considerably the amount of money for public policies.

Main relevance to the project: The history provides evidence about the municipality economic dependance on the nickel industries and how their activities impact the social net. The population and the municipality face difficulties developing different economic activities. The companies´ history mixes with the region´s historical development and land occupation, especially regarding the migration of people from other States to work and live in Niquelândia, starting the process of settlements like the community of Acaba Vida.

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[64] City Hall of Niquelândia. Available at: https://niquelandia.go.gov.br/historia/

[65] Anglo American Brasil. Available at: https://brasil.angloamerican.com/pt-pt/imprensa/noticias/year2012/13-08-2012a

[66] Globo G1 News. Available at: https://g1.globo.com/goias/noticia/2016/01/votorantim-anuncia-suspensao-de-atividades-em-niquelandia-go.html

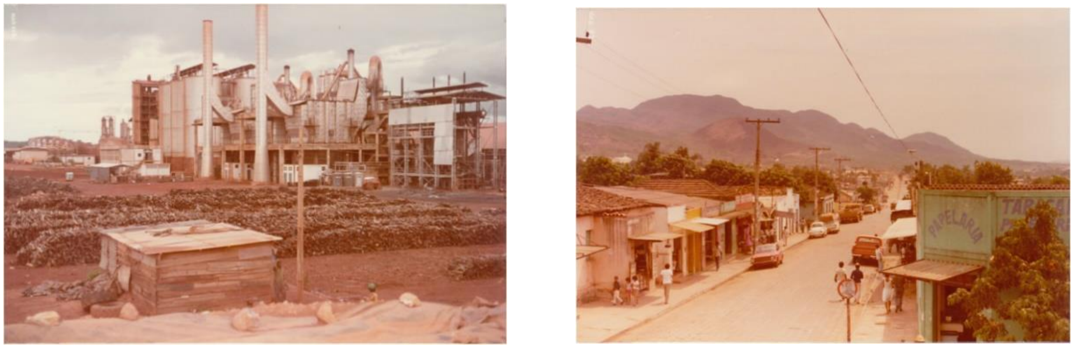


Figure 53. *Left:* Níquel Tocantins Company factory. *Right:* Niquelândia city center in 1983

2.1.6.4.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

According to the City of Rio Branco[67], the history of economic and population development in the capital of the State of Acre, begins with the exploitation of rubber trees, in the mid-1860s when the territory still belonged to the neighboring country, Bolivia. In 1882, Neutel Maia, from the State of Ceará, organized his exploration in the so-called Seringal Volta da Empresa on the side of the Acre River, in a strategic point where a huge gameleira tree (which remains in place until the present day), marked an easy reference point for trade by attracting the attention of all who passed by.

At that time, the territory was of Aquiris, Canamaris and Maneteris indigenous peoples. With the development of rubber and cattle raising, trade grew and the dispute with Bolivia resulted in the Acre Revolution, from 1899 to 1904, when the diplomat Baron of Rio Branco signed the negotiation of the Petrópolis Treaty, finally annexing Acre State to Brazil. The Brazilian advantage in the battles was linked to the geographical conditions of the river, which rises in the Andes and has its mouth in the Atlantic Ocean, with waterway supply conditions for the Brazilians, while Bolivians had to cross the mountain range to reach the battle zone. In 1912, the small regions surrounding the rubber exploitation united in the foundation of the city of Rio Branco, in honor of the Baron of Rio Branco and in 1920, it becomes the capital of the State of Acre.

In the following decade, the rubber crisis and the decline of Brazilian rubber emerged. With the planting of rubber trees in Asia, Europe stops buying from Brazil and the first cycle of rubber trade finds its sad end, leading cities to crisis and decay. Only in 1942, in World War II, when the rubber exploitation in Asia was paralyzed by the war, the Brazilian rubber returned to operation and then occurs the second cycle of rubber in the Brazilian Amazon, the so-called "rubber soldiers" that supplied allied troops in Europe. In 1946, with the end of the war and the new decline of rubber trade, agricultural production and economic diversification began in Acre.

The following decades are marked by the desperation of rubber explorers, selling their lands at low prices, and promoting the rural exodus, expanding the cities quickly and disorderly, especially Rio Branco. The period is marked by poverty, lack of public structure for the households and the fast growth of the cities, increasing pressure for illegal activities to thrive among people in vulnerable conditions. Also increasing conflicts over land, deforestation and social tension that would lead to the attack of the icon of the organization of rubber workers and the struggle of environmentalism in Brazil, Chico Mendes, in 1988.

[67]City Hall of Rio Branco. Available at: http://www.riobranco.ac.gov.br/nossa-rio-branco/

Main relevance to the project: The historic provides the knowledge about the background of land conflicts, the rise of illegal activities and deforestation, the lack of infrastructure in Rio Branco where many people live under marginalized and vulnerable conditions and the lack of formal job opportunities.

Figure 54. *Left:* Rubber tree exploitation. *Right:* Rio Branco (historical archive of the City Hall, un dated).

2.1.6.4.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

According to the City of Miranda[68], this is one of the oldest cities in Mato Grosso do Sul State, 200km away from the capital, Campo Grande. The history starts in 1580 when the Spanish Don Ruy Dias de Melgarejo funded the village of Xeres, destroyed in conflicts with the indigenous populations back then. In 1778 the Captain João Leme do Prado founded the ruins of the destroyed city and due to pressure with the conflicts with Paraguay, by the rivers Miranda and Aquidauana, he decided to build the Prison Nossa Senhora do Carmo do Rio Mondego (the old name of Miranda river).

Only in 1857 the village receives the name of Miranda and in 1865 the city suffers with the Paraguay war. In 1912 the Railway Station is built to carry the sugar cane production to São Paulo State, historical building that is preserved nowadays.

Main relevance to the project: History shows how remote and small this region is, with agricultural economy and no considerable means of development, remaining a small city since its foundation.

Figure 55. *Left:* Rail Station. *Right:* Ruins of the Sugar factory (historical archive of the City Hall, not dated).

[68] City Hall of Miranda. Available at: http://camaramiranda.ms.gov.br/historico-do-municipio/

2.1.6.5 SOCIO-CULTURAL INFORMATION

2.1.6.5.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

2.1.6.5.1.1 Niquelândia, GO

Is described here, as it is the municipality where the PAI is located.

2.1.6.5.1.1.1 Population

The following socioeconomic analyses considers data from the municipality of Niquelândia obtained through the Brazilian Institute for Geography and Statistics (IBGE). According to data from the last census (IBGE, 2010) of the municipality of Niquelândia, the population registered in the municipality was 42,361 residents (4.3 residents/km²), occupying the 24th position among the most populous municipalities in Goiás. For the year 2021, the resident population was estimated at 47,064 people, an increase of 11.10%. The demographic census points to a predominantly young population (from 10 to 19 years old) for both males and females.

According to the 2010 census, the municipality had just over 42,000 inhabitants, of which the large majority has between 10-39 years old (Figure 56). The proportions of men and women are 51% and 49%, respectively. Most families live in the urban area of the city (86%) and a small part live in the rural area of the municipality (14%).

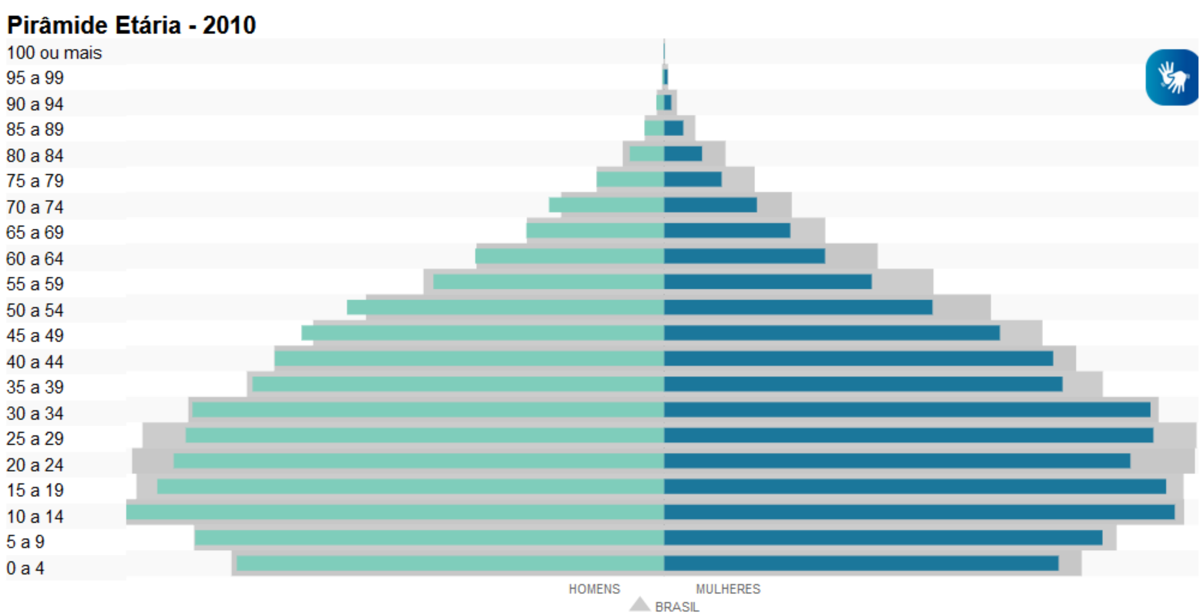


Figure 56. Age pyramid – Niquelândia/GO. Source: IBGE, 2010.

2.1.6.5.1.1.2 Health

Infant mortality rate in 2020 was 2.31 deaths (per thousand live births), ranking 148th in the state of Goiás. In the city there are 18 public establishments of the Unified Health System (SUS).

2.1.6.5.1.1.3 Education

According to the Basic Education Development Index (IDEB), the quality of learning has grown over the years (2005 to 2019). In the region, the rate is 5.4 for students in the final years of elementary school and 5.9 for the initial years of elementary school. These are averages close to the general average of the state, which is 6.0. In the state, 92% of young people aged 16 to 17 are in school. There are 28 schools in the municipality, 24 elementary schools and 4 high schools. Primary schools are 19 establishments. The Municipal Human Development Index (IDHM) for the municipality of Niquelândia is 0.715, occupying the 110th position in the ranking of Brazilian municipalities. Among the municipalities in the state, Niquelândia occupies the 69th position of 246 municipalities.

In general, the levels of education in Niquelândia are low, with the largest part of the population having less than elementary school or no formal education at all, as shown in Figure 57.

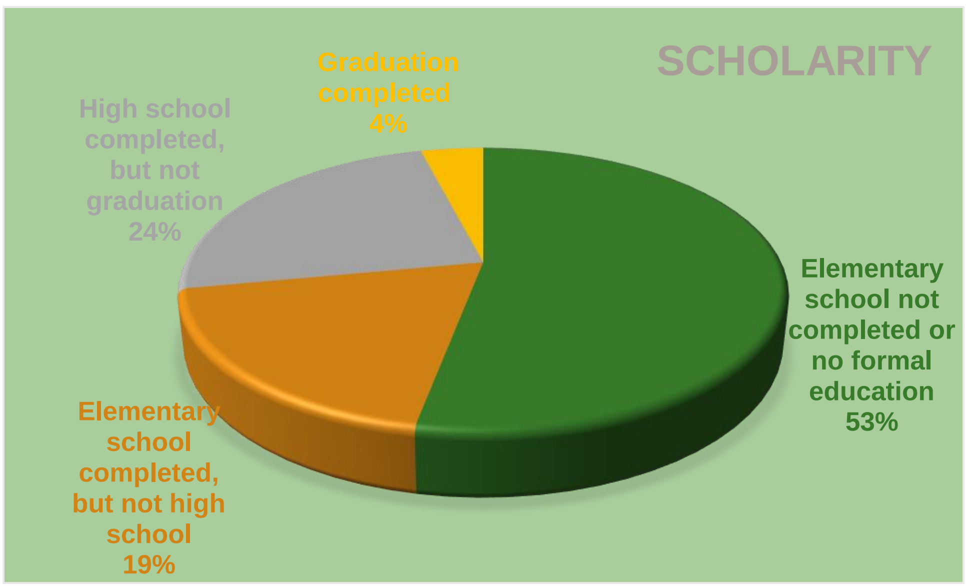


Figure 57. Scholarity in Niquelândia/GO. Source: IBGE, 2010.

2.1.6.5.1.1.4 Women

According to the Brazilian Institute for Geography and Statistics (IBGE, 2010) in Niquelândia, women are found in vulnerable and poor conditions, with a significant number of families composed by single mothers with children, almost 80% more if compared to families with both parents with children and many families (76%) living with less than a minimum wage per person/ per month (BRL 1.212,00 / ~ USD 240).

In these families counting, IBGE considers as “single mothers with children” women with the age of 10 years old or more, which supports a normalization of teenagers’ pregnancy and the lack of analyses for public policies for vulnerable young women. Also, the number of women with children that have no education or have less than the first stages (1º to 9º year) of formal school education represents 52% and less than high school education gets to 69% of women that have children in Niquelândia. Those numbers provide evidence of the young women vulnerability in the region and express large difficulties regarding access to better education and living conditions for women and their children.

2.1.6.5.1.2 Padre Bernardo, GO

After the first visit on site, it was possible to identify the city of Padre Bernardo as the most relevant for the people involved in the project´s area. Due to the hard access to the urban area of Niquelândia, which is farther than Padre Bernardo and the workers' involvement with Padre Bernardo.

2.1.6.5.1.2.1 Population

According to the Brazilian Institute for Geography and Statistics (IBGE, 2010) Padre Bernardo has 27.671 inhabitants (8,81 residents / km²) and estimated 35.011 inhabitants for 2021, with 49% women and 51% men. According to the Age Pyramid, age distribution by gender is equilibrated, with the most frequent being from 5-9 years (Figure 58). The area has 3.142,615 km² and the urban area in 2019 was only 14,4 km². The demographic census points to a predominantly young population (from 10 to 19 years old) for both males and females.

The households are a total of 8,031 and most of the population lives in rural areas (60%) while the urban areas concentrate 40% of the households. Only 22,7% of households have basic sanitation properly available.

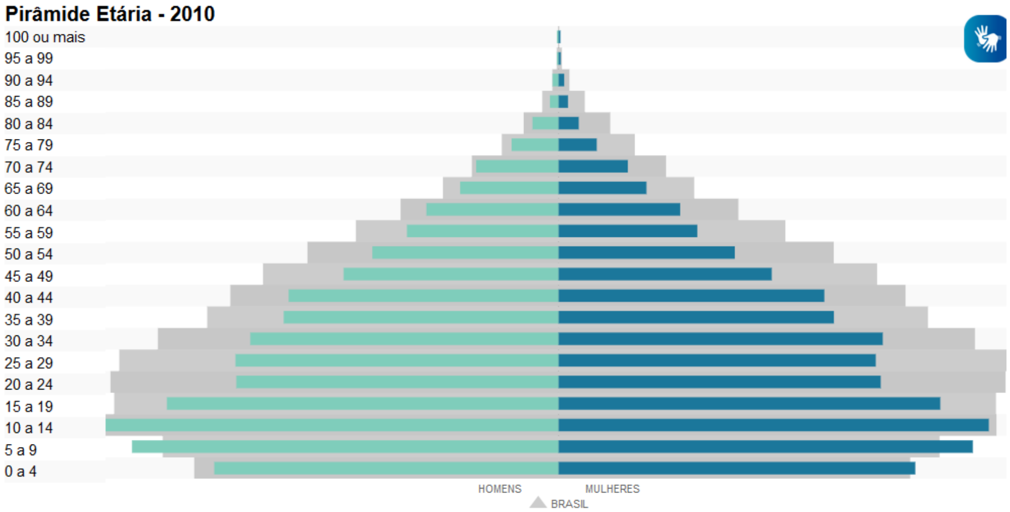


Figure 58. Age Pyramid of Padre Bernardo. Source: IBGE, 2010.

2.1.6.5.1.2.2 Economic activities

In 2019 the Gross Domestic Product (GDP) was R$18,341.43 with a Human Development Index (HDI) of 0.651 in 2010. The Gini Index (GI) regarding social inequity is 0,42 related to 0,539 of the national GI - which makes Brazil in the bottom 10 position ranking of equity in the World and being the only Latin-American country in the list with African countries.

The average salaries in Padre Bernardo of the formal workers are 2 minimum wages (R$2,200 / ~ USD 450/ per month). Only 8,1% of the population has formal jobs and 38,4% receives less than ½ a minimum wage, which is less than R$550.00 / ~ USD 100 / per month. Those numbers put Padre Bernardo as the 2040º ranking position of the 5,570 municipalities in Brazil, the 85º position from the 246 municipalities of the State of Goiás and 4º from the 7 municipalities of the region.

2.1.6.5.1.2.3 Health

Padre Bernardo has 10 units of health assistance from the National Public Health Service (Unified Health System) and no private units. Only one of the facilities has hospitalization available for the population (36 hospital beds), but no ICU (Intense Care Unit).

The infant mortality rate is 9.78 deaths per 1,000 of born alive children, occupying the 2815º ranking position from the 5,570 municipalities in Brazil, 109º from 246 in the State of Goiás and the first position in the region, compared to 7 other municipalities.

2.1.6.5.1.2.4 Education

Of the population in formal education age, 96% attend school, with almost same number of girls (51%) and boys (49%), of them, 27% also works besides attending the school. The other 4% that don´t attend formal education are 48% girls and 52% boys. From these, 60% are working and not attending formal education.

In general, 66% of the population older than 10 years old, doesn´t have the first 9 years of formal education completed (or any formal education at all). The population with elementary education completed (first 9 years) but not high school completed, are 16% and the population with full formal education completed are 15%. The graduation degree represents only 2% of the population.

The educational infrastructure of Padre Bernardo has 21 schools for elementary years (the first 9 years of formal education), 3 high schools and no higher degree education. The educational index IDEB (Basic Education Development Index) for the fundamental years is 4.8 and high school 4.7 which are aligned with the national average rate for the country (5.1 for elementary years and 4.2 for high school) but both are under the National desired score of 6/10.

In general, the levels of education in Padre Bernardo are low, with the largest part of the population having less than elementary school or no formal education at all, as shown in Figure 59.

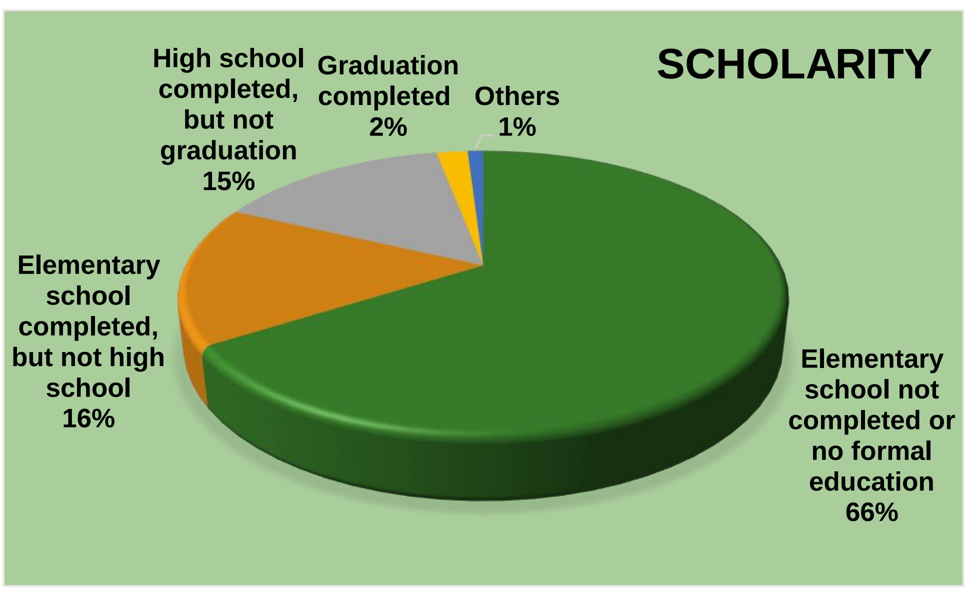


Figure 59. Scholarity in Padre Bernardo/GO. Source: IBGE, 2010.

2.1.6.5.1.2.5 Women

Regarding women not attending formal education neither working, it represents 20% of the young population of Padre Bernardo. From the women that had children, 63% didn´t complete the first 9 years of formal education or have no education at all. Those numbers, together with the average minimum wage of the population, provides evidence that young women are facing difficulties to attend both education and working opportunities in Padre Bernardo.

2.1.6.5.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

2.1.6.5.2.1 Rio Branco, AC

Is described here, as it is the municipality where the PAI 02 is located.

2.1.6.5.2.1.1 Population

The capital, Rio Branco, is the most populated city in the State of Acre, with 336.038 inhabitants, according to IBGE[69] in 2010, and an estimated population of 419.452 in 2021, with 51% women and 49% men. Having 8.835,154 km² the demographic density is 38,03 inhabitants/km². The urban area has 87,42km² and 56,7% of the households have proper basic sanitation. Of the 94.184 households, 92% are in the urban area. Water supply doesn´t reach 46,84% of the population and 78,71% also doesn´t have proper sanitation structure[70].

The age pyramid shows a young population as the largest group of people, between 10 and 39 years old (Figure 60).

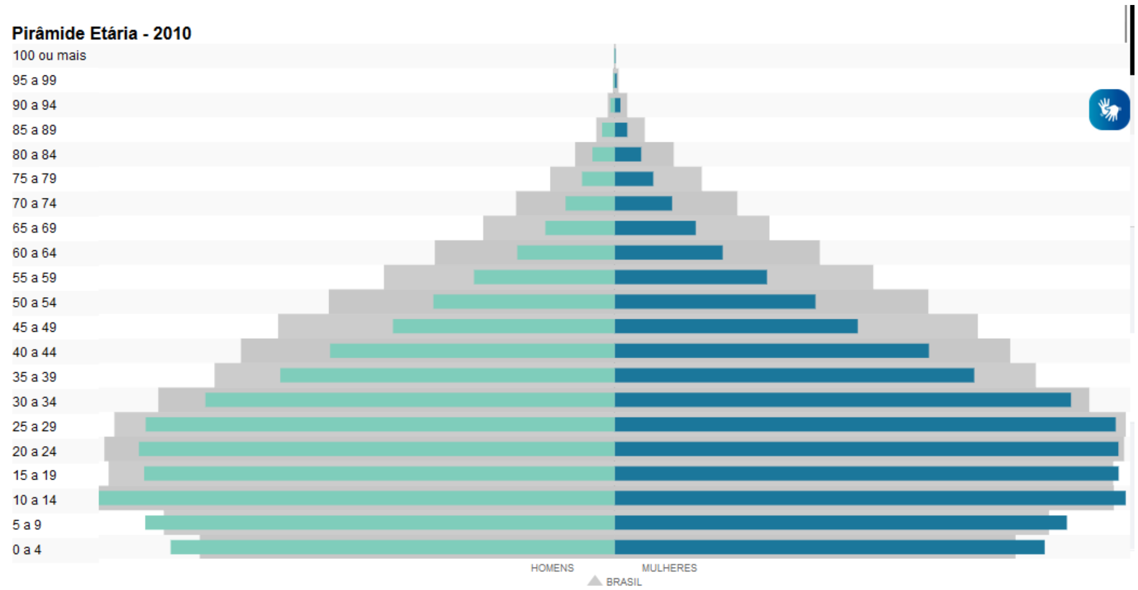


Figure 60. Age pyramid – Rio Branco. Source: IBGE, 2010.

[69] Brazilian Institute of Geography and Statistics. Available at: https://bityli.com/4Teyb
[70] Sanitation and Water Supply Institute. Available at: https://bityli.com/ZGT0E

Rio Branco is in one of the nine states that comprises the Legal Amazon area, from the Amazon biome and is monitored by the National Center for Monitoring and Alert of Natural Disasters (CEMADEN) which accounted in 2010 that 33.767 people are living in dangerous areas exposed to floods and landslides in critical levels, occupying the 38º position of the 5570 municipalities in Brazil and first in terms of households in vulnerable conditions of the 22 municipalities in the State of Acre.

2.1.6.5.2.1.2 Health

Rio Branco has 95 units of public health care with 78 beds for hospitalization and 30 ICU (Intensive Care Units) beds, according to the Transparency Portal of the State of Acre[27]. The infant mortality is 14.97 deaths per thousand of born alive babies, occupying the 1677º position of the 5570 municipalities in Brazil.

2.1.6.5.2.1.3 Education

Regarding infrastructure, Rio Branco has 91 facilities (38 private/53 public) for small children education (before elementary school), 189 facilities (39 private/150 public) for elementary school (first 9 years of formal education) and 65 facilities (no information about private and public) for high school education, and 10 graduation and higher education facilities, with 2 Federal (University and Institute) and presence of the "S" Sistem[28] with technical and vocational education. Only 14% of the schools have libraries and 25% have computer laboratories.

The illiterate population in Rio Branco is 9% of total inhabitants, people that don´t write or read with the age of 15 years old or older. Of the 273.669 inhabitants with 10 years old or older, 5% were not attending school in the analyzed period of 2010. Of those, 62% were currently working. Of the population attending school (95%), 26% were working as well.

The educational index IDEB (Basic Education Development Index) for the elementary years is 4.8 and high school 3.9 which are under the national average rate (5.1 for elementary years and 4.2 for high school) but both are under the desired score of 6/10.

In general, the levels of education in Rio Branco are low, with the largest part of the population having less than elementary school or no formal education at all, as shown in Figure 61.

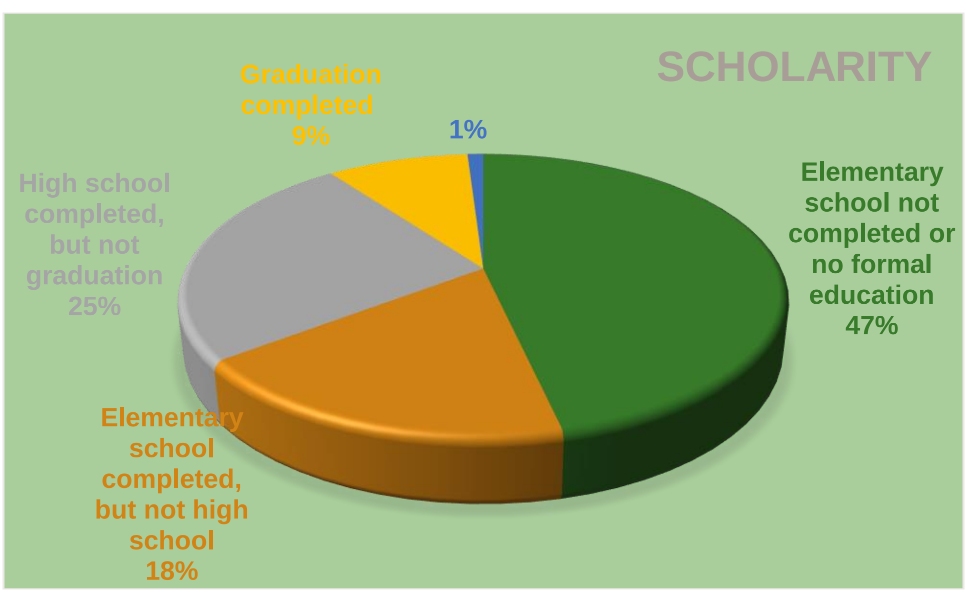


Figure 61. Scholarity in Rio Branco/AC. Source: IBGE, 2010.

2.1.6.5.2.1.4 Women

The statistics consider "women with 10 years old or older" to provide numbers about women that gave birth in the analyzed period, which demonstrates normalization and lack of analyzes regarding underage women in vulnerable situations, such as teenage pregnancy with no proper support. Numbers show that 62% of mothers are single, widowed or divorced, while 38% are married. Of those women that have children in Rio Branco, great majority (43%) have less than the elementary years of formal education or no education at all, and 60% are women that didn´t finish high school education and have children.

2.1.6.5.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

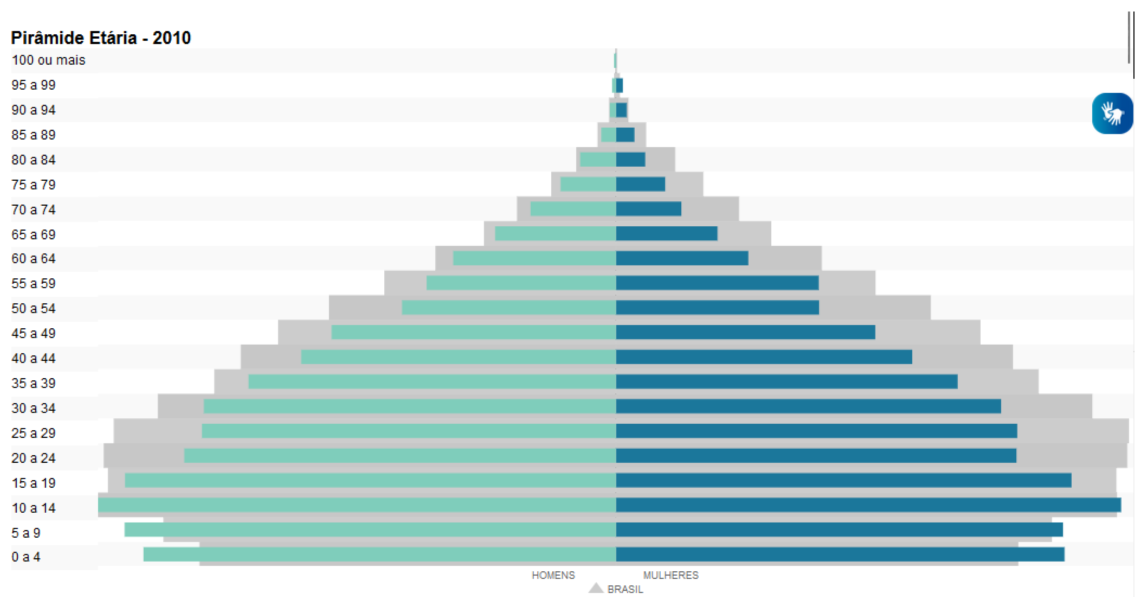
2.1.6.5.3.1 Miranda, MS

Is described here, as it is the municipality where PAI 03 is located.

2.1.6.5.3.1.1 Population

The city of Miranda in Mato Grosso do Sul State, is a small city in number of population, with 25.595 inhabitants, according to IBGE[71] in 2010, and an estimated population of 28.423 in 2021, but has a large territory with 5.471.436km². The demographic density is 4,67 inhabitants/km². The urban area has 6,8km² and 36,3% of the households have proper basic sanitation. Of the 7.091 households, 65% are in the urban area and 35% in rural area. Water supply doesn´t reach 39,79% of the population and 69,15% also doesn´t have proper sanitation structure[72].

The age pyramid shows a young population as the largest group of people are between 10 and 39 years old (Figure 62).



[71] Brazilian Institute of Geography and Statistics. Available at: https://bityli.com/89Tfl
[72] Sanitation and Water Supply Institute. Available at: https://bityli.com/Ro1Z6

Figure 62. Age pyramid – Miranda. Source: IBGE, 2010.

2.1.6.5.3.1.2 Health

According to the State Court of Accounts of Mato Grosso do Sul[73] regarding health indicators in Miranda (2014), there is 1 doctor available per 1.000 inhabitants (accounting both private and public hospitals). The city has 14 public health units and 4 private health units and 46 hospitalization beds. Miranda doesn´t count with technology for exams that need magnetic resonance, tomograph, or x-ray for bone densitometric. The infant mortality is 12,5 deaths per thousand of born alive babies, occupying the 2190º position of the 5570 municipalities in Brazil.

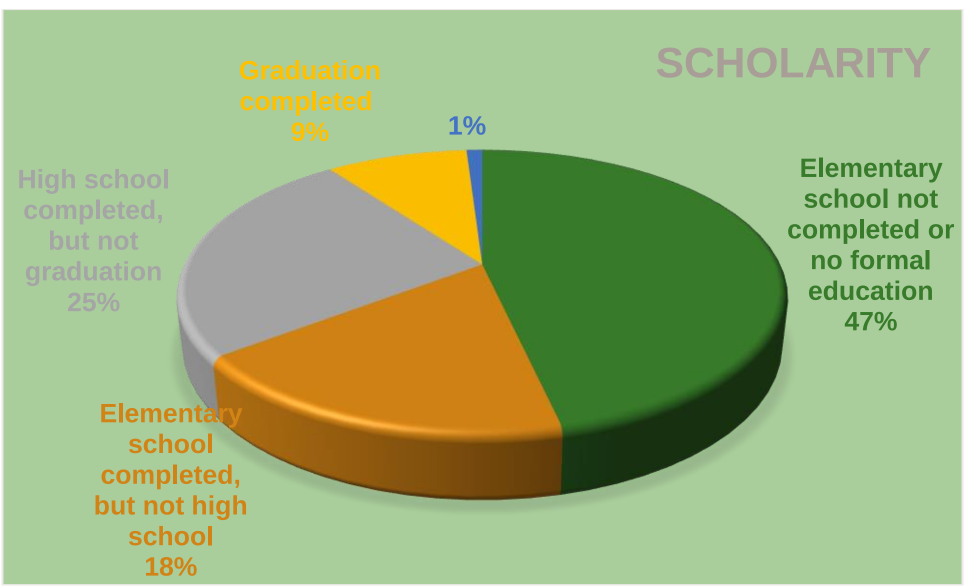
2.1.6.5.3.1.3 Education

Regarding infrastructure, Miranda has 19 facilities (4 private/15 public) for small children education (before elementary school), 18 facilities (6 private/12 public) for elementary school (first 9 years of formal education) and 8 facilities (no information about private and public) for high school education, and presence of the "S" Sistem[28] with technical and vocational education. For graduation and higher education access, Miranda has only online courses available in universities with 3 support facilities. Only 10% of the schools have libraries and 50% have computer laboratories.

The illiterate population in Miranda is 8% of total inhabitants, people that don´t write or read with the age of 15 years old or older. Of the 20.795 inhabitants with 10 years old or older, 96,3% are attending school and 48% are working as well.

The educational index IDEB (Basic Education Development Index) for the elementary years is 3,5 and high school 2,8 which are under the national average rate (5.1 for elementary years and 4.2 for high school) but both are under the desired score of 6/10.

In general, the levels of education in Rio Branco are low, with the largest part of the population having less than elementary school or no formal education at all, as shown in Figure 63.



[73] State Court of Accounts of Mato Grosso do Sul – health indicators. 2014. Available at: https://bityli.com/E2OJa

Figure 63. Scholarity in Rio Branco/AC. Source: IBGE, 2010.

2.1.6.5.3.1.4 Women

The statistics consider "women with 10 years old or older" to provide numbers about women that gave birth in the analyzed period, which demonstrates normalization and lack of analyzes regarding underage women in vulnerable situations, such as teenage pregnancy with no proper support. Numbers show that 52% of mothers are single, widowed or divorced, while 48% are married. Of those women that have children in Miranda, great majority (77%) have less than the elementary years of formal education or no education at all, and 88% are women that didn´t finish high school education and have children.

2.1.7 PROJECT ZONE MAP (G1.4-7, G1.13, CM1.2, B1.2)

The REDD Carbonflor is a Grouped Project developed to comprise the Brazilian Amazon and Cerrado biomes as a project zone (Figure 64). In Figure 65 we can see the three Project Activity Instances and also Brazilian conservation units, indigenous territories and national public forests. Figure 66 shows the project zone classified in native vegetation, non-vegetated, and other types of land use. Lastly, Figure 67 shows the Project Zone and classification of lands as public or private. REDD Carbonflor is focused on private lands.

Initially, the project has three instances of activity, namely:

- PAI 01, located in the municipality of Niquelândia, state of Goiás, about 100 km from the capital of Brazil, Brasília. The property is in the Cerrado biome and comprises a total area of 4,092 ha.
- PAI 02, located in the municipality of Rio Branco, capital of the state of Acre. The property is located in the Amazon biome and has a total area of 10,063 ha.
- PAI 03, located in the municipality of Miranda, state of Mato Grosso do Sul, has a total area of 36,909 ha and is located in the Cerrado biome.

In addition, the Project Zone includes the communities Acaba Vida, identified in Section 2.1.8, whose population will benefit from project activities.

The high conservation value (HCV) areas determined to climate, community and biodiversity benefits will be delimited by the Projects Activity Instances added in the project, into the Project Zone limits.

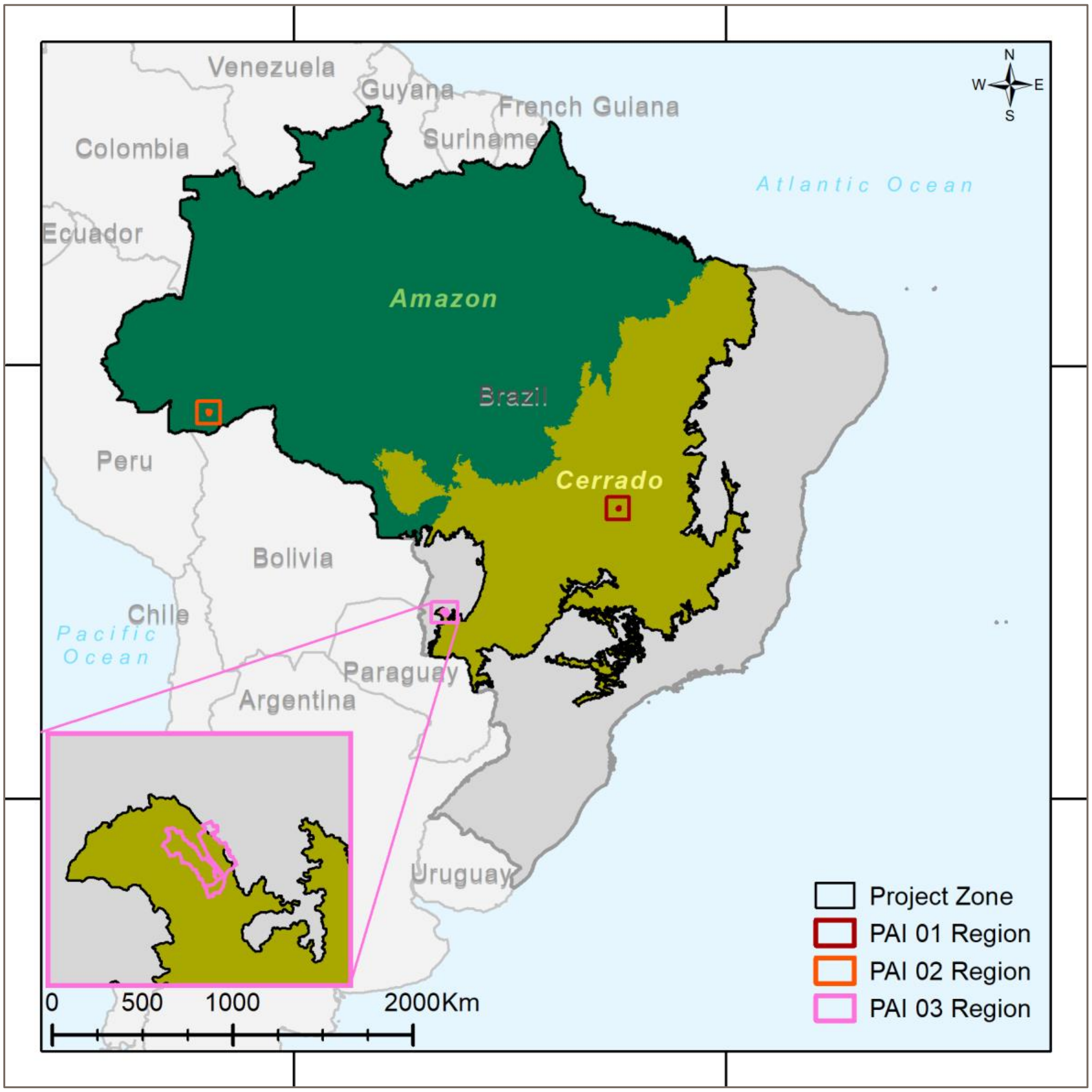


Figure 64. Project Zone

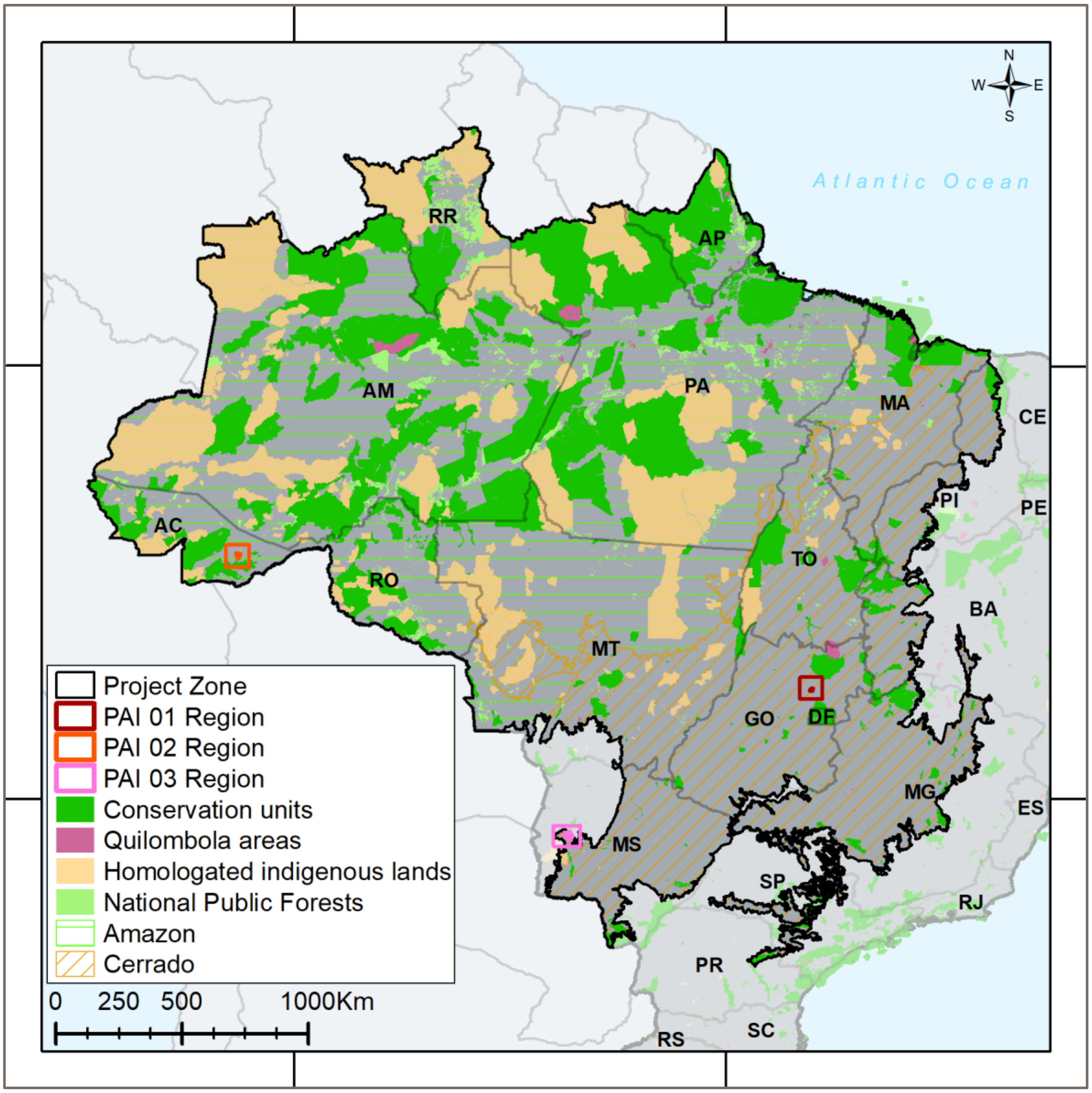


Figure 65. Project zone with divisions of traditional indigenous and quilombola communities, conservation units, and national public forests.

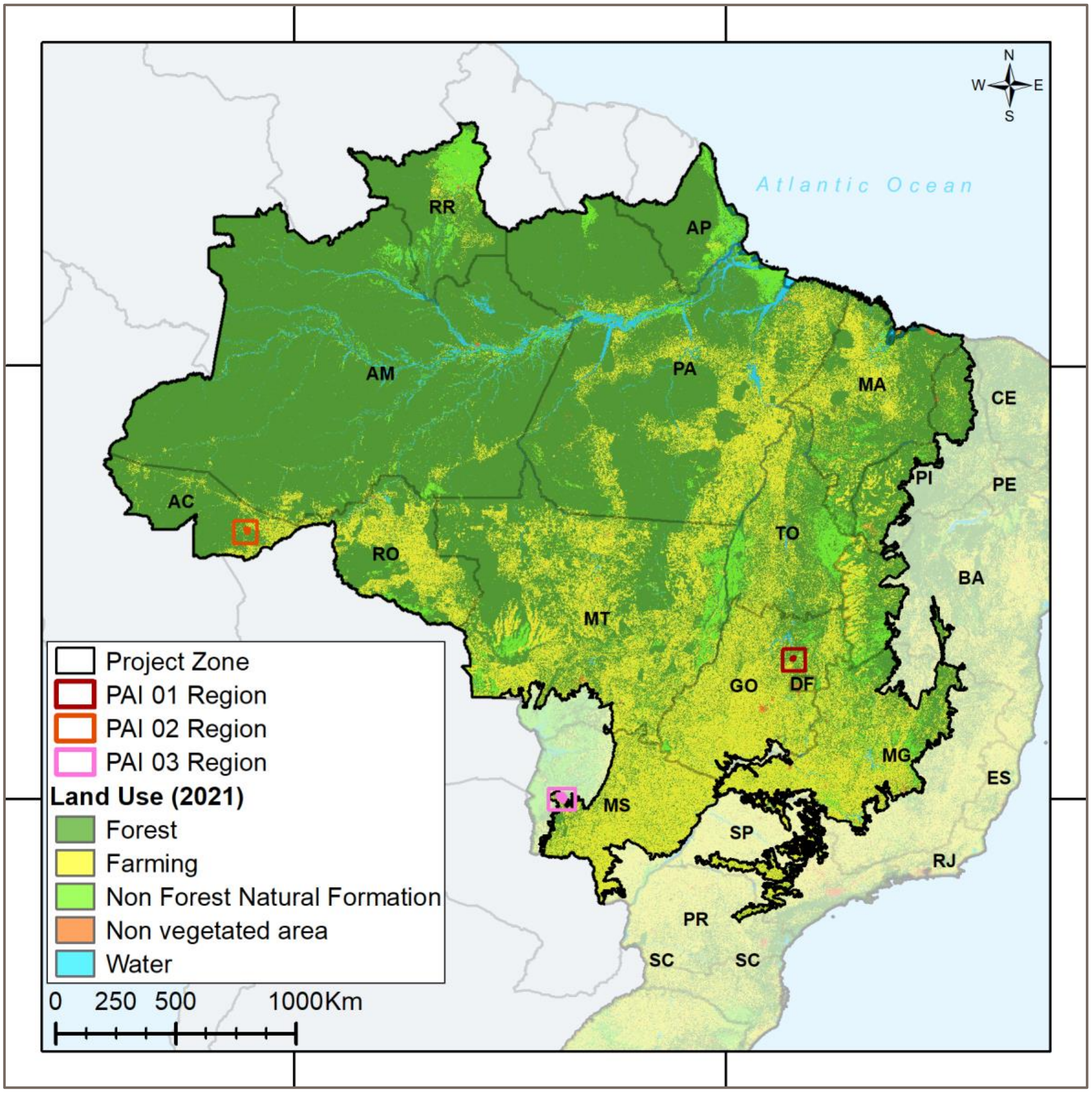


Figure 66. Project zone with divisions of areas with native vegetation, non-vegetated, and other types of land use.

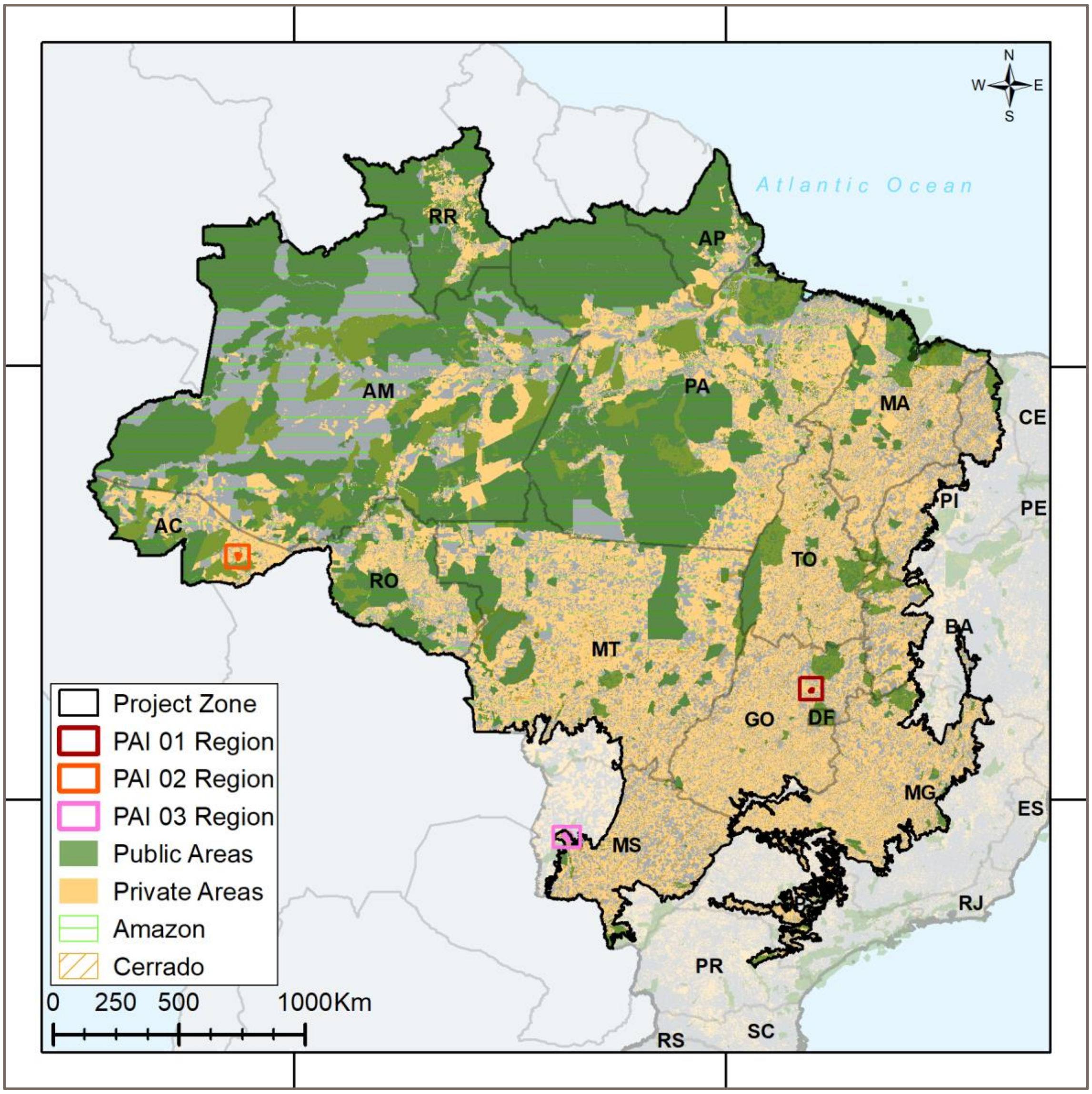


Figure 67. Project zone with divisions between public and private areas.

2.1.7.1 PAI 01 – FAZENDA SERRA (NIQUELÂNDIA, GO, BRAZIL)

Figure 68 and Figure 69 below show PAI 01, Serra Farm, which is in the southern portion of Niquelândia. The property is located within 50km of the boundaries of Padre Bernardo and Mimoso de Goiás municipalities and has a Rural settlement west of it (PA Acaba Vida).

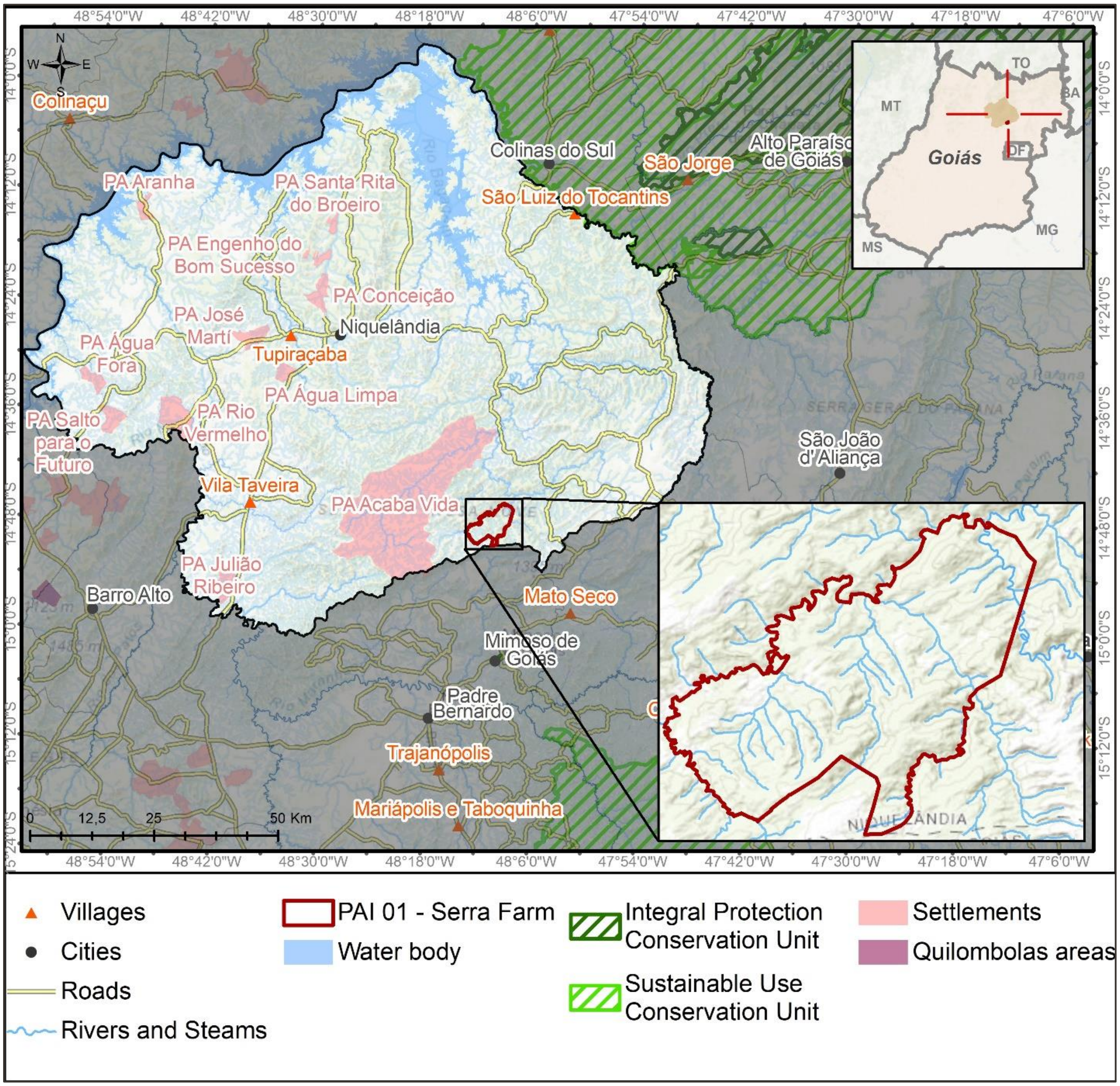


Figure 68. PA01 Project activity instance (PAI 01) location and context

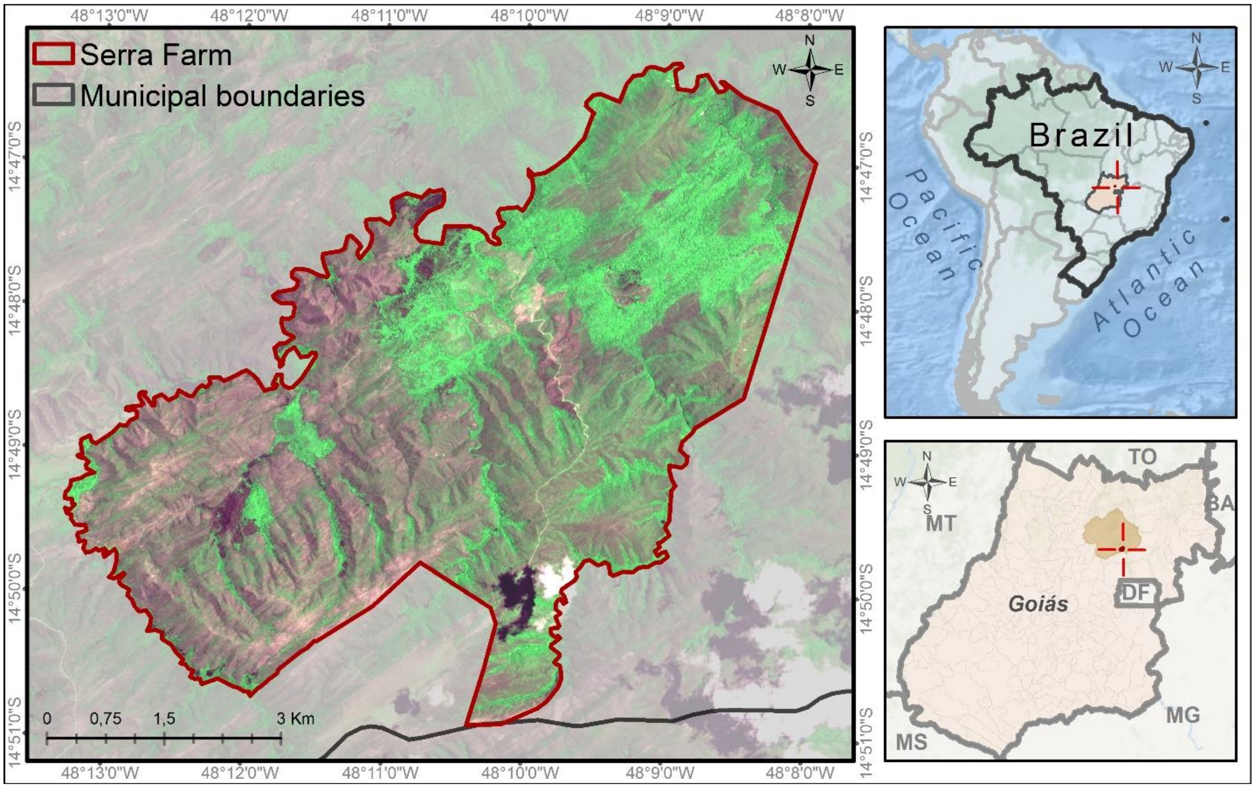


Figure 69. Project activity instance (PAI 01) and municipal boundaries.

2.1.7.2 PAI 02 – FAZENDA BOM DESTINO (RIO BRANCO, AC, BRAZIL)

Figure 70 and Figure 71 show PAI 02, Bom Destino Farm, which is in the west portion of Rio Branco. The property is located within approximately 95 km from the urban area of the city and has two Rural settlement northwest and northeast of it (PA Oriente and PA Figueira).

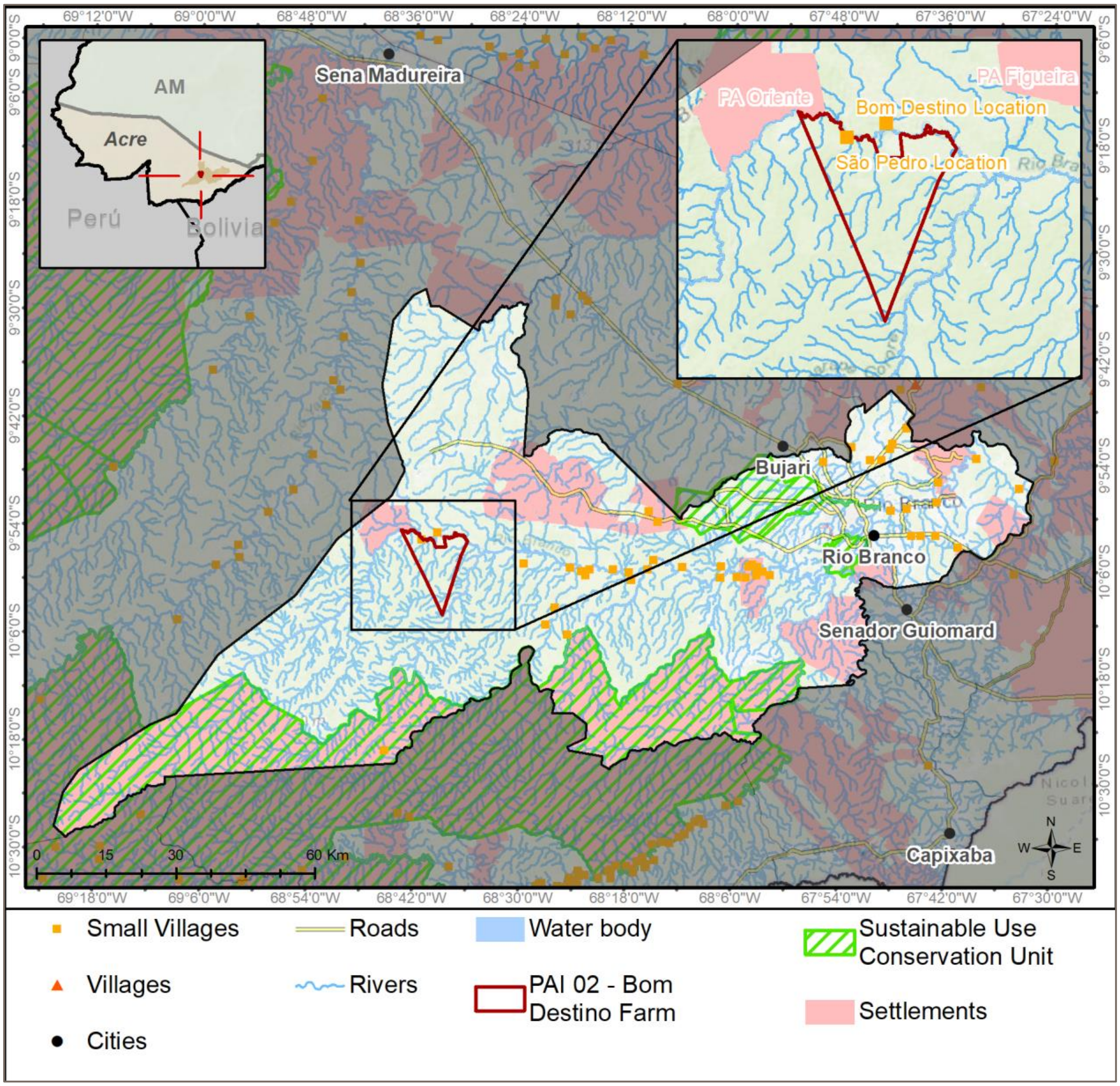


Figure 70. PAI 02 Project activity instance (PAI 02) location and context.

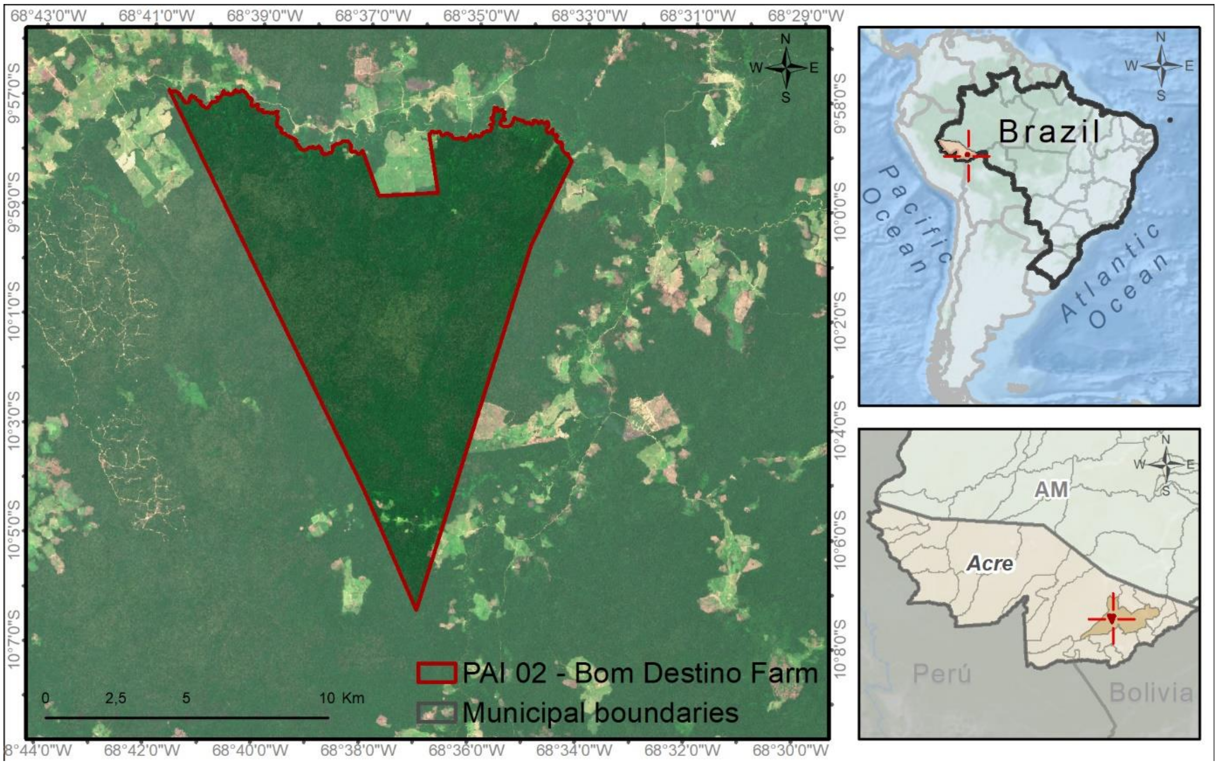


Figure 71. Project activity instance (PAI 02) and municipal boundaries.

2.1.7.3 PAI 03 – FAZENDA BODOQUENA (MIRANDA, MS, BRAZIL)

Figure 72 and Figure 73 show PAI 03, Bodoquena Farm, which is in the northwest portion of Miranda. The property is cut by highway 262, and is located near the municipalities of Corumbá, Bodoquena and Aquidauana. There are no communities near the area.

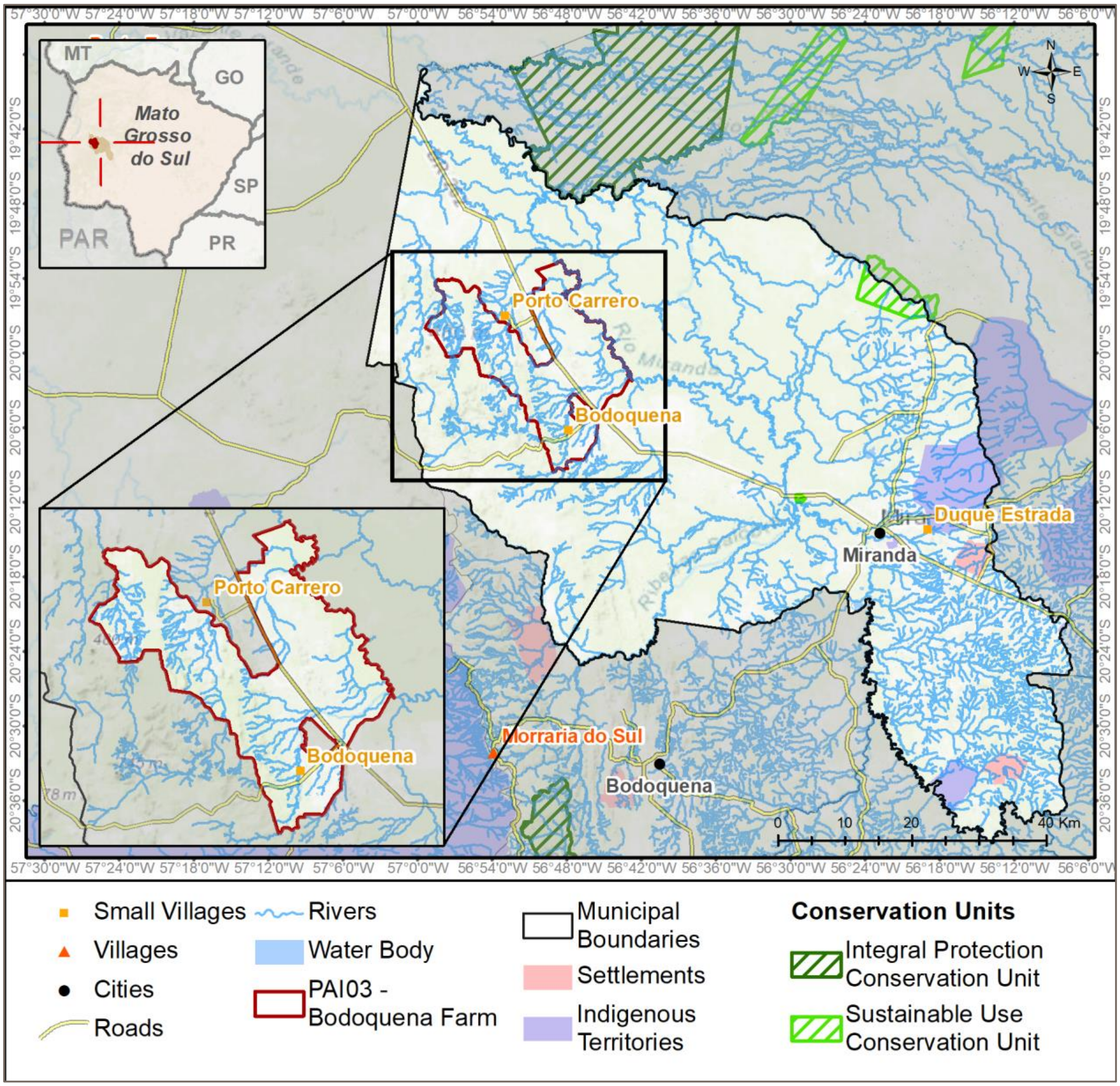


Figure 72. PAI 03 Project activity instance (PAI 03) location and context.

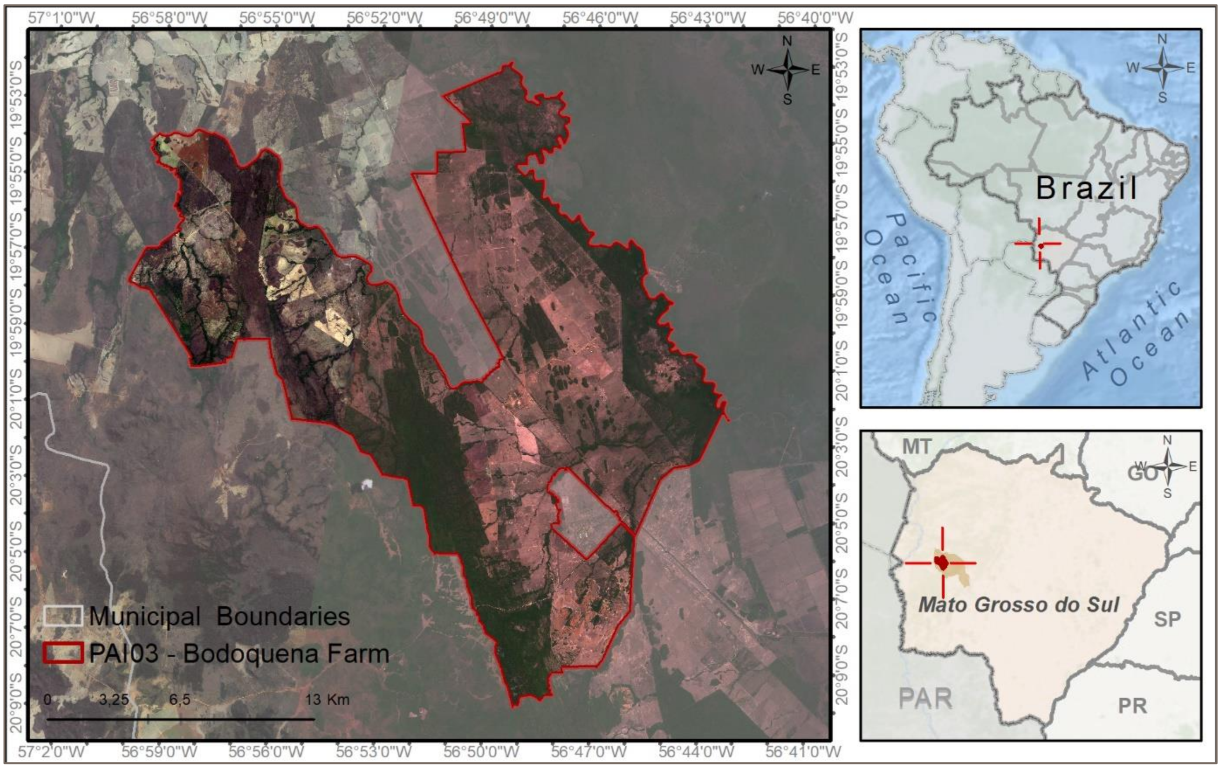


Figure 73. Project activity instance (PAI 03) and municipal boundaries.

2.1.8 STAKEHOLDER IDENTIFICATION (G1.5)

The first step in stakeholder identification is to find traditional populations such as indigenous communities, quilombolas remnants, conservation units and other self-identified groups with relevant features to be identified as different community groups. For this, we used the database described in section 2.1.6.1, where we searched for Traditional Populations, conservation units, as well as rural smallholder settlements within the distance of 20 km from the project area. This was done according to the VCS Verra Standard - AFOLU Non-Permanence Risk Tool V4.0 understanding that a 20km buffer is enough distance where populations are reliant on the project area, such as for essential food, fuel, fodder, medicines or building materials.

The second step consists in the application of questionnaires and interviews throughout the stakeholders by phone and in the field during site visits, to understand their socioeconomic conditions and most importantly how (and if) they differ from each other, recognizing themselves as different community groups and therefore with different representatives. In this step, it is possible to classify the community groups as per their similar culture, features, and way of living, besides its location, depending on their size and relevance to the project, with special attention to those in marginalized or vulnerable conditions.

Other stakeholders are also identified, such as Universities, Associations, Institutions, NGOs representatives from the private sector, regional and local authorities willing to participate as representatives within the community and/or as partners in social and environmental projects with the community´s groups (Table 5).

Table 5. Stakeholder identification (Appendix 1: Stakeholder identification table)

Type	Identification	Special features	Relevance to the Project
A	Traditional Populations living within 20km from the project´s area	Recognized by federal regulation as a Traditional Population such as Indigenous and Quilombolas communities.	These stakeholders are highly relevant in the project to control and combat deforestation with activities based on sustainable practices with the forest. Have the potential to receive social and technical assistance.
B	Community groups within 20km from the project´s area, affected directly or indirectly by the project	Location, size, similar features and self-identified as a community group, but not under the Traditional Populations federal regulation classification	These stakeholders are highly relevant in the project to control and combat deforestation with activities based on sustainable practices with the forest. Have the potential to receive social and technical assistance.
C	Other stakeholders: within 20km from the project´s area, affected directly or indirectly by the project	Subgroups not self-identified as a community in its complexity, but having its own representative	These stakeholders are highly relevant in the project to control and combat deforestation with activities based on sustainable practices with the forest. Have the potential to receive social assistance.
D	Other stakeholders: marginalized and vulnerable subgroups, within 20km from the project´s area, affected directly or indirectly by the project	Subgroups identified as marginalized and/or in vulnerable conditions	These stakeholders are highly relevant in the project to control and combat deforestation with activities based on sustainable practices with the forest. Has the potential to receive social assistance.
E	Other stakeholders: Companies / Institutions / Associations / Cooperatives / NGOs	Private sector, associations and non-profitable organizations acting locally	These stakeholders are of medium importance in the project, for possible partnerships, as well as technical assistance.
F	Other stakeholders: Regional and local authorities	Community´s legal representatives and public sector	These stakeholders are of medium importance in the project for the implementation of public policies, as well as technical assistance.
G	Other stakeholders: University and educational representatives	Teachers and managers in Education area	These stakeholders are of medium importance in the project, for possible partnerships for research, as well as technical assistance.

2.1.9 STAKEHOLDER DESCRIPTIONS (G1.6, G1.13)

The following descriptions of each stakeholder identified for each PAI, classified according to stakeholder type as per listed in Stakeholders Identification table.

2.1.9.1 PAI 01 – FAZENDA SERRA (NIQUELÂNDIA, GO, BRAZIL)

There are no community´s groups living inside the project area, and the settlement of Acaba Vida is the closest community that fits the CCB definition. No Traditional Populations, such as indigenous communities and quilombolas remnants were found within the 20km radius from the PAI 01 area. That information was checked by official secondary sources and confirmed during the site visit.

For the proximity of the community with the project area the ecosystem services provided by the conservation of the project area will positively affect this population, besides the social projects that can be developed with them. On the other hand, any environmental damage that occurs in the PA would also affect the community, such as a wildfire and any contamination in the soil would affect the quality of the water that the community uses. For those possibilities of impacts the community of Acaba Vida is considered the main stakeholder that the project aims to work with to mitigate possible negative impacts and increase co-benefits (Table 6).

Table 6. Stakeholder Description – PAI 01

Type	Stakeholder	Contact
	Padre Bernardo	
F	Padre Bernardo City Hall	Joseleide Lazaro Luiz da Silva gabinetepb2021@padrebernardo.go.gov.br
F	Office of Administration, Government, Planning and Public Security	Leandro José Camilo de Faria admpb@padrebernardo.go.gov.br
F	Office of Social Assistance and Housing	Andressa Franciele Rodrigues da Silva semas@padrebernardo.go.gov.br
F	Office of Education, Culture, Sport and Leisure	Fernando Francisco dos Santos sec.educacao.pb@padrebernardo.go.gov.br
F	Office of Environment	Daiana Monteiro Cavalcante semapb@padrebernardo.go.gov.br
F	Office of Health	Vilmar de Jesus sec.saudepb@padrebernardo.go.gov.br
F	Office of Youth, Sports and Tourism	Fabiana Soares de Jesus turismo@padrebernardo.go.gov.br
F	Administration Office of the District of Trajanópolis and Settlements	Ednaldo Ferreira dos Santos admpb@padrebernardo.go.gov.br
F	Office of Transportation, Construction and Public Services	Fabiano Rodrigues da Silva secretariadeobraspb@padrebernardo.go.gov.br
F	Office of Agriculture and Livestock	Edson Antônio de Castro sec.agri2@padrebernardo.go.gov.br

E	NGO – Support Nucleous for People with Cancer Marta Morais	Tatiane Morais 61 9601-9435
E	Rural Workers Union of Padre Bernardo and Mimoso de Goiás	strpbmgo@hotmail.com
	Niquelândia	
F	City Hall Office	Nubiana de Fátima Nolasco Silva (62) 98457-1537 gabinete@niquelandia.go.gov.br governo@niquelandia.go.gov.br
F	Office of Environment	Andre Rosa de Aguiar (62) 98489-3670 meioambiente@niquelandia.go.gov.br
F	Office of Education	Wesley Campos Gomes Soares (62) 3354-1062 educacao@niquelandia.go.gov.br
F	Tourism Office	Roneide Pereira da Silva (62) 99803-3248 turismo@niquelandia.go.gov.br
F	Office of Agriculture	Rodolfo Luiz Braz Braga (62) 99839-0176 agricultura@niquelandia.go.gov.br
F	Office of Health	**Heider Braz de Lima** 62 99604-7332 fms@niquelandia.go.gov.br
F	Office of Roads and Public Construction	**Lucas Souza Moraes** 62 99658-9959 transporte@niquelandia.go.gov.br
E	EMATER Goiás – Serra da Mesa	+55 (62) 3354-3665
E	EMBRAPA – Recursos Genéticos e Biotecnologia	+55 (61) 3448-4700
E	EMBRAPA – Café	+55 (61) 3448-4378
E	EMBRAPA - Agroenergia	+55 (61) 3448-4246
G	SENAR National Service for Rural Learning	Priscila (62) 34122700
G	SEBRAE	José Carlos do Nascimento (62) 3354-1180

	Brazilian Service to Support Micro and Small Businesses Niquelândia	niquelandia@sebraego.com.br
G	Sesi Senai Niquelândia	Thiago Vieira Ferri (62) 98405-4298 thiago.senai@fieg.com.br
E	Educational Institute Tiradentes	Manoel Alves Gomes Junior (62) 996351664 mjtiradentes@gmail.com
G	FAEG Federation of Agriculture and Livestock of Goiás	Eduardo Veras de Araújo (62) 30962200 Diego Pereira Coelho da Silva (62) 99856-3097 niquelandia@sistemafaeg.com.br
G	UEG State University of Goiás	Cássia Monalisa dos Santos Silva cassia.silva@ueg.br
E	EMBRAPA Brazilian Agricultural Research Company	Márcia Gonzaga (62) 3533-2236 marcia.gonzaga@embrapa.br
	PA Acaba Vida	
B	Assentamento Acaba Vida – Subgroup Machadinho	Elected Representatives: 62 999268769 – Luana Vitória 62 991750991 - Paulo Sérgio
B	Assentamento Acaba Vida – Subgroup Acaba Vidão	Elected Representatives: 62 996156333 – Elizabeth 61 996429558 – André Luiz
B	Assentamento Acaba Vida – Subgroup Acaba Vida	Elected Representatives: 62 999147382 - Adélio 62 998107585 - Patrícia

2.1.9.2 PAI 02 – FAZENDA BOM DESTINO (RIO BRANCO, AC, BRAZIL)

No Traditional Communities such as quilombolas and indigenous were found in the 20km radius of PAI 02. The settlements within 20 km radius from PAI 02 are: Fiqueira and Itamaraty. Also, another settlement, called Oriente, of the neighbor municipality Sena Madureira. The Conservation Unit Extractivist Reserve (RESEX) Chico Mendes is also within the 20km radius from the PAI 02.

The most relevant community´s sub-group that was found, consists in riverside isolated households, that live in the project´s area surroundings and are dependent on the project´s area for their food supply and income needs (Table 7).

Table 7. Stakeholder Description – PAI 02

Type	Stakeholder	Contact
	Rio Branco	
F	Office of Civil City Hall	Valtim José da Silva (68) 3212-7030 casa.civil@riobranco.ac.gov.br
F	Office of Health	Sheila Andrade (68) 3224-4269 / 3224-2507 | Gabinete.semsa@riobranco.ac.gov.br
F	Office of Education	Nabiha Bestene Koury (68) 3211-2400 ou 3211-2448 | nabiha.bestene@riobranco.ac.gov.br
F	Office of Environment	Carlos Alberto Alves Nasserala (68) 3228-2894 | semeia@riobranco.ac.gov.br
F	Office of Agriculture and Livestock	Eracides Caetano De Souza (68) 3225-2110 | eracides.souza@riobranco.ac.gov.br
F	Office of Social Assistance and Human Rights	Marfisa de Lima Galvão (68) 3211-2460 / 3221-6019 / 3211-2453 gabinete.sasdh@riobranco.ac.gov.br
F	Office of Economic Development, Tourism, Technology and Innovation	Neiva Tessinari neiva.tessinari@riobranco.ac.gov.br
F	Office of Administrative Management	Dr. Jonathan Santiago 3222-7736 | dougllas.souza@riobranco.ac.gov.br
F	Attorney´s Office	Joseney Cordeiro da Costa joseney.costa@riobranco.ac.gov.br
F	Culture, Sports and Leisure Foundation	Pedro Henrique Aragão (68) 3224-0899 / 3224-0269
G	SENAR – Rio Branco	senar@senarac.org.br (68) 3224-1797 / (68) 3223-4886
G	SESI - Rio Branco	(68) 3901-4490 /4499
G	SENAC	(68) 3213-3000 – Bosque Unit (68) 3301-5868 – Palácio do Comércio Unit
G	SEBRAE	7º Bec, Avenida Ceará 3693 0800 570 0800
G	Acre Federal University (UFAC)	(68) 3901-2500
G	Acre Federal institute (IFAC)	José Claudemir Alencar do Nascimento proad@ifac.edu.br

		(68) 3302-0804
F	EMBRAPA	Eufran Amaral Eufran.amaral@embrapa.br
F	Climate Change and Environmental Services Regulation Institute	Leonardo das Neves Carvalho gabinete.imc@ac.gov.br / imc.gabinete@gmail.com
E	SOS Amazônia	Miguel Scarcello (68) 999843743 miguel@sosamazonia.org.br

2.1.9.3 PAI 03 – FAZENDA BODOQUENA (MIRANDA, MS, BRAZIL)

An indigenous traditional community was identified, not inside the project area, but within the 20km radius from the pai 03, the Kadiweu people. A state park called Pantanal do Rio Negro is also within the 20km radius from PAI 03.

This farm also has another kind of stakeholders, that are the farm´s employees who live inside the property, in different areas from the carbon project activities (Table 8).

Table 8. Stakeholder Description – PAI 03

Type	Stakeholder	Contact
	Miranda	
F	Office of Civil City Hall	Michel Roger Freddi (67)3242-1508 prefeitura@miranda.ms.gov.br
F	Office of Government	Ney Pinheiro segov.miranda22@gmail.com (67)99917-1694
F	Office of Health and Sanitation	Rosimeire Lopes de Souza (67)3242-2822 abasicamiranda@gmail.com
F	Office of Education	Evanir Duarte (67)3242-2335 educamir@gmail.com
F	Office of Households	Katia Gissele Acunha (67)3242-1508 habitacao@miranda.ms.gov.br
F	Office of Environment	Priscila Alonso de Oliveira 67-32422137

		miranda.meioambiente@gmail.com
F	Office of Agriculture and Rural Development	Assumpção Junior 67-99835-4506 secretariadeagricultura.miranda@gmail.com
F	Office of Social Assistance and Work	Carmem Triches assistencia@miranda.ms.gov.br (67)3242-2822
F	Office of Sports and Leisure	Dino Manoel da Silva (67)3242-3003 semelesportemiranda@gmail.com
F	Office of Administrative Management	Camila Mussato (67)3242-1508 planejamento@miranda.ms.gov.br
F	Office of Indigenous Interests	Lindomar Ferreira (67)3242-1508 prefeitura@miranda.ms.gov.br
F	Office of Tourism and Culture	Celso Moraes de Souza (67)3242-2471 sec.turismomeioambiente@gmail.com
F	Office of Sustainable Development	Suellen Cristini do Rosário (67)99915-5686 prefeitura@miranda.ms.gov.br
F	Office of Construction and Urban Services	Adilson José Saraiva (67)99826-5180 secretariadeobras.miranda@gmail.com
F	Office of Administration and Finance	Luis Carlos Pereira (67)3242-1508 adm.miranda@gmail.com
F	Office of Controlling	Luis Felipe Florença (67)3242-1508 controladoriamirandams@gmail.com
E	Rural Union of Miranda and Bodoquena - SENAR	Massao Ohata (67) 3242-1266 sindruralnovamirandabodoquena@gmail.com
G	SESI	(67) 9 9228-0075 / 0800 723 7374 sac@sesims.com.br

E	Salobra Project	(67) 99983-4906 projetosalobrams@gmail.com

2.1.10 SECTORAL SCOPE AND PROJECT TYPE

The sectoral scope applied for the REDD Carbonflor is Scope 14 - Afforestation, reforestation, and other land uses (“AFOLU”), specifically under the Reducing Emissions from Deforestation and Degradation (“REDD”) - Avoided Unplanned Deforestation and Degradation (“AUDD”) + Avoided Planned Deforestation (“APD”) - project categories. This is a multi-activity grouped project.

2.1.11 PROJECT ACTIVITIES AND THEORY OF CHANGE (G1.8)

The REDD Carbonflor promotes the conservation of forests located in the Cerrado and Amazon biomes. Such conservation will be undertaken in private properties where there are uncontested land rights and land tenure is resolved. Project activities will focus on avoiding conversion (both APD and AUDD), providing significant environmental benefits, such as maintenance of habitat for biodiversity, contributing to water quality through conservation of riparia areas, and avoidance of emissions, thus contributing to climate change mitigation. Furthermore, the project will have a proactive role in involving local communities to better understand the project and how it can benefit such communities. The community benefits will be designed in consultation and jointly with the communities.

REDD Carbonflor aims to mitigate the effects of climate change by reducing GHG emissions from deforestation and forest degradation, adopting measures that halt deforestation and forest degradation factors, and reducing the loss of forest cover. The **expected results** include a decrease in illegal logging, restoration of degraded forests, reduction of forest conversion to other land uses, and maintenance of forest carbon stocks over time.

By promoting the conservation of native forests, the REDD Carbonflor project will contribute (i) to the development of economic alternatives compatible with community well-being and nature conservation; (ii) conservation of forest connectivity protection, as well as structure, associated composition, functional attributes, and high conservation value, compared to baseline conditions.

To ensure the provision of the cited benefits, the project activities to be developed and implemented include (i) stimulating the development of legal economic alternatives and associated business plans that promote biodiversity protection, (ii) management and improvement of conservation systems for native forests and their biodiversity, (iii) support in land use planning, land legalization, and mechanisms to ensure the sustainable development of the communities concerned, (iv) to contribute to technological development and innovation for the monitoring and conservation of forests and biodiversity present in the Cerrado and Amazon biomes.

The expected GHG reductions from the project will change over time with the inclusion of other PAIs, but considering the three PAIs initial, the project’s avoided emissions correspond to an annual average of 103,401.80 tCO_2eq, therefore, for the lifespan of the project, 30 years, it will potentially generate emission reductions of up to 3,102,054.14 tCO_2eq (not accounting for leakage and buffer).

The diagram below identified the roles of each actor involved in REDD Carbonflor. ECCON as the project proponent has a management role and of promoting conservation and community activities with local actors. The landowners will join the project and have an active role in conservation, while the Local communities will be positively impacted by the project activities.

Figure 74. Roles of project participants in REDD Carbonflor

In the diagram below, it is possible to see the Climate, Community and Biodiversity impacts in the current and business as usual scenario vis a vis with the implementation of REDD Carbonflor. It is important to note that the Project's positive impacts increase as it gains scale, and we include new PAIs.

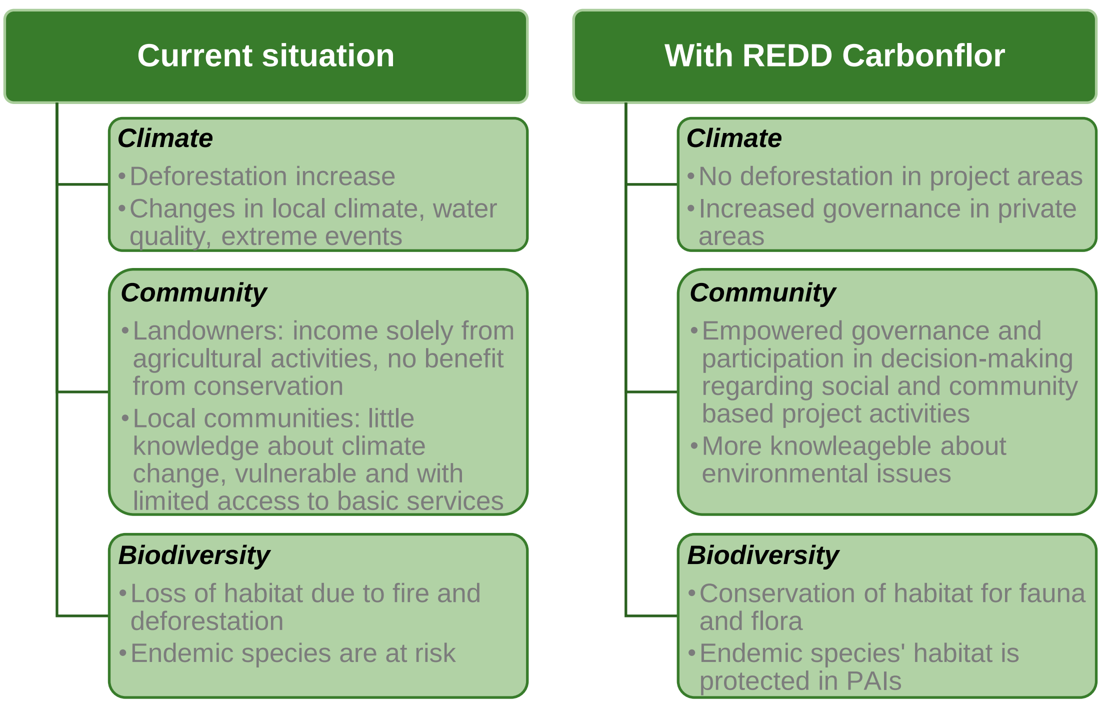


Figure 75. Diagram that summarizes impacts to Climate, Community and Biodiversity in the Current Situation and with the implementation of REDD Carbonflor

The predicted climate, community and biodiversity benefits of the project using the so-called Change Theory. Table 9 shows the change in the causal model that explains how its activities will be carried out. The basic framework of the project, with its phases, activities, outputs, outcomes, and impacts, is provided here. The table below was designed using the SBIA Guidance (Richards, M. and Panfil, S.N. 2011. Social and Biodiversity Impact Assessment (SBIA) Manual for REDD+ Projects: Part 1 – Core Guidance for Project Proponents. Climate, Community & Biodiversity Alliance, Forest Trends, Fauna & Flora International, and Rainforest Alliance. Washington, DC.) for establishing a theory of change. Through project activities we will help conserve at risk carbon stocks, and generate Climate, Community and Biodiversity benefits. A first version of the timeline of these activities is provided in Appendix 2: Project activities and theory of change table. The timeline can be revisited during the installation phase of the Project.

Table 9. Theory of change of the REDD Carbonflor

Activity description	Expected climate, community, and/or biodiversity			Relevance to project's objectives
	Outputs (short term)	**Outcomes (medium term)**	**Impacts (long term)**	
Management				
Signing of 30-year conservation agreements (ECCON+ Landowners)	One 30-year contract signed for each PAI	Increased forest protection, as conservation generates returns for landowners	Improved carbon stocks in protected forests, contributing to climate change mitigation, habitat for biodiversity and improved water quality where PAIs include riparian forest areas. Project enables environmental outcomes with communities	Very high. Project stimulates conservation through long term commitments of forest protection, generating cashflow from conservation. This improves and stimulates conservation activities, which contribute to climate change mitigation, through deforestation reduction, maintenance of habitat for fauna and flora.
Forest monitoring for degradation and deforestation (ECCON)	Annual monitoring of project areas within PAIs	Reduction of deforestation pressure and possibility of actively mitigating risks		
Measurement of biomass through forest inventory (ECCON)	Inventory plot s according to methodology for each PAI	Better estimates of carbon stock in PAIs		
Introduction of voluntary fire brigades	Training of local actors on the importance of firefighting and techniques	Improved interaction among local actors, and increased efficiency in firefighting. Improved and more resilient communities.	Improved control of wildfires, resulting in lower incidence of widespread and uncontrolled fires. Community participation in firefighting strengthens the community.	
Community				
Workshops with the Community for design and implementation of the project	Create a participatory space, where the community feels they are considered and listened in the decision-making process	The project brings opportunities for the community to develop	Opportunity: Increase in the capability of the Project to generate jobs and income in short and long term for the community	Very high as it generates positive impacts in the community's well-being
Participatory conceptions and implementation of social projects	The Community and the team work together to design the community´s needs and what it´s possible to achieve.	The community and the project build trust in each other to be able to develop and monitor the social projects	Security: The benefits are fairly distributed and both parts benefit from the development of the social projects	Very high as it provides long term benefits that wouldn´t happen without the Project scenario

Participatory management and decision-making tools	The training and support from the team build self-confidence in the Community. The Community is valued as the center of the decisions and the benefits for themselves.	The social projects are implemented and led by the Community with the support of the team	Empowerment: Strengthening in the community's capacity to manage and confront their own needs	Improving self-governance and management knowledge beyond the project´s duration period

PAI 01 and PAI 03 are in Goiás and Mato Grosso do Sul respectively. These areas do not have a Jurisdictional REDD Program.

PAI 02 is in Acre, where a Jurisdictional Program was established in the early 2010s (See Appendix 3: Acre's jurisdictional system).

2.1.12 SUSTAINABLE DEVELOPMENT

The REDD Carbonflor project by ECCON will reduce deforestation in at-risk locations, consequently reducing emissions of GHG from avoided deforestation in protecting native vegetation. Such actions will have a series of co-benefits that ensure that project activities are aligned with UN's SDGs.

First, the avoided deforestation from the project will contribute to climate change mitigation by avoiding the emission of greenhouse gases from deforestation, ensuring a local stable climate. It will ensure that the soil and waterways in project areas are maintained, while strengthening local communities by promoting environmental education, and fostering sustainable production, as the revenue from Carbon credit sales will serve as incentive for the landowners to improve conservation practices and keep the native vegetation protected. This will occur with active community participation and involvement that will contribute to achieving the SDG goals.

The 2030 Agenda for Sustainable Development Goals (SDG) is the essence of the REDD Carbonflor project. The SDGs, adopted by all United Nations Member States in 2015, are composed of 17 global goals that aim to promote peace and prosperity for people and for the planet. To accomplish such goals, the countries which participate in the UN are committed to prioritizing actions that balance social, economic, and environmental sustainability.

Hence, the project activities meet six objectives stipulated for the SDG, namely: health and well-being (3), quality education (4), climate action (13), life on land (15), life below water (14), sustainable cities and communities (11), responsible consumption and production (12) and Partnerships for the Goals (17).

To ensure that project goals related to conservation are met, REDD Carbonflor will use satellite images and spectral band composition to evaluate conservation in the project areas, along with on-site visits to validate this information. It will contribute to the environment, by preventing deforestation, and allowing for subsistence in various environmental subjects (vegetation, relief, soil, rock, and water).

In terms of Climate Action (13), this grouped project will begin by avoiding the deforestation of native, old-growth, undisturbed forests. As a grouped project, emission reductions are estimated by project activity instance. For PAI 01 it will protect 3,380 hectares of preserved land, which will reduce greenhouse gas emissions GHG from deforestation and degradation in 252,037.22 tCO_2e during its duration of 30 years (accounting for leakage) by preserving at-risk forests. For PAI 02 it will protect 8,905 hectares of preserved land, which will reduce greenhouse gas emissions GHG from deforestation and degradation by preserving at-risk forests. As a grouped project, the exact amount of emission reductions cannot be determined, but considering the PAI 02, it will avoid the emission of 1,730,014.56 tCO_2e during its duration of 30 years (accounting for leakage). For PAI 03 it will protect 8,903 hectares of preserved land, which will reduce greenhouse gas emissions GHG from deforestation and degradation by preserving at-risk forests. As a grouped project, the exact amount of emission reductions cannot be determined, but considering the PAI 03, it will avoid the emission of 1,030,581.58 tCO_2e during its duration of 30 years (accounting for leakage). In that sense, as the REDD Carbonflor aims to mitigate the effects of climate change by reducing GHG emissions, it's also expected to promote environmental and climatology education among the local households close to the project's area.

As for life on land (15) and life below water (14), since the native vegetation will be protected, its root network that maintains the cohesion and structuring of the soil will also be protected. In that sense, the natural fertility of the soil is maintained, which prevents silting. The maintenance of native vegetation will avoid the emission of greenhouse gases, ensuring that the microclimate (temperature and humidity) is preserved, which ensures a pleasant microclimate in project areas, benefiting the native species and people who live in the regions. This purpose is also directly related to the protection of biodiversity, in a way that the area's conservation goes beyond the vegetation, involving the region's fauna and flora. As a result, this proposal establishes a link with the fifteenth SDG's goal, "Life on Land".

Ensuring that the soil is preserved will also benefit the subsurface mineral resources (which will not be exposed by ravines), maintaining the original geomorphology and in balance with the environment. Therefore, the gentle slopes of the areas will be maintained. In turn, this has a positive impact on ensuring that the water table is kept functioning and that the rivers are kept flowing.

The Amazon biome is home to many of the world's species, both fauna and flora, and plays an important role in climate regulation, holding a significant carbon stock and influencing rainfall patterns. It is characterized by a humid tropical forest, with a high degree of endemism and one of the largest and most diverse biomes in the world. With a large territorial extension, being the largest Brazilian biome, it comprises the area of the largest hydrographic basin in the world, the Amazon River Basin, and has relevant environmental characteristics.

The Cerrado biome is considered the "cradle of Brazilian waters" due to the number of springs present and its underground waters that supply the most important hydrographic basins in the country throughout the year (including the wetland). It has a wide variety of species that inhabit it and, due to its natural characteristics, is vegetation that, after being deforested, is difficult to recover.

Furthermore, local communities will benefit by the project through the consultation process and prioritization of activities chosen by the communities. Initial stakeholder consultation already took place in PAI 01 and is described in the appropriate section. As for PAI 02 and PAI 03, local consultation with communities and stakeholders will help define the projects they want developed to maximize community benefits.

The project will be conducted solely on private farms. Such farms will receive funds from avoiding conversion and deforestation, contributing to climate change mitigation and its associated impacts. Furthermore, according to the 2030 Agenda, different sectors and actors should work together in an integrated manner by pooling financial resources, knowledge, and expertise to achieve the goals of the sustainable development schedule. In that way, the REDD Carbonflor sets out to combat climate change and preserve biodiversity in partnership with traditional communities, stakeholders, and interested third parties, and by that, complying with the seventeenth goal (Partnerships for the goals).

The Project Zone is in the Amazon and Cerrado biomes. These areas have suffered high rates of deforestation in the past forty years and while deforestation rates plummeted from 2004 to 2012, they have increased significantly ever since. In 2021, the deforestation rate for the Amazon Biome was 1,2 Mha (12,2 thousand sq. km), while for the Cerrado it was 850 thousand ha (8,5 thousand sq. km). Until this date in the Amazon, roughly 62 Mha (623 thousand sq. km) have been converted to agriculture and cattle ranching areas[74], In the Cerrado, almost 89 Mha (888 thousand sq. km) have also been converted to agriculture and cattle ranching areas[75]. Both biomes are at risk of illegal and legal conversion. Further deforestation can put these biomes past their tipping point, where ecological functions and climatic regulation will be at risk[76]. In that sense, our REDD Carbonflor project aims to reduce deforestation pressure in these areas, preserving vegetation at risk from deforestation and working in partnership with local stakeholders to guarantee the fair sharing of co-benefits.

2.1.13 IMPLEMENTATION SCHEDULE (G1.9)

[74] Mapbiomas, Collection 7. Amazon Infographic, See: https://tinyurl.com/mu953czk
[75] Mapbiomas, Collection 7. Cerrado Infographic. See: https://tinyurl.com/27eppbc7
[76] Lovejoy and Nobre, 2019 - https://tinyurl.com/yp6tx5eu

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

Date	Milestone(s) in the project's development and implementation
2021-10-06	PAI 01 – The owners of Serra farm signed a Letter of Intent, addressed to ECCON, where they agreed to the elaboration of a REDD project in the area. As detailed in item 1.1.14, it indicates the start date for a APD and AUDD activities and beginning of first monitoring (crediting) period.
2021-11-18	PAI 03 – The owners of Bodoquena Farm signed a Letter of Intent, addressed to ECCON, where they agreed to the elaboration of a REDD project in the area.
2022-04-01	PAI 01 – The owners of Serra Farm signed a contract with ECCON
2022-10-09	PAI 01 – Conclusion of viability analysis; Collection of secondary information; identification of demand; analysis and structuring of information; secondary data collection of biotic environments (fauna and flora); collection of secondary data of physical environment (land cover and land use). Viability analysis will be annual.
2022-10-09	Conclusion of first baseline scenario, eligibility criteria, additionality, methodology applicability and baseline emissions. These assessments will be repeated every six years (2027, 2033, 2039, 2045 and 2051).
2022-10-28	PAI 03 – The owners of Bom Destino Farm signed a Letter of Intent, addressed to ECCON, where they agreed to the elaboration of a REDD project in the area.
2023-01-05	PAI 03 – The owners of Bodoquena Farm signed a contract with ECCON
2023-01-09	PAI 01 – Stakeholder consultation, and end of first VCS_CCB monitoring period running from project start date. Thereafter, the monitoring periods will be annual for the VCS and will follow the calendar year. The monitoring will include biomass inventory, community activities, and biodiversity assessment. Monitoring report will be concluded six months after the monitoring activity.
2023-01-29	PAI 02 – The owners of Bom Destino Farm signed a contract with ECCON
2023-02-28	PAI 02 – Conclusion of viability analysis; Collection of secondary information; identification of demand; analysis and structuring of information; secondary data collection of biotic environments (fauna and flora); collection of secondary data of physical environment (land cover and land use). Viability analysis will be annual.
2023-03-03	PAI 03 – Conclusion of viability analysis; Collection of secondary information; identification of demand; analysis and structuring of information; secondary data collection of biotic environments (fauna and flora); collection of secondary data of physical environment (land cover and land use). Viability analysis will be annual.
2023-03-30	End of landholder attestation. Thereafter, the Landholder attestation will be annual. Expect pipeline registry, pipeline consultation, and validation audition.

2023-04-30	Expected first verification date. Thereafter, verification for VCS and CCB will be expected to be completed within 6 months of the end of each monitoring period.
2031-10-31	Mandatory baseline reevaluation as per current VCS AFOLU rules
2051-10-05	Project crediting period end date.

2.1.14 PROJECT START DATE

According to VCS standard version 4.4, the REDD Carbonflor start date for AFOLU projects is the date when the activities, which lead to the generation of GHG emissions reductions or removals, are implemented. Therefore, the project start date for both APD and AUDD activities is defined as October 06th, 2021, when the Letter of Intent and Contract between ECCON (project proponent) and PAI 01 landowners were signed for the development and implementation of the REDD project. In the Owner's Guide of the forementioned Contract, the landowners formally commit to various obligations, among them:

- Wield efforts to avoid deforestation and fires in the project area for 30 years.
- Don´t make use of synthetic fertilizers in the area.
- Don’t carry out pasture or livestock activities that may affect the Project Area.
- Notify the project proponent in case of deforestation, illegal occupation and/or fires in the Project Area.

As the landowners can legally deforest any forest surplus outside de Legal Reserve and Permanent Preservation Area, the Contract ensures that APD activities won´t be carried out after October 6th 2021.

The Contract also assured that any AUDD activities inside the Project Area will be closely monitored and avoided after October 6 of 2021.

In this way, the signature of the Letter of Intent is the event considered as the Project Start Date, since from that signature the activities of monitoring the vegetation cover, surveillance and security of the project area and survey and contact with communities began, for both APD and AUDD scopes.

2.1.15 BENEFITS ASSESSMENT AND CREDITING PERIOD (G1.9)

The Carbonflor REDD began on October 06th 2021, and will end on October 05th 2051, comprising a project with a total crediting period of 30 years.

The first crediting period starts on October 06th 2021 and ends on October 05th 2031, comprising a total project crediting period of 10 years.

2.1.16 DIFFERENCES IN ASSESSMENT/PROJECT CREDITING PERIODS (G1.9)

There is no difference in assessment//project crediting periods.

2.1.17 ESTIMATED GHG EMISSION REDUCTIONS OR REMOVALS

Table 11. Estimated reduction or removals of GHG emissions for the Project (accounting for leakage)

Year	**Estimated GHG emission reductions or removals (tCO_2e)**			**Total**
	PAI 01	PAI 02	PAI 03	
2021	9,907.01	0	9,131.21	19,038.22

2022	41,485.75	22,905.86	76,124.76	140,516.37
2023	24,426.91	129,034.38	79,364.81	232,826.10
2024	20,334.66	131,331.70	83,743.40	235,409.76
2025	20,394.27	133,627.04	86,845.99	240,867.30
2026	20,453.55	135,920.40	89,948.32	246,322.27
2027	20,512.52	138,211.80	93,050.40	251,774.72
2028	20,571.16	140,501.26	96,152.24	257,224.66
2029	20,629.48	142,788.80	99,253.82	262,672.10
2030	20,687.49	126,005.93	102,355.16	249,048.58
2031	17,077.26	40,544.93	49,395.37	107,017.56
2032	3,133.17	42,776.97	27,418.92	73,329.06
2033	688.36	40,540.25	24,386.25	65,614.86
2034	684.62	38,305.00	21,374.06	60,363.68
2035	680.89	36,071.22	18,361.89	55,114.00
2036	677.18	33,838.88	15,349.73	49,865.79
2037	673.50	31,607.97	12,337.59	44,619.06
2038	669.83	29,378.49	9,325.47	39,373.79
2039	666.19	27,150.42	6,313.36	34,129.97
2040	662.56	25,291.48	3,301.27	29,255.31
2041	658.96	25,119.56	2,508.48	28,287.00
2042	655.37	24,904.19	2,501.98	28,061.54
2043	651.80	24,690.66	2,495.49	27,837.95
2044	648.26	24,478.96	2,489.02	27,616.24
2045	644.73	24,269.07	2,482.56	27,396.36
2046	641.22	24,060.99	2,476.12	27,178.33
2047	637.73	23,854.69	2,469.70	26,962.12
2048	634.26	23,650.16	2,463.30	26,747.72
2049	630.81	23,447.38	2,456.91	26,535.10
2050	627.37	23,246.34	2,450.54	26,324.25
2051	590.35	23,047.03	2,253.48	25,890.86
2052	0	19,412.74	0	19,412.74
Total estimated ERs	252,037.22	1,730,014.56	1,030,581.58	3,012,633.36
Total number of crediting years	30	30	30	30
Average annual ERs	8,401.24	57,667.15	34,352.72	100,421.11

2.1.18 RISKS TO THE PROJECT (G1.10)

During the project lifetime, it is expected that some risks, both natural and human-induced, occur in the climate, community, and biodiversity benefits. For each of these identified risks, Table 12below shows the risks, their potential impacts and the actions needed to mitigate them. Furthermore, we used the AFOLU "Non Permanence Risk Tool" VCS Version 4, Procedural Document, 19 September 2019, v4.0." to identify further risks to the project. The results of the tool are presented in Appendix 4: Project risks table - ECCON-Non-Permanence-Risk-Report - 20.12.22".

Table 12. Likely natural and human-induced risks to the expected climate, community, and biodiversity benefits during the Project lifetime

Identify Risk	**Potential impact of risk on climate, community and/or biodiversity benefits**	**Actions needed and designed to mitigate the risk**
	External Risks	
Farms being sold	REDD Carbonflor is discontinued in the PAI, thus resulting in deforestation and lack of resources to invest in Climate, Community and Biodiversity benefits.	The legal binding agreement between ECCON and the Landowner stipulates a 30-year period and landowners are aware of the contract conditions and their responsibilities. In the event of farm being sold, the contract is linked to the farm and not the owner. ECCON will register the Carbon Contract in the land tenure document to make it public.
Farms being invaded, thus related to dispute over access and land rights.	Deforestation in PAI which emits carbon to the atmosphere and negatively impacts Biodiversity and Climate Benefits	REDD Carbonflor is focusing on farms where land tenure has been resolved. Furthermore, neighboring communities are approached and supported by the project.
Changes in Public Policies (local, state and national) that affect the viability of the project	Changes in policies can compromise the project, and the benefits to climate, community, and biodiversity.	Constant monitoring of changes to legislation. When and if needed, adaptation to new context.
Carbon income is not sufficient to maintain farmers engaged.	PAI is removed from the grouped project and insufficient income will compromise Climate, Community and Biodiversity benefits.	During farm selection, we show the expected financial outcome of the project. Farmers willingly sign a 30 year legally binding agreement. ECCON has constant and transparent communication with farmers
	Natural Risks	
Local impacts of climate change	Deforestation in areas outside PAI are deforested, which may cause negative impacts to community and biodiversity, changing temperatures, subsistence crop failure, low level/quality of water in streams.	Inclusion of other PAIs in neighboring areas, scaling up of project. Communication with local communities about the importance of maintaining native vegetation.
Unplanned deforestation by external agents (Human induced)	The communities and any potential land grabbers or other landowners within the project area can invade land and convert such areas to agriculture or cattle ranching activities. This would have an impact on carbon stocks, habitat for biodiversity and, depending on the area, an impact on local climate regulation.	Farmers receive resources to increase the protection of areas prone to AUDD, thus they are our allies in avoiding unplanned deforestation in their lands. Constant monitoring and communication with farmers help mitigating this issue, Furthermore the landowners and the Project have established relationship with local authorities, which can contribute with se

		solution of any problems of land invasion.
Wildfires (Human induced)	Landgrabbers or local communities in the areas could use fire for deforestation. This fire can destroy the forest, especially in drier years, and undermine the project's climate benefits, also affecting habitat for biodiversity and flora.	Monitoring of project areas and communication with local stakeholders are some of the measures that will be undertaken. Furthermore, consultation with stakeholders will help improve the understanding of this invasion/fire risk.
Wildfires (Natural)	Wildfires coming from neighboring properties or from lightning can undermine the project's climate benefits, also affecting habitat for biodiversity and flora. In the Amazon natural wildfires are not common, but in the Cerrado, such fires occur frequently. Small scale fires have limited effect on biodiversity and carbon stocks, but widespread fires without any control can negatively affect habitat, increase emissions, and threaten local communities.	The maintenance of “fire-breaks” and patrolling of the areas in the dry season, along with a plan to combat fire by landowners are the actions that will mitigate this risk. In the conversation with farmers and local communities, we will stimulate the creation of voluntary fire brigades.
Extreme droughts (Natural)	A Drier Amazon may increase tree mortality and compromise the project's climate and biodiversity objectives. In the Cerrado, drier years increase the amount of dry matter on the ground, increasing the risk of fire and flammability of the region, which could compromise the project's climate and biodiversity objectives.	Monitoring of climatic conditions in the Amazon and Cerrado will allow for prevention of this risk, as well as the implementation of “fire-breaks” to help slow-down any fire that may occur.

2.1.19 BENEFIT PERMANENCE (G1.11)

The measures to benefit the communities in a long-term basis, with positive impacts beyond the project´s lifetime, starts with the participatory decision-making tools to be able to address what the communities consider as their most relevant needs. Afterwards, ECCON team analyze which actions are possible to be made, the schedule distributed during the project´s lifetime and which of them will bring the most benefits for the communities, biodiversity and climate all together, especially in the long-term and beyond the project´s lifetime.

The communities will also benefit from the governance empowerment measures that ECCON will promote. As observed in many communities in Brazil, their need for a better structured governance system is a key factor for them to develop in the long-term. As a proper measure to empower the communities, efforts in the governance organization will be one of the main strategies, so they are able to promote benefits for themselves beyond the project´s lifetime.

Another measure for benefit permanence is to develop self-financed and sustainable projects, which means the implementation of activities that can generate enough income to pay for itself to continue. For example:

courses for cheese production and creation of a mini-factory, a honey production and sales micro-business for women working from home, management tools and structure for a community-based ecotourism plan, to mention a few options.

Especially regarding biodiversity, all the research developed during the project´s lifetime, including the fauna monitoring, will generate important knowledge regarding endemic and endangered species. The measures to use this knowledge in long-term benefits beyond the project´s lifetime includes using this information to create conservation projects and to bring the communities closer to the importance of having protected areas, providing training in how they can help to protect and monitor biodiversity beyond the project´s lifetime, for their own benefits through climate balance and ecosystem services.

2.1.20 FINANCIAL SUSTAINABILITY (G1.12)

REDD Carbonflor is a grouped project where all the seed funding is provided by ECCON. Since there are multiple instances and landowners involved in the project, its financial information is commercially sensitive. ECCON already provides a series of broad community benefits, such as its monthly environmental letters, participation in events and, specifically linked to REDD, we disseminate the importance and need for conservation, while providing potential farmers with viability analysis and guidance.

The financial information can be shared with relevant stakeholders upon request and by signing a non-disclosure agreement. Funds from the sales of carbon credits are shared between the landowner and the Project Proponent and must ensure the project goals are met. ECCON will set aside a portion of the credit sales in a fund, which will be used for achieving the project's climate, community, and biodiversity benefits. Considering that Carbon Prices are volatile, we prefer to establish a share of the revenue from credit sales to the fund and discuss with local communities the best use of such funds. At the same time, landowners are committed to strengthening governance to avoid unplanned deforestation and degradation (AUDD), while also committing to avoid any planned deforestation (APD).

It is important to note that the share of resources must be such as to ensure that:

i. the Climate, Community and Biodiversity goals of the project are achieved;
ii. that the landowner is engaged in conservation throughout the 30 years of the project; and
iii. that it is financially sustainable for the project developer.

By adopting shares of funds for each of the stakeholders involved in the project (Landowners, communities and ECCON) we share the risks, but also the benefits of increasing carbon prices. To ensure the viability of the project, we adopt a stepwise approach:

1. *Financial viability for the landowners:* ECCON receives requests for areas to be analyzed to join REDD Carbonflor. ECCON analyzes eligibility criteria and emission avoidance potential for candidate farms. According to the potential, ECCON engages in a conservation contract with the farmer who will receive a share of carbon credits throughout the project lifecycle. This contract ensures that both the farmer and ECCON will have a positive cashflow from carbon credit sales.
2. *Mapping of community demands and establishment of governance (2.3 Stakeholder Engagement):* After contracts are signed, ECCON actively searches for neighboring communities and vulnerable groups. Through mapping and consulting with local communities, we understand their needs and classify. We also undertake a macro-analysis of the costs involved in such demands. Lastly, we discuss with local stakeholders how to leverage community benefits, as many of the demands are related to the lack of public policies (health, education, infrastructure).
    a. *Mapping of demands;*
    b. *Classification of demands;*
    c. *Modelling demand’s costs and feasibility; and*

d. *Establishment of community governance to prioritize actions and use of resources.*
   i. *Some actions demand direct investments which will come from the fund.*
   ii. *Some of the demands are related to lack of access to public policies, in which cases ECCON will discuss with community groups and relevant stakeholders in the area how to contribute that the communities and vulnerable populations are positively affected by the project.*

3. *Distribution of funds*: once the project is validated, after every verification event the carbon n credits are sold, and the proceeds are split among:
   a. *Landowners*: who will receive their share.
   b. *Community Fund*: will receive its share of the resources to be invested in community benefits and the governance of the funds will be agreed with the communities themselves.
   c. *ECCON*: will use its share to cover its operational costs and to enable the scaling up of REDD Carbonflor to other important areas as well as to ensure it can keep its activities sharing information with the broad community.

Evidence of projected revenues are common understanding of the increasing carbon credit´s market flow, with an initial estimate of 2,560,738.35 credits being sold from PAI 01, PAI 02, and PAI 03 during the 30-year project period.

VM0007 v1.6 methodology, used in the VCS GPD, does not state any limit for project size or number of activity instances.

2.1.21 GROUPED PROJECTS

The REDD Carbonflor is a grouped project, designed to include more than one Project Activity Instance ("PAI") through the inclusion of new areas that meet all the proposed eligibility criteria, which allows the expansion of project activities throughout its development.

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

According to the CCB Standard v3.1 (section G.1.13, G.1.14 and footnote 31) and VCS Standard v4.4 (sections 3.6.16 to 3.6.22), the following set of eligibility criteria was established by ECCON for the inclusion of new Project Activity Instances (PAIs). The geodetic polygon of the Cerrado and Amazon biome is provided in the supporting REDD Carbonflor document folders as well as in the section 2.1.7.

REDD Carbonflor' project zone is defined by the geographic boundaries of the Cerrado and Amazon biomes, as shown in the Figure 61. Project Zone. These geographic limits include the Brazilian states of Acre, Amapá, Amazonas, Distrito Federal, Goiás, Pará, Rondônia, Roraima, also portions of the states of Tocantins, Minas Gerais, Mato Grosso, Mato Grosso do Sul, Maranhão, Bahia, Piauí and São Paulo.

New instances of project activities can encompass private properties along these two biomes, which have characteristics in line with the additionality presented in section 3.1.5. The baseline scenario is the conversion of the area of native vegetation for commercial purposes (see section 3.1.4), in the APD component in 20% in forest formations of the Amazon biome, 65% in savannah formations of the Amazon biome and 80% in the Cerrado outside the Legal Amazon biome. On the other hand, in the AUDD component the scenario is the illegal conversion of areas, in 80% in the forest formations of the Amazon biome, 35% in the savannah formations of the Amazon biome and 20% in the Cerrado, as shown in Table 13.

Table 13. Areas eligible for legal conversion (APD) and areas of legal reserve and permanent protection (AUDD)

Biome (vegetation type)	Eligibility for legal conversion (APD)	Legal Reserve and Permanent Protection areas AUDD
Amazon (forest formations)	20%	80%
Amazon (savannah formations)	65%	35%
Cerrado	80%	20%

In Brazil, natural vegetation is diverse and harbors complex ecosystems that are not easily defined by international bodies, such as our vegetation of Cerrado. Thus, for the REDD Carbonflor, we considered the UNFCCC definition of forest (2006)[77], in accordance with the Brazilian Forest Service definition of forests[78], to fit with the reality of our Brazilian ecosystems. The UNFCCC (2006) defines forests as an area of at least 0.05-1.0 ha with crown cover (or equivalent density) of more than 10-30%, with trees with a potential to reach a minimum height of 2-5 meters at maturity in situ. A forest can consist of both closed (dense) forest formations, where multi-strata and suppressed trees cover a high proportion of the ground and open forests.

For the Amazonia and Cerrado, we considered all the vegetation defined as forests by the government classification (IBGE) and all wooded savanna vegetation that fulfills the UNFCC requirements, encompassing vegetation such as *cerrado ralo* and *cerrado rupestre*, with 2–4-m-tall trees, and 5–20% canopy cover (less than 5% cover will be disregarded), *cerrado sensu stricto* with 3–6-m-tall trees and 20–50% forest cover, and *cerrado denso* with 8–15-m-tall trees and 50–70% forest cover (Ribeiro & Walter, 2008[79]). According to the definition presented, all classes of vegetation that make up these two biomes are considered eligible for REDD Carbonflor.

The communities mapped for the project are also included in the project zone (Cerrado and Amazonia biomes) and will be determined considering the proximity of the PAI and the observed impacts considering the climate, community and biodiversity scenarios. All communities will have the same stakeholder engagement processes (see sections 2.1.8 and 2.1.9) and will be monitored using the methods described in 3.3 Monitoring. Each community will be analyzed and characterized to map the main needs, to develop proposals for actions considering the specifications of each scenario. Residents will be heard so that activities are developed to contribute in the best possible way to the local community.

The starting date of new PAIs will be defined with the signature of the "Letter of Intention" between ECCON and the landowners, as described in sections 2.1.13 and 2.1.14, since this document ensures the responsibilities for compliance the activities for participation in REDD Carbonflor.

All new project instances will be described indicating technical, financial, geographical, and other relevant information, in the monitoring report in their respective inclusion periods and adopt the activities described in section 2.1. Also, they will use the same technologies and measures described in this PD (see sections 2, 3, 4 and 5). Activities, measures, and technologies may be adapted to the specific features of the areas, when necessary, provided that all adaptations are reported and justified in the monitoring report. According to searches carried out by the project proponent on the main carbon project platforms, PAI 01 and PAI 03 are not located in jurisdictional REDD areas. PAI 02 is in Acre, where there is a Jurisdictional REDD System

[77] UNFCCC 2006 Forest definition - http://unfccc.int/cop7/documents/accords_draft.pdf
[78] Brazilian Forest Service definition of Forest - https://snif.florestal.gov.br/pt-br/florestas-e-recursos-florestais/167-definicao-de-floresta
[79] Ribeiro & Walter, 2008 - https://www.alice.cnptia.embrapa.br/handle/doc/554094

(SISA) (see Appendix 3 for a description of the status of Acre's jurisdictional program.). For each new PAI the same searches will be carried out to identify the presence of jurisdictional programs.

Finally, the criteria listed by the VM0007 methodology in section 4.3 are listed and validated in Table 14 below.

Table 14. All REDD Activity Types

Item	Eligibility Criteria	Validation
4.3.1 General	Land in the project area has qualified as forest (following the definition used by VCS; in addition, see Section 5.1.2) for at least the 10 years prior to the project start date. Mangrove forests are excluded from any tree height requirement in a forest definition, as they consist of (close to) 100% mangrove species, which often do not reach the same height as other tree species and occupy contiguous areas and their functioning as a forest is independent of tree height.	The proponent uses the historical MapBiomas Land Use and Coverage database (collection 7), to evaluate non-forest classes, which may indicate deforestation or vegetation classes, in each instance of the project, in order to validate the Cerrado and Amazon Biomes, during the 10-year historical period prior to the start date or inclusion of the PAI in the project. This study was carried out for all PAIs included so far (01, 02 and 03) and only the areas of native vegetation conserved in the last 10 years were maintained as PAA (project accounting area).
4.3.1 General	If land within the project area is peatland or tidal wetlands and emissions from the SOC pool are deemed significant, the relevant WRC modules (see Table 3) must be applied alongside other relevant modules.	The proponent will use the IBGE database to evaluate the soil class strata within the project area, to validate that the project area does not contain peat soil nor tidal wetlands in PAI 01. The same procedure will be performed for new PAIs.
4.3.1 General	Baseline deforestation and forest degradation in the project area fall within one or more of the following categories: Unplanned deforestation (VCS category AUDD) Planned deforestation/degradation (VCS category APD) Degradation through extraction of wood for fuel (fuelwood and charcoal production) (VCS category AUDD)	The project area falls within two categories: APD and AUDD.
4.3.1 General	Leakage avoidance activities must not include: Agricultural lands that are flooded to increase production (e.g., rice paddy) Intensifying livestock production through use of feed-lots10 and/or manure lagoons.	Not applicable in PAI 01, PAI 02 and PAI 03.

4.3.2 AUDD	Baseline agents of deforestation must: (i) clear the land for tree harvesting, settlements, crop production (agriculturalist) or ranching or aquaculture, where such clearing for crop production or ranching or aquaculture does not amount to large scale industrial agriculture or aquaculture activities; (ii) have no documented and uncontested legal right to deforest the land for these purposes; and (iii) be either residents in the reference region for deforestation (cf. Section 5.1.2) or immigrants. Under any other condition this methodology must not be used.	Risk of illegal deforestation (AUDD) from land grabbers, from illegal wood harvesters, from landowners due to low enforcement of the law. This is the common scenario in Brazil, where over 95% of deforestation is illegal[80].
4.3.2 AUDD	If, in the baseline scenario of avoiding unplanned deforestation project activities, post deforestation land use constitutes reforestation, this methodology may not be used.	Not applicable.
4.3.3 APD	Where conversion of forest lands to a deforested condition must be legally permitted.	Brazil has legislation that allows for farmers to clear a portion of their areas for alternative land uses. This is delimited in Brazil's Forest code (Law 12.651/2012) and described in Table 13. However, due to various challenges and among them governance, most of the deforestation occurs without a license[81].
4.3.4 APD	Fuelwood collection and charcoal production must be non-renewable13 in the baseline period.	Not applicable.
4.3.4 APD	If degradation is caused by either illegal or legal tree extraction for timber, this methodology cannot be used.	Not applicable.

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

The geographical area within which all project activity instances REDD Carbonflor activity must occur are delimited by the REDD Carbonflor Zone, encompassing areas of native forest under deforestation pressure in the Amazon and Cerrado biomes.

[80] See: https://s3.amazonaws.com/alerta.mapbiomas.org/rad2020/RAD2020_MapBiomasAlerta_FINAL.pdf
[81] See: https://s3.amazonaws.com/alerta.mapbiomas.org/rad2020/RAD2020_MapBiomasAlerta_FINAL.pdf

The project will be limited due to the total area of private properties with forest cover. The Proponent does not recognize limits of economic capacity or managerial nature, nor thresholds for project expansion beyond which there may be negative impacts on biodiversity. The VM0007 v1.6 methodology, used in the VCS GPD, does not set any thresholds for project size or number of activity instances.

Therefore, each new project activity instance will have financial, technical and/or locational parameters consistent with the initial instances or face the same technological and/or other investment barriers as the barriers we identified for the initial instances. Furthermore, they will be in the REDD Carbonflor Project Zone (Amazon and Cerrado biomes).

All new instances to be included in this project activity will necessarily be evaluated using the same methodologies, satellite imagery and field techniques applied for the first PAIs instances, as described in the PD and will be subject to the same technologies or measures as specified in the project description as well as the baseline scenario determined in the project description for the specified project activity and geographic area.

Thus, for all new instances of project activity, an increase in the project's positive impact on biodiversity and community benefits is expected. The project activity does not expect that there will be of negative impacts on biodiversity or community.

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

The project does not foresee risks associated with non-continuity of benefits, as there is no expansion beyond the Project Zone. In addition, the inclusion of new instances will be in line with the project activities already presented, which have similarity in all assumptions and meet the additionality characteristics consistent with the initial PAI for the project activity and specified geographic area. ECCON's technical team will provide support, follow-up, and monitoring of the execution of all activities in each project activity instance considered after validation.

The risk mitigation measures for climate, community and biodiversity benefits identified in this document are applicable to all PAIs.

2.2 WITHOUT-PROJECT LAND USE SCENARIO AND ADDITIONALITY

Additionality was assessed according to VT0001 v3.0[82]. This tool was adapted from the CDM "Tool for the Demonstration and Assessment of Additionality in A/R CDM Project Activities" (Version 02) and provides a stepwise approach to demonstrate additionality in VCS AFOLU projects. The following sections present the results of each step.

2.2.1 LAND USE SCENARIOS WITHOUT THE PROJECT (G2.1)

The present project has the same existing conditions and the same baseline scenario, as demonstrated in section 2.1.5 and described in section 3.1.4. In addition, Carbonflor REDD was developed with the intention of conserving and protecting areas of great environmental cultivation, such as the Cerrado and the Amazon, there is no intention of generating GHG emissions with the intention of subsequent removal, reduction, or destruction.

- **Ecosystem type:** The project zone is defined by two distinct ecosystems: the Cerrado, a savannah-dominated region, which also includes other vegetation such as grasslands, woodlands and forests, where PAI 01 and PAI 03 are located and the Amazon, where PAI 02 is located. The

[82] https://verra.org/wp-content/uploads/imported/methodologies/VT0001v3.0.pdf

Amazon is characterized as dense "terra firme" forests, seasonal forests, "igapó" forests, flooded fields, "várzeas", savannas, mountain refuges, and pioneer formations.

The Cerrado is characterized by its tropical climate, with rainy summers and dry winters, has as its main characteristic the occurrence of two seasons: a rainy season (October to April), when more than 90% of the rain falls, and a dry season (May to September), with almost total absence of rain. In the Amazon region annual precipitation is high (2300 mm/yr)[83], and the temperature is high, usually ranging between 22ºC and 28ºC. This is the so-called humid equatorial climate, which characterizes some areas near the Equator.

- **Current and historical land use:** Our project begins with three different areas. PAI 01, PAI 02 and PAI 03.

The land use scenarios in the absence of the project would be:

A) Avoiding Unplanned Deforestation and Degradation (AUDD)

1. Continuation of pre-project land use with the constant threat of illegal deforestation: cross-referencing shows that almost all deforestation alerts issued last year have one or more indications of illegality: 99.8% of them, equivalent to 95% of the deforested area, are unauthorized or overlap with protected areas or violate the Forest Code[84].
2. Project activity in the area within the project boundaries conducted without being registered as a VCS AFOLU Project: The landowner needs to invest his own resources to protect the forest. Landowner chooses not to use his own resources to protect the forest and suffers pressures from illegal deforestation by land grabbers and other agents that will convert such areas to agriculture and pasture for livestock.

B) Avoiding planned Deforestation (APD)

Landowners have forest beyond the legal requirements and can convert such areas to alternative land-uses such as pasture for livestock or agriculture.

1. Forest is converted to pasture/agriculture: Highly likely to occur, as well as applicable to all PAIs that meet the Eligibility Criteria. According to the Brazilian Forest Code, forest areas beyond the legal requirement can be converted.
2. Maintenance of excess native forest in the area within the project boundaries, carried out without being registered as a VCS AFOLU Project: There are no public or private incentives that promote conservation in surplus native vegetation areas, thus the areas are threatened by legal conversion once cattle ranching and agriculture are profitable and can be legally done in these areas.

2.2.2 MOST-LIKELY SCENARIO JUSTIFICATION (G2.1)

AUDD - Scenario 1 would be the most likely. Due to low enforcement of environmental protection policies, the areas are unwillingly converted and invaded by occupants other than the landowner. Unfortunately, this occurs frequently in the Brazilian Amazon and Cerrado.

AUDD - Scenario 2 is possible, but unlikely, due to costs regarding management and monitoring of the area.

[83] https://acta.inpa.gov.br/fasciculos/28-2/PDF/v28n2a01.pdf
[84] See: https://s3.amazonaws.com/alerta.mapbiomas.org/rad2020/RAD2020_MapBiomasAlerta_FINAL.pdf

APD - Scenario 1 is likely because there is a legal right to convert these areas and the financial returns from cattle ranching and agriculture are much more attractive than conservation which does not yield returns. Furthermore, by converting land, its value increases significantly.

APD - Scenario 2 is unlikely due to the costs of managing and monitoring forests, the entrenched culture of deforestation in the project region, and the agricultural aptitude of the area, making the permanence of standing surplus forest an unrealistic scenario.

2.2.3 COMMUNITY AND BIODIVERSITY ADDITIONALITY (G2.2)

The project aims to protect the standing forest in the project area, benefiting biodiversity by protecting the habitat of many species of fauna and flora as well as avoiding emissions from deforestation and degradation which would contribute to accelerating climate change. The forest also regulates local temperature and humidity, which benefits the local communities. Without the project, the forest would most likely be cut down because of the pressures from degrading agents, destroying habitats, and removing the benefits that the communities and climate gain from the standing forest. Local laws that protect the environment are not usually enforced, evidence is seen in the deforestation and illegal activities increasing numbers, causing many places to be invaded and deforested, which most likely would be the case of all PAIs involved in this project. Also, research funds in Brazil are known to be insufficient to cover many areas of the country, especially in private lands and the research products represent biodiversity knowledge and benefits that probably wouldn't happen in a "without the project scenario".

By taking into consideration similar communities in Brazil and the lack of support for social organizations to thrive in their projects, the actions that will be carried out with the communities locally wouldn't happen in a "without the Project scenario". As analyzed in the historic conditions of all PAIs and identified in socio and economic scenario of the municipalities, Brazil in general, have limited actions for vulnerable and marginalized population's needs and sometimes doesn't even count with an environmental agenda for them, causing the identified difficulties in proper households, land conflicts, lack of proper sanitation, education and access to health care, lack of job opportunities and increase of illegal activities, which by consequence, causes biodiversity damages.

2.2.4 BENEFITS TO BE USED AS OFFSETS (G2.2)

Not applicable. The Project does not aim to use any distinct community and biodiversity benefits as offsets, besides the VCUs generated in the verification from VCS.

2.3 STAKEHOLDER ENGAGEMENT

To accomplish all the decision-making processes with effective and integral participation of the stakeholders, a 5 steps methodology will be followed as below:

STEP 1: Identification and first contact with stakeholders

- *Brainstorm to identify stakeholders, relate and locate them within 20km radius from the project area.*
- *Classify stakeholders.*
- *Invite them to the Stakeholders Consultation: provide project information and make documentation fully accessible.*
- *Stakeholders Consultation: via official documents sent by e-mail, to those stakeholders that use this kind of communication channel, such as public sectors, associations, universities and other educational organizations, and private sector. Face-to-face informational meetings at the Community groups.*

- *Election of community´s representatives that will be the communication channel and will be leading each action of the project in the community.*
- *FPIC (Free, Prior and Informed Consent): not required as there are no Traditional Populations (indigenous, quilombolas and other communities) living inside the Project area. During the meetings, it will be collected evidence that the stakeholders received the proper information about the project scope, its reasons and purposes, duration, location, economic, social, cultural and environmental impacts and risks, the sharing benefits mechanism and all VCS – CCB procedures.*
- *HCV (High Conservation Value areas): Analysis of the livelihood needs and traditional culture that are connected to the project´s area.*

STEP 2: Workshops for participatory decision-making

Moving forward with the workshops with the stakeholders, as recommended by SBIA[85], the workshops will have a 3-days length to discuss the following subjects:

- *Participatory decisions to build the Theory of Change: the projects' activities with the communities will be defined with them and for each activity, it will be built the description regarding expected results, consequences, and impacts, identifying causal relationships that explain how the activities will achieve the expected benefits. Demonstrating that the benefits would not have been achieved in the absence of the Project.*
- *Risk management: identify risks, point out measures to mitigate risks, identify illegal activities, identify conflicts in the last 10 years, describe measures to resolve conflicts, demonstrate that no activity could harm existing disputes and conflicts.*
- *Long-term viability: point out measures to maintain and improve the benefits to the communities beyond the duration of the project, point out financial mechanisms that provide an adequate flow of resources for implementation and to achieve benefits for communities in the long-term.*
- *Anti-discrimination policies that will be followed by all the staff and people involved in the Project and proper communication channels for complaints feedback and repair process.*
- *Employee relations: providing training and job opportunities when possible, providing lectures about their rights and safety at work. Considering employee anyone being paid to develop project-related activities (e.g., daily payment for participation during workshops for the community´s representatives).*

STEP 3: Social and environmental Projects with the Community

After all the workshops to attend participatory management and decision-making process, next step will be to implement the social and environmental projects that were discussed with the Community:

- *Meetings for the social projects design and schedule.*
- *Contacts with stakeholders and other supporters that will be involved in each action and its effective implementation.*

STEP 4: Monitoring Plan

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[85] Richards, M. and Panfil, S.N. 2011. Social and Biodiversity Impact Assessment (SBIA) Manual for REDD+ Projects: Part 1 – Core Guidance for Project Proponents. Climate, Community & Biodiversity Alliance, Forest Trends, Fauna & Flora International, and Rainforest Alliance. Washington, DC. Available at: https://verra.org/wp-content/uploads/social-and-biodiversity-impact-assessment-sbia-manual-for-redd-projects-part-1.pdf

After the social projects are implemented and the carbon Project is also running, it´s necessary to put the monitoring plan into action, that includes:

- *Develop and implement a monitoring plan that identifies the variables (linked to project objectives and Theory of Change), communities, community groups and other stakeholders to be monitored, types of measurements, sampling methods, monitoring frequency and reports.*
- *Estimate impacts, benefits, costs and risks. It will include an assessment made by each community group affected each year.*

STEP 5: Assessment and update

The last step has a continuous length throughout the project´s duration and includes:

- *Proper distribution of information to make available and disseminate the results of the monitoring plan, publicly available on the Internet and communicated straight to the stakeholders.*
- *Channels for public comments available to the Community in the proper channels selected by them.*
- *Support during the validation, verification, and audit processes.*
- *New workshops and meetings to discuss, evaluate and make changes in the whole process of the social and environmental projects with the communities every year.*

With those Steps and focusing on the integral and effective participation of the stakeholders, we aim to engage stakeholders in a long-term relationship, providing management tools for them to benefit from positive impacts during and beyond the duration of the carbon Project.

2.3.1 STAKEHOLDER ACCESS TO PROJECT DOCUMENTS (G3.1)

All project documentation, including project description and monitoring reports will be sent to the stakeholders via WhatsApp group and explained in person during face-to-face meetings for the communities, sent via e-mail for the institutional stakeholders and will be available on ECCON's website in a dedicated space for the REDD Carbonflor Project for general comments and contributions.

Other methods for them to access the project documents can be attended in case the need for a printed version or any other kind of presentation is requested during the stakeholders' meetings.

During the monitoring period, when the updates and possible changes in the documents will be presented to the stakeholders, access to the documents will be guaranteed during the face-to-face meetings for them to participate in all changes and decisions.

2.3.2 DISSEMINATION OF SUMMARY PROJECT DOCUMENTS (G3.1)

Information about project´s proponents (G1.1), objectives around the CCB standards (G1.2), location and its physical and social parameters (G1.3), the boundaries of the project area (G1.4), stakeholder identification (G1.5) and classification (G1.6), provide a map with the project boundaries, high conservation values areas and possible impacted areas (G1.7), development of the Theory of Change, explaining the project´s activities (G1.8) and the implementation schedule (G1.9) will be disseminated to the stakeholders through workshops.

As the SBIA recommends, workshops with three days length will be carried out, to provide full awareness for the stakeholders about the focal issues of the project and especially, to listen to their comments. During the workshops, participatory tools will be used so that all the information can be disseminated in relatable language and everyone in the room can fully understand the project´s summary, regardless of the educational level.

During the project´s lifetime, new workshops will be carried out with the stakeholders, especially the communities, to make the monitoring report information available, including information about the risks, costs and benefits for the communities, making sure that the management tools provide enough space for discussions, contributions and changes.

2.3.3 INFORMATIONAL MEETINGS WITH STAKEHOLDERS (G3.1)

The content of the first Stakeholders Consultation follows below, being adapted by ECCON´s team in relatable language for each group or sub-group, so that the main goals of the meeting are properly informed:

- *To make first contact with the community, get to know them face-to-face and start WhatsApp groups to start direct communication between the Community members and the ECCON team.*
- *To present the project´s scope, reasons and purposes, duration, location, benefit sharing information, the people involved and the procedures.*
- *To build a participatory decision-making process regarding the benefits that the Community needs and their priority lists.*
- *To elect their representatives, with one man and one woman per Community group or sub-group.*

During all communication with the community some visual material is used to explain the project´s processes with appropriate language to guarantee full understanding by those that doesn´t write or read, which are a considerable portion of the communities. When the meetings happen with public sector and other stakeholders with specific qualifications, more technical language can be used.

The visual materials that are used during the meetings are: banners and folders. Both materials have the same content, so that participants can follow the information provided during the meeting and keep it as a copy, to be accessed at their own discretion. At the communities, after the representatives are elected, they receive extra folders to be delivered to the families that couldn´t attend the meeting, to guarantee access to the information even for those not present.

The banners presented and the folders delivered, contain the following topics:

- ✓ *Why are we making a carbon Project? This section explains the reasons and purposes of the Project, since the greenhouse gas emissions and global warming effects in climate change, up to why the trees conservation and carbon gas trapping are important conservation tools.*
- ✓ *REDD Carbonflor specific information. This section informs about the project´s name, scope, duration, and location.*
- ✓ *The Project in the Community. This section covers most frequent asked questions about the community´s involvement with the Project. Information about the benefit sharing, the community´s responsibility, their representative's election, best channel for communication and the participatory decision-making process to listen to their demands and doubts and to build their list of benefits.*
- ✓ *FAQ and Complaints Channel. This last section has the most frequent asked questions answered and ECCON´s contacts for the complaint channel in case the Community members feel or see any misconducts regarding harassment of any kind during the project´s duration.*

With this methodology, it is possible to have the participatory meetings, to listen their thoughts and questions and to start the decision-making process of the social projects, built with the community, attending the first step of the stakeholder's engagement process (see Figure 76).

Figure 76. Participatory Meeting with Stakeholders Procedure.

The informational meetings occurred according to the schedule described in Table 15 below.

Table 15. Schedule of informational meetings by PAI.

Project Activity Instance (PAI)	Location	Date of 1st meeting	Invited stakeholders
PAI 01	Padre Bernardo	JAN/09th/2023	Other stakeholders from Padre Bernardo
PAI 01	Acaba Vida – São Jorge School	JAN/11th/2023	Community members
PAI 01	Acaba Vida – José Mariano School	JAN/12th/2023	Community members
PAI 01	Acaba Vida – Dom Bosco School	JAN/14th/2023	Community members
PAI 01	Niquelândia	To be scheduled in May/2023	Other stakeholders from Niquelândia

PAI 02	To be scheduled in April/2023	To be scheduled in April/2023	Community members
PAI 02	Rio Branco	To be scheduled in April/2023	Other stakeholders from Rio Branco
PAI 03	To be scheduled in April/2023	To be scheduled in April/2023	Community members
PAI 03	Miranda	To be scheduled in April/2023	Other stakeholders from Miranda

The attendance lists and all information that was provided to stakeholders during the consultation through banners and folders, can be seen in Stakeholder consultation.

2.3.3.1 PAI 01 – FAZENDA SERRA (NIQUELÂNDIA, GO, BRAZIL)

ECCON first contacted a community member of Acaba Vida through the person working at the PAI 01 – Fazenda Serra. Of this first contact, it was asked for this first member to schedule the informational meetings with the Community, when we found out that it would be necessary to reach different locations inside the community´s area to be able to connect with more families. As Acaba Vida is a rural Community, each Family has a small farm and lives far away from each other. For this reason, ECCON carried out three information meetings in strategic locations (at the community´s schools) for the families to gather where it would be closer to them.

Three Whatsapp groups were created, one for each community sub-group and added the most contacts possible by the first contacted person. From that, it was asked for the contacts to add more people and the online groups reached: 44 participants for Acaba Vidão locality, 31 participants for Acaba Vida locality and 57 participants for Machadinho locality. In each group it was communicated all the information for the meetings and sent the invitation in Portuguese, also with an audio version, as the best relatable language to communicate with everyone in the groups. The invitation was sent several times, a week before the visit and 1 day before each meeting, to confirm and remember them to participate (
Figure 77).

Figure 77. Invitation to Informational Meeting sent via Whatsapp to the Acaba Vida Community.

2.3.3.2 PAI 02 – FAZENDA BOM DESTINO (RIO BRANCO, AC, BRAZIL)

Consultation of stakeholders is planned to occur in April 2023.

2.3.3.3 PAI 03 – FAZENDA BODOQUENA (MIRANDA, MS, BRAZIL)

Consultation of stakeholders is planned to occur in April 2023.

2.3.4 COMMUNITY COSTS, RISKS, AND BENEFITS (G3.2)

Since the project consists of maintaining the forest as it is in a private property, communities don't participate in any costs of the project or to receive the benefits.

Regarding the risks, it was open and asked with participatory tools for stakeholders to give their point of view during the first meeting, when the project was presented to them. This way it was possible to listen to their concerns and to open the communication channels for them to express their fears and questions about the possible risks. The information about the risks that the stakeholders have given were taken into consideration during the project´s design and mitigation measures could be created in the very early stages due to their contribution.

The information about the benefits for the communities is also done through the best communication channel indicated by them. Also, during the face-to-face meetings and workshops, the participatory tools in decision-making are used to organize their ideas and stimulate their empowerment to determine their priorities, creating a trust relationship between them and the project. After they´ve created their list of desired benefits, it´s ECCON´s turn to create strategies to address what is possible to be done. The relationship with the stakeholders is a continued job, by letting them know the steps and the processes that are being done to bring the possible benefits for them.

By giving support to answer all the community's fears and questions, providing proper communication channels, disseminating all documents with transparency, and to use participatory tools to listen to them, the risks of stakeholder's misunderstandings and insecurities are mitigated, and the benefits are addressed with a shared decision.

2.3.5 INFORMATION TO STAKEHOLDERS ON VALIDATION AND VERIFICATION PROCESS (G3.3)

The information to stakeholders on the Validation and Verification Process were provided during the face-to-face meetings and will be during the workshops, in Portuguese and relatable language for the community and sent via e-mail to other stakeholders that are used to use this kind of communication channel, such as the associations and public sector.

Especially with the communities, their elected representatives will receive a specific training to better understand the steps and standards of the project and to be able to attend the validation and verification processes from a third-party auditor in relatable language, face-to-face, so that all their questions can be listened and answered, stimulating them to feel confident about this step of the process.

2.3.6 SITE VISIT INFORMATION AND OPPORTUNITIES TO COMMUNICATE WITH AUDITOR (G3.3)

The stakeholders will be notified about the auditors visit via e-mail for the institutional stakeholders (such as public sectors and associations) within 10 days prior to the visit. For the communities, the information will be disseminated through the WhatsApp groups (their preferred communication channel) within 10 days prior to the visit and by phone calls to their elected representatives, to make sure that they can receive and participate in the auditor´s activities.

ECCON team will be responsible for the costs and planning of the logistics to guarantee the auditor´s access to the communities. The communication channel preferred and accessible for the community will also be made accessible for the auditor to communicate with them privately.

ECCON will make sure about safety and comfort issues to guarantee that the auditor has the best conditions to develop the activities.

2.3.7 STAKEHOLDER CONSULTATIONS (G3.4)

In all Stakeholder Consultations, participatory tools were used to encourage stakeholders' to ask questions and make comments about the project, so the meetings are interactive, not expository. Thus, the REDD Carbonflor Project will ensure the engagement and participation of stakeholders and local communities, as well as listening to their opinions and bringing the information to the project´s design.

The mechanism listens to the communities' opinions and the inputs are considered for the project's design, especially regarding their relationship with the project´s areas, which are hard to identify during research and for them are the priority concerns. For example: the communities consider as a risk to have a protected area close to them, where wild animals can put their livestock at risk, so the technical team can add this information to the risk monitoring and create mitigation strategies before the problems might happen.

The methodology then can stimulate the risk analyses by the communities, so that the decisions can be taken before negative impacts can happen. Through the communication channels, to keep in touch with the communities, is the best way to guarantee that their inputs will be listened and taken into the project´s design.

2.3.7.1 PAI 01 – FAZENDA SERRA (NIQUELÂNDIA, GO, BRAZIL)

The first stakeholder consultation was carried out face-to-face with the public sector of Padre Bernardo, aside from the official communication of the Project´s documents sent by e-mail to all described stakeholders of E, F and G types. In Padre Bernardo, the meeting happened on January 9th/2023 when the Office of Environment received ECCON´s team by the Secretary and two technical employees for the meeting (Figure 78). They received the official information about the Project and their questions were answered.

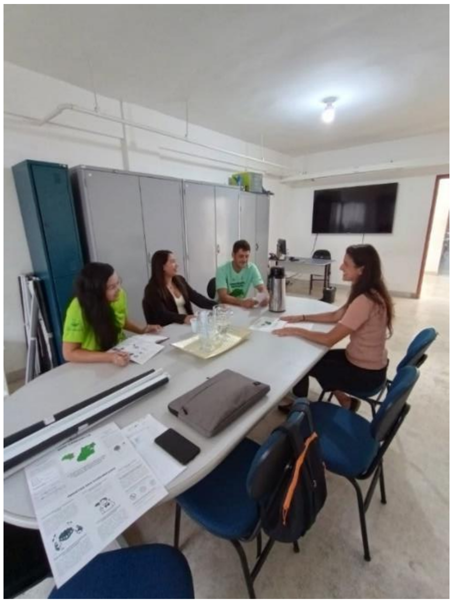

Figure 78. Stakeholder Consultation with public sector of Padre Bernardo/GO. Source: ECCON team, 2023.

The Community of Acaba Vida, the main stakeholder Community group (type B), was visited in three participatory meetings in the period of January 10th to the 14th/2023.

At the Community of Acaba Vida, due to the difficult logistics of reaching the families, the meetings were carried out in three different regions where the families could gather.

A second meeting was carried out at São Jorge Elementary School on JAN/11th/23 with the Community sub-group of Machadinho. We were received by 24 members of the Community that reported that 8 families live in this locality (Figure 79).

Figure 79. Informational meeting with Machadinho sub-group (São Jorge School) at Acaba Vida Community. Source: ECCON team, 2023.

Third meeting was carried out at José Mariano School on JAN/12th/23 with the Community sub-group of Acaba Vidão. We were received by 29 members of the Community that reported that 44 families live in this locality (Figure 80).

Figure 80. Informational meeting with Acaba Vidão sub-group (José Mariano School) at Acaba Vida Community. Source: ECCON team, 2023.

The fourth meeting was carried out at Dom Bosco School on JAN/14th/2023 with the Community sub-group of Acaba Vida. We were received by 11 members of the Community that reported that over 60 families live in this locality (Figure 81).

Figure 81. Informational meeting with Acaba Vida sub-group (Dom Bosco School) at Acaba Vida Community. Source: ECCON team, 2023.

As the first activity to benefit the communities and approaching the cultural behavior of visiting remote communities in Brazil, ECCON´s team took 30 basic needs food kits and delivered to each community´s sub-groups (Figure 82).

Figure 82. Basic needs food kit delivered during consultation meetings at Acaba Vida Community.

For PAI 02 and PAI 03 the Stakeholder Consultation will follow the same methodology with banners and folders to be used during the face-to-face meetings, which are scheduled to happen in the first semester of 2023.

2.3.7.2 PAI 02 – FAZENDA BOM DESTINO (RIO BRANCO, AC, BRAZIL)

Consultation of stakeholders is planned to occur in April 2023. Stakeholder Consultation will follow the same methodology with banners and folders to be used during the face-to-face meetings.

2.3.7.3 PAI 03 – FAZENDA BODOQUENA (MIRANDA, MS, BRAZIL)

Consultation of stakeholders is planned to occur in April 2023. Stakeholder Consultation will follow the same methodology with banners and folders to be used during the face-to-face meetings.

2.3.8 CONTINUED CONSULTATION AND ADAPTIVE MANAGEMENT (G3.4)

The stakeholders have access to the proponent's e-mail (carbonflor@ecconsa.com.br) and the WhatsApp groups that were created to strengthen the relationship between ECCON´s team and the stakeholders. They are free to make questions at any time. Through those communication channels, that were proposed by themselves, they will receive a semestral bulletin informing the main updates of the project and the following scheduled site visits for face-to-face meetings that will happen when needed.

Adaptive management will be required to evaluate the relationship with the stakeholders, to determine how often a face-to-face meeting is needed and if the stakeholders are receiving and providing information in a satisfactory flow for the project's goals and their own needs, which are the indicators during Monitoring Report to verify their interactions. Adaptive management understands that during the activities possible changes in management tools will be necessary, and every time that a new demand shows up, the adaptive management mechanism will detect it, listen, respond, analyze the need for a face-to-face meeting and take into consideration the contributions to adapt the next activities accordingly.

2.3.9 STAKEHOLDER CONSULTATION CHANNELS (G3.5)

Consultation and communication are done directly with the stakeholders, via the WhatsApp number and e-mail with institutional stakeholders, and via face-to-face meetings that are being held especially with the communities. This e-mail and WhatsApp groups will also be the channels for receiving comments and questions and providing information and official answers for the communities and other stakeholders.

By following the Participatory Meetings mechanism, it´s possible to identify the communities legitimate representatives during face-to-face meetings. The families are invited to join the meetings and for those that weren´t organized with representatives previously, ECCON helps to coordinate an election of their representatives. For those that are already organized in formal associations, cooperatives or any other kind of governance structure, during the Participatory Meetings it´s possible to check their legitimacy with the participants.

With their elected and legitimate representatives being the straight consultation channel, it´s possible to keep in touch with the communities and to identify if they understand each step of the process, ensuring that they receive and give proper information during the project´s lifetime.

2.3.10 STAKEHOLDER PARTICIPATION IN DECISION-MAKING AND IMPLEMENTATION (G3.6)

Stakeholder participation in decision-making will be assured by always having the channels open for communication and by making sure that the representatives were chosen to express the opinions of the majority from each community sub-group, stimulating them to give their opinions every time a decision needs to be taken.

To make sure that the Community effectively participates in the decision-making process, there will be a 3-days' workshop carried out face-to-face and for other stakeholders, meetings will also be carried out in addition to the e-mail communication, as the best strategy to become closer to those willing to get involved with the projects.

During the workshops, participatory tools will be conducted to all the participants to express their opinions, usually in an anonymous way, such as adding their "color ball" to the cards used to illustrate the focal issues with their answer about the decision that must be taken. All participatory tools consider the lowest level of education among the participants, to make sure that communication is stablished for everyone in the room to understand and provide enough space for all of them to have their comments and contributions listened.

As requested, each community sub-group has a man and a woman as their representatives, so that women can feel stimulated to discuss gender focused issues.

2.3.11 ANTI-DISCRIMINATION ASSURANCE (G3.7)

ECCON/Carbonflor has available to the public its policies and codes that were developed to provide transparency and security for its team, partners, suppliers, and customers, guaranteeing ethical and legal performance.

The ECCON Conduct Code ("*Código de Conduta*", in Portuguese) defines the values, rules, behaviors, and postures that must be adopted by all those related to the company and its projects. Its purpose is to establish and maintain guidelines to ensure good practices and compliance with the law, such as the National Labor Law, and internationally recognized regulations, such as the Universal Declaration of Human Rights and the UN Global Compact. In that sense, the Code avoids disagreements and inappropriate behavior and serves as guidance in decision-making for problem situations (Appendix 6: ECCON policies and codes of conduct).

To establish its values and protect its members, ECCON and Carbonflor's internal policy do not allow any type of abuse or harassment, whether moral, sexual, or discriminatory. It is provided equal treatment to all associates, regardless of race, ethnicity, color, sex, age, and disability, among other characteristics protected by law. Therefore, discrimination and prejudice are not tolerated. To ensure such demeanor, companies and those involved in the project are audited by administrative and judicial bodies, through certificates and legal documents, to verify inappropriate conduct that may represent a risk to the project.

Given that, ECCON/Carbonflor provides an anonymous reporting channel to oppose and investigate any behavior that goes against the internal antidiscrimination policy, which can be accessed at the ECCON website while the Carbonflor website is still being developed.

2.3.12 FEEDBACK AND GRIEVANCE REDRESS PROCEDURE (G3.8)

The process for receiving, hearing, responding to and attempting to resolve grievances will follow these stages:

i. *Amicably attempt resolution: The proponent will analyze grievances and give feedback within a week.*
ii. *Mediation by a third party: If a grievance cannot be resolved amicably between the proponent and the person or community in question, the dispute will be mediated by an independent third party, which could be a state or federal institution.*
iii. *Arbitration: If the dispute cannot be resolved by an independent third party, the issue will be taken to be judged by the district in question for each of the PAIs.*

2.3.13 ACCESSIBILITY OF THE FEEDBACK AND GRIEVANCE REDRESS PROCEDURE (G3.8)

The feedback and grievance redress procedure will be announced to the stakeholders during the in person meetings and via e-mail. Responses will be given via telephone, WhatsApp group, mail or e-mail.

2.3.14 WORKER TRAINING (G3.9)

The carbon Project itself doesn´t require direct workers in the present moment, but in case there are opportunities in the future, training and preparing the local communities to be able to take those jobs will be prioritized. In this case, the ECCON´s technical and social teams will work together to inform the stakeholders for a participatory decision process for recruitment and training.

Regarding the social projects and specially the projects with environmental education involved, proper training will be offered for the communities to work with environmental issues, such as monitoring and reporting about fauna and fire prevention techniques. Courses and training about sustainable agriculture and livestock management, for example, are intended to be carried out to build up a relationship with the communities, getting them closer to the project's activities and environmental protection goal.

2.3.15 COMMUNITY EMPLOYMENT OPPORTUNITIES (G3.10)

There will be no employment opportunities in the first moment of implementation of the project. For future opportunities, within the project´s technical perspectives in the long-term,

Some informal and part-time jobs will be generated for the communities during the ECCON team´s visitations. Such as daily payments for those helping in logistics (drivers and horses), providing meals and hosting the team in their homes

2.3.16 RELEVANT LAWS AND REGULATIONS RELATED TO WORKER'S RIGHTS (G3.11)

This project will not create any direct jobs; therefore, this topic will not be developed.

2.3.17 OCCUPATIONAL SAFETY ASSESSMENT (G3.12)

Since there will be no employment created by the project, there is no need for an occupational safety assessment.

2.4 MANAGEMENT CAPACITY

2.4.1 PROJECT GOVERNANCE STRUCTURES (G4.1)

ECCON is responsible for managing the landowners, stakeholders and all project activities that are under Verra´s validation and verification processes.

The landowners' commitment in the long-term (30 years) and the stakeholders' involvement are relationships built under ECCON´s responsibility.

The stakeholders comprise all identified institutions and communities for each PAI that may affect and be affected by the project, as well as all the social projects' elements, under ECCON´s coordination. The main strategy is to empower communities' own governance systems so that they can self-coordinate the social projects in the long-term and beyond the project´s lifetime. Also, the benefits for climate and biodiversity are connected to the benefits for the stakeholders and are planned to continue after the project´s governance structure finishes its 30 year-long commitment.

It is ECCON's responsibility to ensure that the project's activities of planning, executing, and monitoring follow Verra's Climate, Communities and Biodiversity standards during the project's lifetime of 30 years (Figure 83).

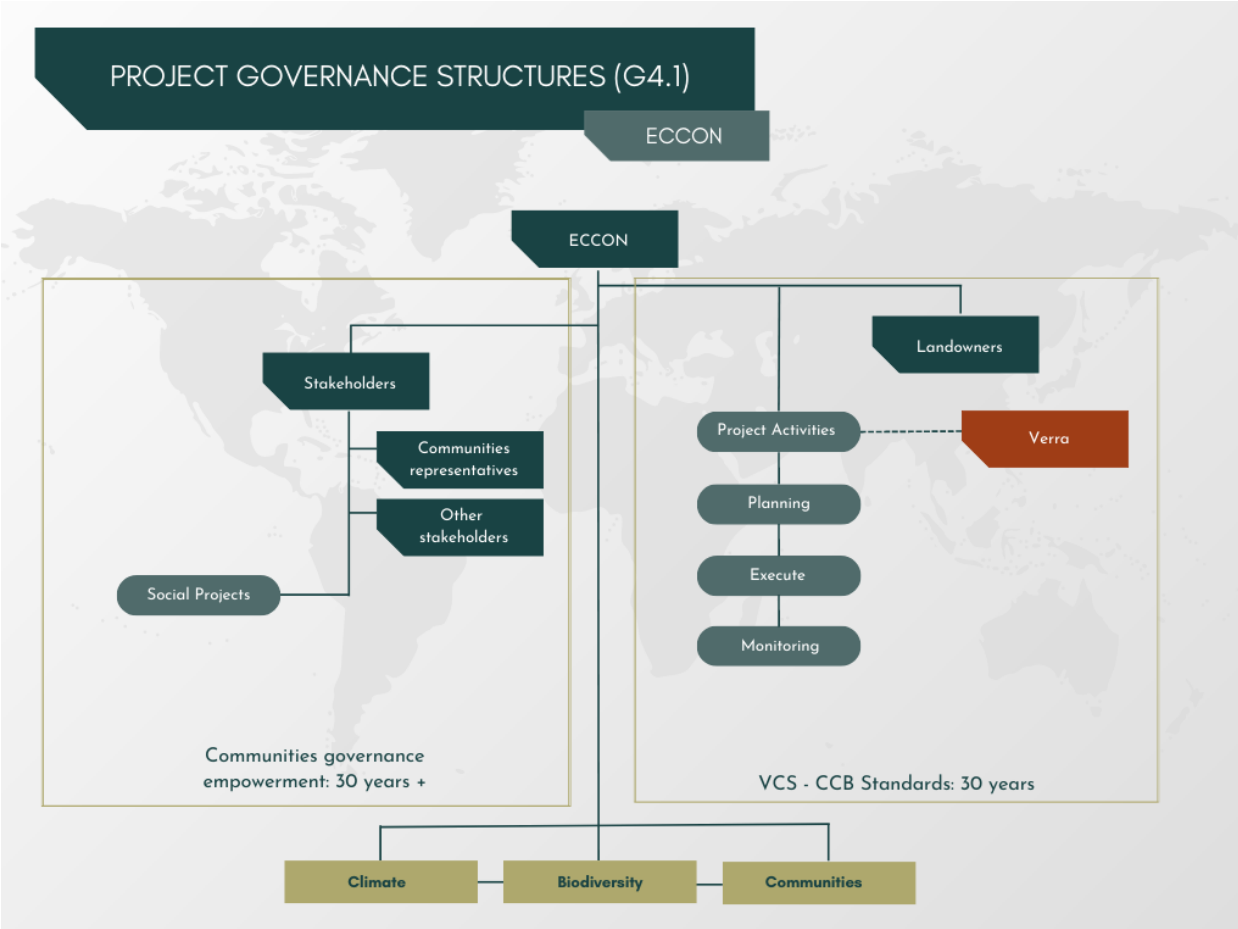

Figure 83. REDD Carbonflor Project Governance Structure

2.4.1.1 COMMUNITIES

Local communities are mapped according to each PAI.

2.4.1.1.1 Communities in PAI 01 – Fazenda Serra (Niquelândia, Goiás, Brazil)

Acaba Vida Settlement

The Community is not currently organized in associations, cooperatives, or any other kind of institution. They also don´t have elected representatives to speak on behalf of the Community. The families are individual units in each farm, sometimes with a few households together that belong to the same family, such as sons and daughters with their families living in the same yard of their parents. Decision-making processes are done collectively, through meetings.

For the REDD Carbonflor decision-making process, it was proposed for each community sub-group to have two representatives and during the first meeting they decided to elect them, one man and one woman, to guarantee women´s participation.

The representatives will be responsible for the Working Groups and need to work on carrying out the projects, be responsible for accounting reports regarding the projects, hold meetings with the community and be representatives of the community, that is, pass on information and consult the community about the decisions, making the communication between the ECCON team and the community sub-group that they represent.

2.4.1.1.2 Communities in PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

Communities' governance structures will be analyzed during site visits planned to occur in April 2023.

2.4.1.1.3 Communities in PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

Communities' governance structures will be analyzed during site visits planned to occur in April 2023.

2.4.1.2 ECCON

ECCON is a private limited liability company. Its headquarters are in São Paulo/SP. ECCON is an environmental consulting firm that supports companies in their sustainability journey. It was founded in 2014 and provides environmental services, along with data generation and dissemination through Monthly Environmental Letters and through its social networks. ECCON is also a Carbon Project developer. Its responsibilities with REDD Carbonflor include:

- ✓ *Feasibility analysis of properties joining REDD Carbonflor;*
- ✓ *Promotion of the participation and cooperation of landowners.*
- ✓ *Development of VCS and CCB projects along with all the inherent technical steps.*
- ✓ *Advice on the commercialization, sales and transfer of verified carbon credits.*
- ✓ *Development of a community impact monitoring plan.*
- ✓ *Conduction of community meetings to inform and explain the proposed project along with providing a means for the community to express and be available to address reasonable grievances.*
- ✓ *Development of a social program that benefits local communities*
- ✓ *Ensure that there are communication channels open between local communities, other stakeholders, and landowners with ECCON*

2.4.1.3 LANDOWNERS

Landowners must provide all evidence of ownership of the property (land deeds and titles) and maps that clearly define the boundaries of the property. Also show that the property is registered with the appropriate government authorities.

Furthermore, landowners are committed to

- *Eliminate the causes of deforestation;*
- *Recognize and agree not to perform any activity that may interfere with the execution of REDD Carbonflor during the project term.*
- *Pay any onus, taxes, fines or any other debts against the property.*
- *Landowners must also ensure that there are no barriers to the generation of carbon credits on the property, including, but not limited to:*

  (i) clearing the forest for alternative land-uses;

  (ii) forest compensation for agriculture;

  (iii) expansion of old roads or the construction of new roads;

  (iv) expansion into new forests on the property for community facilities for use or infrastructure (i.e., bridges, housing, electricity, etc.);

(v) expand deforestation;

(vi) for mining;

- *Pay any onus, taxes, fines or any other debts against the property.*

2.4.1.3.1 PAI 01 – Fazenda Serra (Niquelândia, Goiás, Brazil)

Maria Cecília De Camargo Penteado, Maria Christina De Camargo Penteado and Renata Mussi de Camargo Penteado are the landowners.

2.4.1.3.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

Coimma Incorporações Imobiliárias LTDA is the landowner.

2.4.1.3.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

Fazenda Bodoquena LTDA. is the landowner.

2.4.2 REQUIRED TECHNICAL SKILLS (G4.2)

The technical requirements required to implement the REDD Carbonflor Project include:

- *Stakeholder identification and community mobilization.*
- *Biodiversity assessment and monitoring.*
- *Measurement and monitoring of carbon stocks.*
- *Land use and deforestation modelling.*
- *Project management.*
- *Local knowledge.*

2.4.3 MANAGEMENT TEAM EXPERIENCE (G4.2)

ECCON has a multidisciplinary team with extensive experience. Below, in summary, are the technical qualification of the professionals involved in the project.

Yuri Rugai Marinho: CEO. Graduated in Law and has a Master in Environmental Law from the Faculdade de Direito da Universidade de São Paulo (USP). He has 18 years of experience in legal and technical consultancy. Experience with Environmental Law, in consultancy, litigation and due diligence areas. Consultant of Waterloo Global Science Initiative (Canada) and Kinship Conservation Fellowship Program (United States). Awarded in the Dow Sustainability Innovation Student Challenge Award (SISCA) in 2014.

Fernando Montanari: Environmental Engineer from the Universidade do Vale do Itajaí and University of the Algarve (Portugal) in 2009. Specialization in Geoprocessing and Georeferencing of Properties from the Universidade Regional de Blumenau in 2011, Master's in Urban and Industrial Environment from the Universidade Federal do Paraná and Universität Stuttgart (Germany) in 2015. Coordination and development of Environmental Impact Assessment studies, projects for the recovery of degraded areas and conducting environmental licensing processes. Solid experience in geoprocessing and georeferencing.

Maria Cecilia F. Ferronato: Biologist and Master in Conservation and Biodiversity of Fragmented Habitats from the Universidade Estadual de Londrina (UEL). Development of successful evaluation projects for reforested areas, Vegetation Characterization Reports in environmental studies related to environmental licensing. 7 years of experience in environmental consulting services. Management of ECCON Data.

Julia Maillet R. Lenzi: Graduated in Law from Universidade Presbiteriana Mackenzie. MBA in Agribusiness from Escola Superior de Agricultura "Luiz de Queiroz" da Universidade de São Paulo (ESALQ/USP) and Masters in Biodiversity and Environmental Conservation from Trinity College Dublin (TCD/IE). Experience in the environmental legal segment, climate change, socio-biodiversity and environmental conservation.

Marcelo de Castro Chaves Stabile: Agricultural Engineer from Universidade de São Paulo (ESALQ/USP), M.Sc. in Agronomy from Texas A&M University with a focus on Precision Agriculture and PhD in Agriculture from the University of Sydney with a focus on Land us and Land change modelling. Expertise in Sustainable commodities, sustainable agriculture, and cattle ranching, as well as Payment for Ecosystem Services and Carbon.

Daniela Gennari: Biologist from Centro Universitário São Camilo (2010) and Master in Zoology from the Institute of Biosciences of the Universidade de São Paulo (2020). Performance in Environmental Studies involving diagnosis, survey, monitoring and rescue of fauna in projects in the energy sector (TL, solar and hydroelectric plants). Coordination of the Jiboia-do-Ribeira Conservation Project in communities in the Ribeira Valley.

Lais Cândido Silva: Forest engineer and master's in environmental and Forestry Sciences in the area of Forestry and Forest Management from Universidade Federal Rural do Rio de Janeiro (UFRRJ). Experience in quantification and modeling of biomass and forest carbon, team management, agroforestry system, conservation and environment.

Aline Tiagor: Graduated in Tourism and Hospitality at UNIVALI/SC (2010). Experience in management and research in Tourism in Conservation Units in Brazil. Technical specialist in hospitality and travel agency, acting as a travel designer in destinations in National Parks in Brazil and consultancy for the implementation of accommodation facilities, Business Plan, operational processes and team training. Expertise in consultancy in strengthening traditional communities in the Amazon for participatory management of social projects and income generation. Development of participatory management methodologies and shared decision-making for the construction of sustainable projects.

Gustavo Carceles Fraguas: Environmental Engineer graduated from the Escola Politécnica da Universidade de São Paulo – USP. MBA from USP in progress. Experience in technical analysis of industrial effluents, environmental monitoring and waste management. Management of contaminated areas.

Anne Karoline de Oliveira: Graduated in Biological Sciences (2017), with a master's degree in Physical Geography from the Universidade de São Paulo (in progress). She has experience in planning projects and environmental land use planning, diagnosis, public consultations, and zoning. Acting in projects for the application of environmental legislation for protected areas and in the elaboration of environmental studies with experience in geoprocessing.

Felícia França Pereira: Graduated in Cartographic Engineering and Surveying from the Universidade Federal Rural da Amazônia - (2019), Master's Degree in Natural Disasters from Universidade Estadual Paulista - UNESP and Technical in Roads from the Federal Institute of Education, Science and Technology of Pará State - (2016). Experience in land use and land cover mapping, surveying, and processing of geospatial data and data obtained by UAV and LiDAR. It works in the areas of geoprocessing and remote sensing.

Amanda Almeida Frizzo: Graduated in Environmental Engineering from the Universidade Estadual de Campinas – UNICAMP (2021) with Academic Exchange from Linnaeus University - Sweden (2019) in "Sustainability and Multilevel Governance". Experience in agroforestry for ecological restoration and horticulture. Expertise in biogas renewable energy projects with environmental licensing, carbon credit management, preparation of environmental reports, certifications and socio-environmental projects. Experience with commercial analysis in the energy sector and landfills.

Ana D. A. Hadzi-Antic: Graduated in Law (in progress) from the Faculty of Law of the Universidade de São Paulo (USP). He worked in the environmental and urban area, in law firms and in the São Paulo City Attorney's Office. Has experience in drafting legal documents; follow-up of judicial and administrative proceedings; research of doctrine and jurisprudence; and due diligence. He has extracurricular experiences in the areas of Environmental Law, Urban Law and Climate Change.

Camilla Olival: Environmental Engineer graduated from the Escola Politécnica da Universidade de São Paulo – USP (2018). Expertise in consulting projects involving the development of the stages of management of contaminated areas in accordance with state and federal regulations. Consultancy on solid waste management project for urban areas. Acting in projects of application of environmental legislation for protected areas and preparation of environmental studies.

Fernando Cerri Costa: Bachelor’s in science and Technology (2012), Environmental and Urban Engineer (2015), Master in Environmental Science and Technology (2019) all from the Universidade Federal do ABC (UFABC). Currently, he is a doctoral candidate in Natural Disasters at UNESP – Campus São José dos Campos. Expertise in geotechnical cartography projects for suitability for urbanization, developing diagnosis of the physical environment, hydraulic-hydrological modeling, conservation priority map and urbanization trend map. Scholarship researcher on Hydrogeological Risk Management and climate change. Experience in geoprocessing linked to the various works and research carried out.

Maria Vitória P. Monteiro: Maria Vitória P. Monteiro: Graduated in Law from the Universidade de São Paulo. Msc. in Sustainable Resource Management at Technical University of Munich (current). Specialist in Environmental Law at Faculdade CERS. Environmental Technician by IFTM-MG. Experience in Environmental Law, Mining, Climate Change and Administrative Litigation.

Mariana Sanches Saú: Law degree (in progress) from Universidade Presbiteriana Mackenzie. Worked in civil litigation at a law firm and at the Attorney General's Office of the Municipality of São Paulo. He has experience in the elaboration of pieces and other legal documents, research of doctrines, jurisprudence, and production of articles. She has extracurricular experience in the areas of Children's Law, Climate Change, and also participates in Moot Courts related to Environmental Law and International Law.

Sofia Amaral Tori: Environmental and Urban Engineer, and Bachelor of Science and Technology both at Universidade Federal do ABC (UFABC), with sandwich undergraduate degree at University College Dublin (UCD) in Earth and Environmental Sciences. Experience in consulting services in the area of engineering and sanitation, and studies related to hydro-climatology. Performance in preparation of technical studies and reports, environmental licensing process, and geoprocessing services, with an emphasis on the physical environment.

Tatiana C. Leite de Aguiar: Graduated in Law from Universidade Potiguar. Post-graduated in Tax Law from IBET; in Public Law from UFRN; and, in homoaffective and gender law from UNISANTA. Master and PhD in Law from PUC/SP. Professor at FGV/SP in ESG, Compliance, Business and Tax postgraduate courses; at IDP/SP in the Professional Master's course; and, at ESPM in the law undergraduate course. Lawyer. ESG consultant.

Thais Mazzafera Haddad: Biologist from the State Universidade de Londrina (UEL, 2011). Master in Biological Sciences from the same University with a focus on Plant Ecology. PhD in Sciences from the Escola Superior de Agricultura “Luiz de Queiroz”, ESALQ/USP. Post-doctorate at the Institute of Biology of the Universidade Estadual de Campinas (Unicamp). Expertise in environmental diagnosis, phytosociological analysis and elaboration of environmental projects. Specialist in Plant Ecology and Ecological Restoration.

Vitória Camacho de Morche: Bachelor in Geography from the Faculdade de Filosofia, Letras e Ciências Humanas da Universidade de São Paulo (2021) and student of Agronomic Engineering at Universidade Anhanguera. She has experience in several areas of Geoprocessing. He worked in the public and private sectors, working in the search, systematization and implementation of geographic data, satellite images and MDEs, manipulation of vector files, features and objects, in the transposition of databases, in the mapping of APAs, APPs, legal reserves and suppression of native vegetation.

2.4.4 PROJECT MANAGEMENT PARTNERSHIPS/TEAM DEVELOPMENT (G4.2)

The project proponent will provide guidance and training to ECCON staff. Training includes drone piloting course and data collection.

2.4.5 FINANCIAL HEALTH OF IMPLEMENTING ORGANIZATION(S) (G4.3)

Financial information from ECCON is commercially sensitive, this will be shared in Appendix 6: ECCON's Financial statement.

2.4.6 AVOIDANCE OF CORRUPTION AND OTHER UNETHICAL BEHAVIOR (G4.3)

ECCON has a Code of Conduct with the objective of building good business conduct and sharing values (Appendix 7: ECCON's Code of practice) among its employees, ensuring clarity and legal certainty. ECCON does not offer or accept bribes, kickbacks, or other corrupt payments, and has clear rules on corruption and includes training, monitoring, and consequence management, avoiding any activity related to this topic.

Contracts made with clients are always recorded, as well as expenses and working hours that were necessary to carry out the requested activity. Communications via email and telephone may also become records.

It is important to keep records of the business carried out so that, in the event of a lawsuit or government investigation, the necessary documents are on hand, following the instructions received in that situation.

The Brazilian Anti-Corruption Laws will be included in all the contracts and terms signed between the project proponent and any of the other entities involved in project design and implementation. By that, all the involved actors are obliged to fully observe Law No. 12,846 / 2013[86] ("Brazilian Anti-Corruption Law") and declare that they are aware of all the terms and definitions provided for in the Brazilian Anti-Corruption Law, which define as a harmful act to promise, offer, or give, directly or indirectly, an undue advantage to a public agent or the third person related to it, among others.

Finally, the evidence that can be checked to confirm involvement in any form of corruption is a prior due diligence that is conducted before signing contracts or related documents. The process of a due diligence will verify documents from entities involved, such as, record of administrative, civil and criminal procedures, among debits before agencies and involvement in illegal affairs.

2.4.7 COMMERCIALLY SENSITIVE INFORMATION (*RULES* 3.5.13 – 3.5.14)

There is no commercially sensitive information in this project description document. Supporting documents which include commercially sensitive information that were not made publicly available include NDA signed with clients; contracts with landowners and documents related to project financials.

[86] Accessed at: https://www.planalto.gov.br/ccivil_03/_ato2011-2014/2013/lei/l12846.htm

2.5 LEGAL STATUS AND PROPERTY RIGHTS

2.5.1 STATUTORY AND CUSTOMARY PROPERTY RIGHTS (G5.1)

The areas from the Project are distributed in a mosaic configuration, located in private properties, who are engaged to the Project through free, prior, and informed consent. The Letter of Intentions demonstrates the rights to the lands and the commitment with the Project.

Also, in the preliminary analysis carried on by the Project proponent, all the documents related to rights to use and manage the land were provided. In Brazil, the main ownership documents are:

- *Registry (Matrícula) or Ownership Term (Termo de Posse): the Registry Office provides these documents, which describe relevant historical information with regards to legal, judicial as well as financial transactions pertaining to the property. If in these documents exist any legal matters, a due diligence and risk analysis is carried out.*
- *Valid Certificate of Rural Land Record (CCIR) with the National Institute of Land Settlement and Agrarian Reform (INCRA) and, in some cases, a certified geo-referenced perimeter description of the area.*
- *Certificate of regularity with the tax on rural property (Imposto sobre Propriedade Territorial Rural) (ITR).*
- *Rural Environmental Registry (Cadastro Ambiental Rural) (CAR). CAR is a nationwide public registry, compulsory for all rural properties, and aims to incorporate all information related to environmental compliance (APP and Legal Reserve, vegetation, consolidated areas, and others), to create a database for controlling, monitoring, environmental and economic planning and fighting off deforestation.*

Any regulatory or environmental licenses regarding the property.

2.5.2 RECOGNITION OF PROPERTY RIGHTS (G5.1)

The property rights for each parcel of the mosaic configuration are recognized and respected. All properties involved in the project either have property titles or equivalent documents to certify and assure rights over the land.

If in the future any relocation of activities needs to be undertaken, it will take place with a written and signed agreement, that demonstrates free, prior, and informed consent of those involved and provides just and fair compensation.

2.5.3 FREE, PRIOR AND INFORMED CONSENT (G5.2)

This section about FPIC was built by consulting the following four documents: Free, Prior and Informed Consent and REDD+: Guidelines and Resources, from WWF, 2014[87]; Community Engagement Guidance: Good Practice for Forest Carbon Projects, from Forest Trends, 2011[88]; Free, Prior, and Informed Consent:

[87] SPRINGER, J.; RETANA, V. et al. Free, Prior and Informed Consent and REDD+: Guidelines and Resources. WWF, 2014.

[88] Blomley, Tom, and Michael Richards. Community Engagement Guidance: Good Practice for Forest Carbon Projects. In Building Forest Carbon Projects, Johannes Ebeling and Jacob Olander (eds.). Washington, DC: Forest Trends, 2011.

Principles and Approaches for Policy and Project Development, from RECONFTC, 2011[89]; Free, prior and informed consent in REDD+: A handbook for grassroots facilitators, from RECOFTC, 2014[90].

Free, Prior and Informed Consent ("FPIC") is a key component for the effectiveness of REDD Carbonflor. According to the United Nations Declaration on The Rights of Indigenous Peoples, FPIC is defined as the right of indigenous peoples and traditional communities to determine and develop priorities and strategies for the development or use of their lands or territories and other resources. So, to obtain approval from traditional populations to develop a project (AFOLU, REDD, among others), it is necessary to inform and clarify all the aspects regarding to implementation, development and monitoring the project in an adequate language, ensuring that all the information was understood by those that may be affected by the project, so that they can give or withhold their consent.

All the participatory tools and stakeholders' engagement process for REDD Carbonflor were designed to embrace the communities and stimulate their active participation, so that FPIC can be considered an additional component to ensure their fundamental right of having their opinions considered for any project that may affect their livelihood and well-being.

In the cases when FPIC will be required, the 10 elements below will be followed by the ECCON, the Project Proponent:

1. *Identifying customary lands and rights holders. Process conducted by mapping of the key area.*
2. *Identifying and engaging with appropriate community decision-making institutions/ authorities. Process conducted by mapping of the key area and online/in-field research.*
3. *Identifying and engaging support organizations.*
4. *Building mutual understanding and agreement on a locally appropriate FPIC process (adequate language and methods for local culture).*
5. *Providing information. The information will be provided by documentation and face-to-face meetings.*
6. *Engaging in negotiation and supporting decision-making. Several meetings will be held to support decision-making with participatory tools to listen to contributions and opinions.*
7. *Documenting consent-based agreements. Can be done by video or photo, especially when a written document is not the usual method for the local culture.*
8. *Supporting and monitoring implementation of agreements. The Project proponent has a specialized team to provide support in the implementation and monitoring of agreements.*
9. *Establishing and operating a conflict resolution mechanism. Communication is made via e-mail, phone, message applications and during face-to-face meetings, intending to guarantee an efficient conflict resolution mechanism.*
10. *Verifying consent. In the verification stage of the auditing, the documented consent (written, video or photo) will be verified by the third party.*

Other elements that ensure that the project will not encroach uninvited on private property, community property, or government property will be held. In the proposed Project, no property rights will be affected, since the landowners have already signed the Letter of Intentions, which shows their commitment to the Project and the Project Proponent. For the landowners, the process of FPIC used was: (i) approach with landowners with explanations from a REDD project; (ii) several meetings for clarifications and negotiation;

[89] Free, Prior, and Informed Consent: Principles and Approaches for Policy and Project Development. RECONFTC, Bangkok, February 2011.
[90] Free, prior and informed consent in REDD+: A handbook for grassroots facilitators - Questions and answers. RECOFTC, Bangkok, 2014.

(iii) in-field trips and analysis provided by the Project proponent; (iv) signature of written agreement between the involved parts.

Also, appropriate restitution or compensation will be allocated to any parties whose lands have been or will be affected by the project, however, this is not the case for the current project.

In the Project Zone, the communities related to the Project have been consulted by the process of Stakeholder Consultation, and the elements of FPIC are not required, following the classification below:

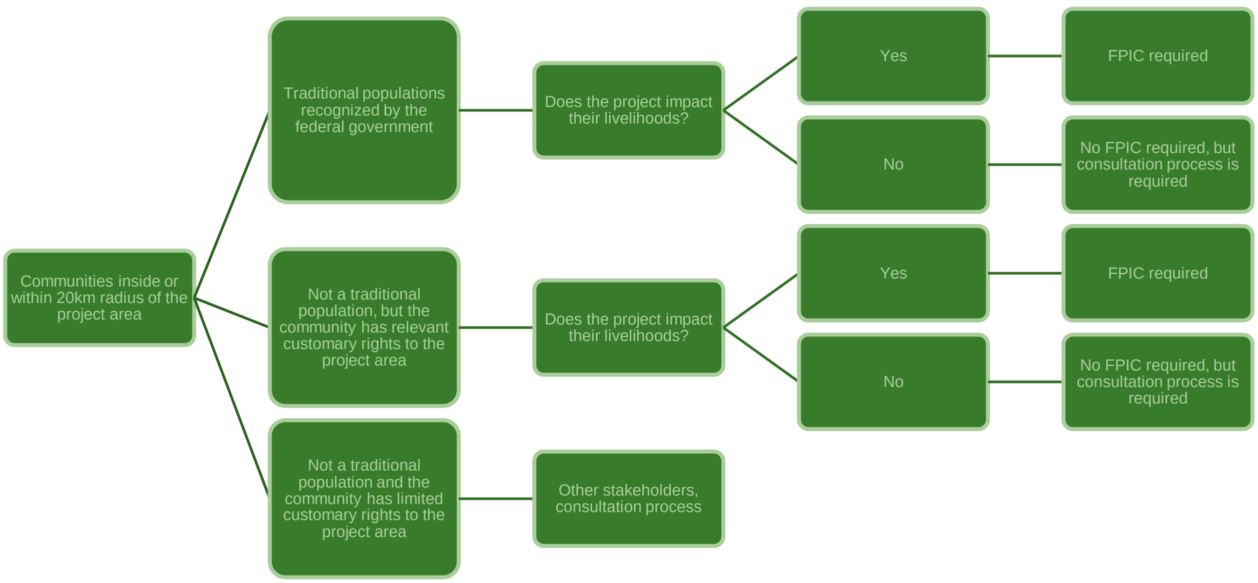

Figure 84. FPIC flow – Stakeholders classification to FPIC requirement.

2.5.4 PROPERTY RIGHTS PROTECTION (G5.3)

The project activities do not lead to any type of involuntary relocation as all the owners legally own their land and present documents that accredit it. Thus, the signed pre-contract ensures that landowners are not being forced to relocate activities that are important to the culture or livelihood.

2.5.5 ILLEGAL ACTIVITY IDENTIFICATION (G5.4)

Illegal deforestation may affect the project. Hence, the Project proponent will train local villagers to work as monitoring staff in the Project Area. This is the main activity to prevent and avoid illegal activities. The community near the Project Area will also be encouraged to report illegal loggers in the region.

The Project proponent will also monitor the occurrence of illegal activities inside the Project area. If any illegal activity is identified, a mitigation plan will be prepared, defining short, medium, and long-term strategies to address the risk to the Project, in a way to guarantee the benefits to the climate, community and biodiversity over the lifetime of the Project.

2.5.6 ONGOING DISPUTES (G5.5)

The Project area has no ongoing disputes. By Consulting land deeds and personal documents, it is possible to verify the existence of any legal issues in terms of civil, criminal, and administrative law related to the property or its owners. ECCON undertook due diligence with the information of the landowners and the farm. We have not identified any disputes over lands in the last 20 years.

2.5.7 NATIONAL AND LOCAL LAWS (G5.6)

Considering that, from a wide perspective, the biomes of Amazônia, Cerrado and Pantanal are included in the project, and that Amazônia and Cerrado are considered as two of the most relevant biomes in Brazil, the importance of implementing the project is clear.

These biomes, respectively, are the two largest biomes in the country, occupying an area of 49.59% and 23.92% of the territorial extension of the country. Besides that, the regulatory framework in Brazil brings specificities in the applicable rules to these biomes, given their importance.

Among the many characteristics of the mentioned biomes, we highlight that Amazônia embraces the most important Tropical Forest in the world, which regulates precipitation and climate in the country. While Cerrado is currently the most threatened biome in Brazil, due to the expansion of agriculture and livestock. In recent years, deforestation in the Cerrado has reached 45,6% of the biome and the legal framework in deforestation is not as restrictive as with other biomes.

The program is also in compliance with Brazilian national laws including the Brazilian Constitution, which in chapter 6 provides for environmental protection (Article 225). The activities of the program are aligned with the national mandate as expressed in Article 225, paragraph 4, below:

> *The Brazilian Amazonian Forest, the Atlantic Forest, the Serra do Mar, the Pantanal Mato-Grossense and the coastal zone are part of the national patrimony, and they shall be used, as provided by law, under conditions which ensure the preservation of the environment*.

In addition, the project is also aligned with the National Environmental Policy (Federal Law No. 6,938/1981), considering general national objectives of conservation and recovery of ecosystem services and many other major principles exposed by the law.

2.5.7.1 NATIONAL ENVIRONMENTAL LAWS

Law on the Protection of Native Forests - "Forest Code" (Federal Law No. 12,651/2012)[91]: the Forest Code establishes that every rural landowner must preserve native vegetation in a portion of their property as a Legal Reserve. This portion depends on the region and biome in which the property is located.

In the Amazon the Legal Reserve must be at least 80% of the property area, while in Cerrado (within the Legal Amazon) it must be 35%, and in other biomes 20% (see Table 13). The Forest Code also defines Areas of Permanent Protection: areas that include Riparian Zones to protect rivers, lakes, and water springs; slopes with declivities greater than 45º; "restinga" vegetation; mangroves; edges of boards and plateaus; the top of hills higher than 100 meters that have an average slope above 25º; areas with altitudes higher than 1,800 meters, regardless of the type of vegetation; and the marginal zone of veredas vegetation. The Forest Code, finally, defined the carbon credit as "a title to a tradable intangible and incorporeal asset" (Article 3, XXVII).

[91] Accessed at: https://www.planalto.gov.br/ccivil_03/_ato2011-2014/2012/lei/l12651.htm

National Policy on Climate Change (Federal Law No. 12,187/2009)[92]: Institutes the National Policy on Climate Change (Política Nacional sobre Mudança do Clima – PNMC, in Portuguese). The PNMC defines actions and measures aimed at mitigating as well as adapting to climate change, with the following specific objectives about conversion: (i) Seek a sustained reduction in conversion rates, in their four-year average, in all Brazilian biomes, until zero illegal conversion is reached; i(i) Eliminate the net loss of the forest cover area in Brazil, by 2020.

National Fund on Climate Change (Federal Law No. 12,114/2009)[93]: Law No. 12,114 of December 9, 2009 - Creates the National Fund on Climate Change (Fundo Nacional sobre Mudança do Clima – FNMC, in Portuguese).

Payment for Ecosystem Services Law[94] (Federal Law No. 14,119/2021): Brazil has recently passed a Law for Payment for Environmental Services (nº 14.119/2021), and some articles of the law establish a foundational legal framework that gives legal security to many types of projects, as for example, REDD+ projects since it gives good definitions in topics that are aligned with forests, exosystemic services, and carbon credits. Native vegetation protection activities are modalities of environmental services, defined by the Law as a set of individual or collective activities that favor the maintenance, recovery, or improvement of ecosystem services. REDD+ projects, for example, consist of a type of project in which there is payment for the environmental service of forest protection provided by certain individuals or communities.

2.5.7.2 STATE LAWS

Table 16. Location of each PAI and the local state legislation

PAI	Location (State)
PAI 01 – Fazenda Serra	Goiás
PAI 02 – Fazenda Bom Destino	Acre
PAI 03 – Fazenda Bodoquena	Mato Grosso do Sul

The project area of implementation is inside the territorial extension of the following states: Goiás and Acre. The Project is under these state's laws and regulatory frameworks. Specifically, these include:

2.5.7.2.1 PAI 01 - Goiás:

Decree No. 9,909/2021[95]. Creates the State Committee for Fight and Prevention of Forest Fires. The Committee was created to protect vegetation relevant to the conservation of the Cerrado Biome. This law is mostly preventive, with educational aspects. The regulation also uses meteorological aspects to determine the level of risk, considering the high amount of forest fires due to natural causes.

The project is following this set of norms, since it always emphasizes to those involved that the protection of forests is a point of attention, because there are many risks involved in forest fires.

[92] Accessed at: http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2009/lei/l12187.htm
[93]Accessed at: https://www.planalto.gov.br/ccivil_03/_ato2007-2010/2009/Lei/L12114.htm
[94] Accessed at: http://www.planalto.gov.br/ccivil_03/_ato2019-2022/2021/lei/L14119.htm
[95]Accessed at: https://legisla.casacivil.go.gov.br/api/v2/pesquisa/legislacoes/104213/pdf

Decree No. 9,891/2021[96]. Creates the State Plan of Mitigation/Adaptation to Climate Change, aiming the construction of low carbon economy in agriculture.

The objectives of the law are reducing the emission and increase the sequestration and fixation of greenhouse gases in agriculture and encourage greater use of technical knowledge of agronomic practices for soil, water and biodiversity conservation, as well as the dissemination of low greenhouse gas emission production systems, with increased productivity.

Decree No. 18104/2013[97]. Provides on the protection of native vegetation, institutes the new Forestry Policy. Creates the Cadastro Ambiental Rural from the Goiás State (CAR GOIÁS), with the purpose of integrating the environmental information of rural properties. Establishes the areas of permanent preservation and the areas of legal reservation. In Brazilian law, this means that a percentage of the rural property must have vegetation coverage, without any type of economical use.

2.5.7.2.2 PAI 02 – Acre

Law No. 1117/199498. Provides on the environmental policy of the State of Acre. It addresses principles and objectives related to sustainable development, as well as basic mechanisms for its implementation. It also includes pollution control, soil and subsoil use, surface and underground water, wild fauna, flora protection, mineral resources, genetic patrimony, sanitation, waste, buildings, and environmental licensing.

Law No. 1426/200199. Provides on the preservation and conservation of the State's forests, institutes the State System of Protected Natural Areas, creates the State Forest Council and the State Forest Fund. Addresses public lands, forest resources, sustainable development, forest education, and infractions and sanctions.

Law No. 2308/2010[100]. Creates the State System of Incentives for Environmental Services - SISA, the Incentives for Environmental Services Program - ISA-Carbono, and other programs for Environmental Services and Ecosystem Products of the State of Acre. It establishes the accounting for carbon credits and the State's voluntary target. Finally, it also addresses conservation of biodiversity, waters, landscape beauty, climate regulation, and soil improvement.

2.5.7.2.3 PAI 03 – Mato Grosso do Sul

Law No. 4,163/2012[101]: Disciplines, within the scope of the State of Mato Grosso do Sul, the exploitation of forests and other forms of native vegetation, the use of forest raw material and the obligation of reforestation. Forests and other forms of native vegetation existing in the State of Mato Grosso do Sul are considered assets of common interest to all citizens, and requirements regulated by this law for types of environmental suppression must be followed.

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[96] Accessed at: https://leisestaduais.com.br/go/decreto-n-9891-2021-goias-institui-o-plano-estadual-de-mitigacao-adaptacao-as-mudancas-climaticas-e-sustentabilidade-na-agropecuaria?q=plano%20estadual%20recursos%20h

[97] Accessed at: https://matrincha.go.gov.br/site/wp-content/uploads/2020/06/20130718_LEI_ESTADUAL_18104_PROTECAO_VEGETACAO_NATIVA.pdf

[98] Accessed at: http://www.legis.ac.gov.br/detalhar/3020.

[99] Accessed at: http://www.legis.ac.gov.br/detalhar/3777.

[100] Accessed at: http://www.legis.ac.gov.br/detalhar/475.

[101] Accessed at: https://www.legisweb.com.br/legislacao/?id=139797.

Law No. 4555/2014[102]**.** Creates the State Policy for Climate Change - PEMC, in the State of Mato Grosso do Sul. Establishes principles, definitions, objectives and guidelines for the required adaptations to the impacts derived from climate change, as well as contribute to reduce or stabilize the concentration of greenhouse gases in the atmosphere.

Law No. 5235/2018[103]**.** Defines concepts, objectives, guidelines, and actions of the State Policy for Preservation of Environmental Services, establishes the State Program of Payment for Environmental Services (PESA), and establishes a Management System for this Program, in order to promote sustainable development, environmental conservation, and to encourage the provision and maintenance of these services throughout the state.

Law No. 3020/2005[104]. Establishes policy and norms for carbon sequestration in the state of Mato Grosso do Sul. The fixed sources of greenhouse gas emitters, especially carbon dioxide and methane, located in the State's territory, must be considered as priority environmental opportunities for carbon projects and their respective credits, to be monetized by the Clean Development Mechanism of the Kyoto Treaty, as well as other existing markets.

Decree No. 13777/2013[105]. Determines that the State of Mato Grosso do Sul, by means of eligibility criteria, will recognize sustainable development programs that aim the preservation of native forests, associated with the promotion of agricultural production, cattle-raising, and sustainable forestry, and that are capable of generating voluntary socio-environmental and cultural compensation bonds.

2.5.7.3 BIODIVERSITY AND TRADITIONAL POPULATIONS

Federal Law No. 13,123/2015[106] **("Brazilian Biodiversity Law").** It provides access to genetic resources, protection and access to associated traditional knowledge, and the benefits sharing for the conservation and sustainable use of biodiversity. The law covers all activities carried out with Brazilian biodiversity, including activities that were not covered by previous legislation, such as research related to taxonomy, phylogeny, ecological studies, biogeography, and epidemiology.

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[102] Accessed at: http://www2.normaambiental.com.br:8888/cargill379410/lpext.dll/np/Infobase6/21f5e16/21f60ec/2200f7d?f=templates&fn=altmain-h.htm&q=(%5Bcampo%20tema%3AMeio.ambiente%5D)(%5Bcampo%20tipo_de_norma%3A%5D%5Bcampo%20ementa%3A%5D)n%E3o%20%5BCampo%20revogados%5D&x=Advanced&2.0#LPHit1

[103] Accessed at: http://www2.normaambiental.com.br:8888/cargill379410/lpext.dll/np/Infobase6/21f5e16/21f60ec/2202ff7?f=templates&fn=document-frame.htm&q=(%5Bcampo%20tema%3AMeio.ambiente%5D)(%5Bcampo%20tipo_de_norma%3A%5D%5Bcampo%20ementa%3A%5D)n%E3o%20%5BCampo%20revogados%5D&x=Advanced&2.0#LPHit1

[104] Accessed at: http://www2.normaambiental.com.br:8888/cargill379410/lpext.dll/np/Infobase6/21f5e16/21f60ec/21facd2?f=templates&fn=altmain-h.htm&q=(%5Bcampo%20tipo_de_norma%3A%5D%5Bcampo%20ementa%3A%5D)n%E3o%20%5BCampo%20revogados%5Dcarbono&x=Advanced&2.0#LPHit1

[105] Accessed at: http://www2.normaambiental.com.br:8888/cargill379410/lpext.dll/np/Infobase6/21f5e16/2204439/220e368?f=templates&fn=document-frame.htm&q=(%5Bcampo%20tipo_de_norma%3A%5D%5Bcampo%20ementa%3A%5D)n%E3o%20%5BCampo%20revogados%5Dcarbono&x=Advanced&2.0#LPHit1

[106] Accessed at: https://www.planalto.gov.br/ccivil_03/_ato2015-2018/2015/lei/l13123.htm

Federal Decree No. 6,040/2007[107]. Establishes the National Policy for the Sustainable Development of Traditional Peoples and Communities, advocating that traditional territories are necessary spaces for the cultural, social, and economic reproduction of traditional peoples and communities, used permanently or temporarily. Its general objective consists of the sustainable development of traditional peoples and communities, with emphasis on the recognition, strengthening, and guaranteeing of their territorial, social, environmental, economic, and cultural rights, respecting their identity, forms of organization, and institutions.

2.5.7.4 WORKER'S RIGHTS

The project, as well as the involved landholders (legal entity or private individual), property management personnel, and any other employee category directly linked to the property operation will operate under Brazilian Labor legislation)[108]. During the project's execution, to guarantee that there will no violation of the Brazilian Labor law, an in-depth audit is carried out to verify the incidence of child or forced labor, as well as to analyze the existence and content of labor lawsuits.

Decree-Law No. 5,452/1943[109]**.** "The Consolidation of Labor Laws (Consolidação das Leis do Trabalho)". Its main objective is the regulation of individual and collective work relations. Professional identification, working hours, minimum wage, occupational health and safety, protection of women and minors, social security, and union regulations can be found in this Law. Legal persons, self-employed or civil servants are excluded from it.

2.5.7.5 ANTI-CORRUPTION LAWS

All the involved actors are obliged to fully observe Law No. 12,846 / 2013[110] ("Brazilian Anti-Corruption Law") and declare that they are aware of all the terms and definitions provided for in the Brazilian Anti-Corruption Law, which define as a harmful act to promise, offer, or give, directly or indirectly, an undue advantage to a public agent or the third person related to it, among others. The project developer maintains free, prior, and informed consent (FPIC) with each part.

2.5.7.6 TAXATION REGULATIONS:

With respect to the taxation regulations relevant to the project, Brazil has the following taxation regulations:

- *COFINS (Contribution to Social Security Financing), Complementary Federal Law No 70/1991:*[111] *This regulation relates to the social contribution to finance social security.*
- *CSLL (Social Contribution on Net Corporate Profit), Federal Law No 7689/1988:*[112] *This regulation is the social contribution calculated on net profit.*
- *FGTS (Length of Service Guarantee Fund), Federal Law No 8036/1990:*[113] *This regulation is a contribution paid to a fund for each employee hired. When the employee is laid-off, they can take the money as compensation.*

[107] Accessed at: http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2007/decreto/d6040.htm
[108] Accessed at: http://www.planalto.gov.br/ccivil_03/decreto-lei/del5452.htm
[109] Accessed at: https://www.planalto.gov.br/ccivil_03/decreto-lei/del5452.htm
[110] Accessed at: https://www.planalto.gov.br/ccivil_03/_ato2011-2014/2013/lei/l12846.htm
[111] Accessed at: https://www.planalto.gov.br/ccivil_03/LEIS/LCP/Lcp70.htm
[112] Accessed at: https://www.planalto.gov.br/ccivil_03/LEIS/L7689.htm
[113] Accessed at: https://www.planalto.gov.br/ccivil_03/Leis/L8036consol.htm

- *IRPJ (Corporate Income Tax), Federal Law No 9430/1996:[114] This regulation is for tax paid on corporate income.*
- *ISS (Tax on Services of Any Nature), Complementary Federal Law No 116/2003:[115] Each city has a similar law to fulfill the federal law and this regulation is a municipal tax paid on services.*
- *INSS (Social Security): Federal Law No 8212/1991:[116] This regulation is for contribution paid for the Federal Retirement Fund.*
- *PIS (Social Integration Tax), Complementary Federal Law No 07/1970:[117] This regulation is for contribution paid to the Social Integration Fund.*
- *ITR (Rural Land Tax), Federal Law No 9393/1996:[118] This regulation is for tax paid on rural landownership.*

2.5.8 APPROVALS (G5.7)

The Project is developed on privately owned lands, in a mosaic format, and complies with all the required laws, statutes and frameworks, according to item 2.5.7.

In the federal scope, there is a technical note from the Ministry of the Environment (MMA)[119] recognizing the role of REDD+ projects in the voluntary market:

> "Considering all the mitigation potential of the land use change sector and forests in Brazil, this context presents a valuable opportunity to attract large investments in projects that act directly in the territory, providing environmental monitoring, surveillance and environmental protection services in areas, transforming the local reality and promoting the conservation and recovery of large-scale native vegetation, an essential contribution to reducing illegal deforestation, supporting sustainable development and ensuring long-term conservation of Brazilian forests".

We highlight that the Project is based on the voluntary market in private areas, where the approval of the implementation of the project activities depends only on the communities and landowner, which was already provided by signed agreement. It means that it is not necessary to obtain any national, state, or municipal approval to start its activities.

2.5.9 PROJECT OWNERSHIP (G5.8)

The Project will initially take place in three areas, located in Niquelândia/GO, Rio Branco/AC and Miranda/MS, respectively. All areas are registered with local land registry offices through property registers.

The Landowners signed a Letter of Intent and Contracts with ECCON, where they agreed with the elaboration of a REDD+ Project in the area. Therefore, ECCON is the proponent of the Project, while the Landowners are the owner of the properties and the forests. The property deeds are listed in Table 17 below, with their respective identification:

Table 17. Farm name, property deed, information, and location

[114] Accessed at: https://www.planalto.gov.br/ccivil_03/LEIS/L9430compilada.htm
[115] Accessed at: https://www.planalto.gov.br/ccivil_03/leis/lcp/lcp116.htm
[116] Accessed at: https://www.planalto.gov.br/ccivil_03/LEIS/L8212cons.htm
[117] Accessed at: https://www.planalto.gov.br/ccivil_03/LEIS/LCP/Lcp07.htm
[118] Accessed at: https://www.planalto.gov.br/ccivil_03/leis/l9393.htm
[119] Available on: https://www.gov.br/mma/pt-br/assuntos/servicosambientais/florestamais/FlorestamaisCarbono.pdf

PAI	Farm Name	Property Registry	Date	Extension
PAI 01	Fazenda Serra, Lote No. 04 Located in Niquelândia, State of Goiás, Brazil	No. 1503, from the Real Estate Office of Mimoso de Goiás, State of Goiás	Issuance: November 11, 2021. Register: August 16, 2010.	1,046 hectares
	Fazenda Serra, Lote No. 03 Located in Niquelândia, State of Goiás, Brazil	No. 1504, from the Real Estate Office of Mimoso de Goiás, State of Goiás	Issuance: November 03, 2021. Register: August 16, 2010.	1,135 hectares
	Fazenda Serra, Lote No. 03 Located in Niquelândia, State of Goiás, Brazil	No. 1505, from the Real Estate Office of Mimoso de Goiás, State of Goiás	Issuance: November 03, 2021. Register: August 16, 2010.	1,911 hectares
PAI 02	Fazenda Bom Destino, Located in Rio Branco, State of Acre, Brazil	No. 16385, from the 1º Ofício de Registro de Imóveis de Rio Branco	Issuance: September 29, 2022. Register: September 19, 2003.	10,071 hectares
PAI 03	Fazenda Bodoquena, parcel 02, Located in Miranda, State of Mato Grosso do Sul, Brazil	No. 14975, from the 1º Office of the District of Miranda	Issuance: April 05, 2022. Register: April 06, 2022.	897,30 hectares
	Fazenda Bodoquena, parcel 04, Located in Miranda, State of Mato Grosso do Sul, Brazil	No. 14976, from the 1º Office of the District of Miranda	Issuance: April 05, 2022. Register: April 06, 2022.	14.238,28 hectares
	Fazenda Bodoquena, parcel 05, Located in Miranda, State of Mato Grosso do Sul, Brazil	No. 14977, from the 1º Office of the District of Miranda	Issuance: April 05, 2022. Register: April 06, 2022.	3.196,41 hectares
	Fazenda Bodoquena, parcel 03, Located in Miranda, State of Mato Grosso do Sul, Brazil	No. 14978, from the 1º Office of the District of Miranda	Issuance: April 05, 2022. Register: April 06, 2022.	44,272 hectares
	Fazenda Bodoquena, parcel 07, Located in Miranda, State of Mato Grosso do Sul, Brazil	No. 14979, from the 1º Office of the District of Miranda	Issuance: April 05, 2022. Register: April 06, 2022.	18.337,74 hectares

2.5.10 MANAGEMENT OF DOUBLE COUNTING RISK (G5.9)

Although the Project can generate benefits related to climate, communities, and biodiversity, for being considered able to generate or remove the GEEs, it is required that the project is due registered on a market platform. We have chosen such platform to be Verra's Registry.

There are no current Governmental programs in the State of Government of Goiás or Mato Grosso do Sul, related to net reductions and removals of greenhouse gases.

The Government of Acre has the Normative Instruction, from the Instituto de Mudanças Climáticas ("IMC") No. 1/2015, which creates a Jurisdictional system (see Appendix 3: Acre's jurisdictional system).

In addition, the Project has no intention of being registered in any other carbon market registry. Therefore, it is possible to attest that there will be no issues of double counting of carbon credits generated from the project.

2.5.11 EMISSIONS TRADING PROGRAMS AND OTHER BINDING LIMITS

Does the project reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading?

☐ Yes ☒ No

2.5.12 OTHER FORMS OF ENVIRONMENTAL CREDIT

Has the project sought or received another form of GHG-related credit, including renewable energy certificates?

☐ Yes ☒ No

2.5.13 PARTICIPATION UNDER OTHER GHG PROGRAMS

The project has not been registered and is not seeking registration in any other GHG program.

2.5.14 PROJECTS REJECTED BY OTHER GHG PROGRAMS

The project has not been rejected by any other GHG programs.

2.5.15 DOUBLE COUNTING (G5.9)

The carbon credits generated from the Project will be registered under the Verified Carbon Standard (VCS) and sold under that mechanism, to guarantee the non-incidence of double courting. The credits from the Project will not be registered or sold under any other mechanism or scenario, and monitoring will be provided, to ensure that credits are not sold twice.

3 CLIMATE

3.1 APPLICATION OF METHODOLOGY

3.1.1 TITLE AND REFERENCE OF METHODOLOGY

The methodology applied to the grouped project is VM0007 - REDD+ Methodology Framework (REDD+ MF), in Version 1.6, from September 08, 2020.

The following modules, both from VCS, are also applicable for the project:

3.1.1.1 **CARBON POLL MODULES:**

VMD0001 – "Estimation of carbon stocks in the above-and belowground biomass in a live tree and non-tree pools" (CP-AB), v1.1

VMD0002 - "Estimation of carbon stocks in the dead-wood pool" (CP-D), v1.0

3.1.1.2 **BASELINE MODULES:**

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

3.1.1.3 **LEAKAGE MODULES:**

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

VMD0010 – Estimation of emissions from activity shifting for avoiding unplanned deforestation and avoiding unplanned wetland degradation (LK-ASU), v1.2

3.1.1.4 **MONITORING MODULES:**

VMD0015 – "Methods for monitoring of greenhouse gas emissions and removals in REDD project activities" (M-REDD), v2.2

3.1.1.5 **MISCELLANEOUS MODULES:**

VMD0017 – "Estimation of uncertainty for REDD+ project activities" (X-UNC), v2.2

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

3.1.1.6 TOOLS

Finally, the tools used in this project are:

Tool 02 (United Nations Framework Convention on Climate Change, Clean Development Mechanism) – Combined tool to identify the baseline scenario and demonstrate additionality. Version 07.0, from September 22, 2017.

CDM Executive Board "Tool for testing significance of GH G emissions in A/R CDM project activities (Version 01)" – Tool to facilitates the determination of which GHG emissions by sources, possible decreases in carbon pools, and leakage emissions are insignificant for a particular CDM A/R project activity. xxx

AFOLU “Non Permanence Risk Tool” VCS Version 4, Procedural Document, 19 September 2019, v4.0. – Tool to provides the procedures for conducting the non-permanence risk analysis and buffer determination required for Agriculture Forestry and Other Land Use (AFOLU) projects (see Appendix 4: Project risks table).

3.1.2 APPLICABILITY OF METHODOLOGY VM0007

The methodology is applicable under the following conditions, where forest is considered as area of at least 0.05-1.0 ha with crown cover (or equivalent density) of more than 10-30%, with trees with a potential to reach a minimum height of 2-5 meters at maturity in situ. A forest can consist of both closed (dense) forest formations, where multi-strata and suppressed trees cover a high proportion of the ground and open forests. For a complete definition of forests, see 2.1.21 Grouped Projects.

Table 18. Methodology applicable (VM0007)

Type	Condition	How the project meets the condition?
All Project Activities	All land areas registered under the CDM or under any other GHG program (both voluntary and compliance oriented) must be transparently reported and excluded from the project area. The exclusion of land in the project area from any other GHG program must be monitored over time and reported in the monitoring reports.	The project area does not have any area registered as CDM or any other GHG program (voluntary or compliance). Therefore, there is no exclusion of areas (section 2.5.13).
All REDD Activity Types	Land in the project area has qualified as forest (following the definition used by VCS) for at least 10 years before the project start date.	The project area is qualified and meets the condition, with ecosystem functioning as a forest in the period between 2012 and 2021.
	If land within the project area is peatland or tidal wetlands and emissions from the SOC pool are deemed significant, the relevant WRC modules must be applied alongside other relevant modules.	Not applicable. The area is not peatland or tidal wetland, as can be seen in Figure 10. Niquelândia Soil Map. Source: IBGE/BDIA, Figure 11. Rio Branco Soil Map. Source: IBGE/BDIA. Figure 12. Miranda Soil Map. Source: IBGE/BDIA. indicating that there is no presence of organic soils.
	Baseline deforestation and forest degradation in the project area fall within one or more of the following categories: Unplanned deforestation (VCS category AUDD) Planned deforestation/degradation (VCS category APD)	The baseline deforestation and forest degradation in the project area fall within the Categories: Unplanned and planned deforestation (AUDD and APD categories). See section 2.1.10

Type	Condition	How the project meets the condition?
	Degradation through the extraction of wood for fuel (fuelwood and charcoal production) (VCS category AUDD)	
	Leakage avoidance activities must not include: Agricultural lands that are flooded to increase production (e.g., rice paddy) Intensifying livestock production using feedlots and/or manure lagoons.	Leakage avoidance activities do not include flooding agricultural land or creating feed-lots or manure lagoons. Such activities are not common in the project region.
Avoiding Unplanned Deforestation	Baseline agents of deforestation must: (i) clear the land for tree harvesting, settlements, crop production (agriculturalist) or ranching or aquaculture, where such clearing for crop production or ranching or aquaculture does not amount to large scale industrial agriculture or aquaculture activities; (ii) have no documented and uncontested legal right to deforest the land for these purposes; and (iii) be either resident in the reference region for deforestation or immigrants. Under any other condition, this methodology must not be used.	(i) Baseline drivers of deforestation are small-scale farmers, who convert land to small-scale crops and pasture production. (ii) The agents of deforestation, according to geospatial data, have no right to deforest the land, since land use in protected areas is not allowed, as Permanent Protection Areas and Legal Reserve. (iii) According to section 3.1.4, the agents of deforestation are local residents in the reference region.
	If in the baseline scenario of avoiding unplanned deforestation project activities, post-deforestation land use constitutes reforestation, this methodology may not be used	Within the area of the Project, the post-deforestation land use constitutes agriculture and livestock. Reforestation does not constitute post-deforestation land use of the Project. According to sections 2.2.1 and 3.1.4 and geospatial images, reforestation is not a common practice in the Brazilian land use economics.

Type	Condition	How the project meets the condition?
Avoiding Planned Deforestation/Degradation	Where conversion of forest lands to a deforested condition must be legally permitted.	Legal deforestation, in the project zone, must follow the parameters of Brazilian law 12.651/2012. It states that Private properties in the Cerrado outside the legal Amazon can deforest up to 80% of the property. Cerrado within the legal Amazon can deforest up to 65% of the forest and properties within the Amazon biome, can deforest up to 20% for other land uses (see Table 13). Furthermore, even protected areas within private properties can be legally permitted to deforest if it is for a common purpose, such as infrastructure projects, but them requested by the public power. Each state may have its own legislation on legal deforestation (see 2.5.7). For PAI 01, in Goiás, this is State Law 18.104/2013. For PAI 02 in Acre, this is Law Law No. 1426/2001 and for PAI 03 in Mato Grosso do Sul this is Law No. 4,163/2012.

Table 19. Applicability conditions of VMD0001 - CP-AB

Condition	Project adherence
This module is applicable to all forest types and age classes.	The module is applicable to the uneven-aged forest types of the project.
Inclusion of the aboveground tree biomass pool as part of the project boundary is mandatory as per the framework module REDD MF.	The aboveground tree biomass pool is included, being the most significant pool.
Non-tree aboveground biomass must be included as part of the project boundary if the following applicability criteria are met (per framework module REDD-MF): Stocks of non-tree aboveground biomass are greater in the baseline than in the project scenario; Non-tree aboveground biomass is determined to be significant (using the T-SIG module).	Non-tree aboveground biomass was excluded because it is smaller in the baseline (grazing lands and crop lands.) than in the case of the project (forest) and is conservatively excluded.
Belowground (tree and non-tree) biomass are not required for inclusion in the project boundary because omission is conservative.	Belowground tree biomass is included for completeness whole tree (aboveground and belowground) biomass. Non-tree belowground biomass pool has been excluded.

Table 20. Applicability conditions of VMD0002 - CP-D

Condition	Project adherence
This module is applicable to all forest types and age classes.	The module is applicable to the uneven-aged forest types of the project.
This module is applicable if the dead wood pool is included as part of the project boundary.	This pool is included when it represents a significant component of forest biomass.

Table 21. Applicability conditions of VMD0006 - BL-PL

Condition	**Project adherence**
The module is applicable for estimating the baseline emissions on forest lands (usually privately or government-owned) that are legally authorized and documented to be converted to non-forest land.	Project activities involve avoiding planned deforestation (APD), so the module is applicable. Legal deforestation in the country is regulated by the Brazilian Forest Code (Law No. 12,651/2012) and associated state legislation. There are no legal limits of which proportion of the farm can be legally deforested each year. See section 2.5.7.
Where, pre-project, unsustainable fuelwood collection is occurring within the project boundaries Modules BL-DFW and LK-DFW must be used to determine potential leakage.	Unsustainable firewood collection has not been identified within the project boundary in the initial consultations with local stakeholders in PAI 01. This will be verified when consulting stakeholders in the other PAIs.

Table 22. Applicability conditions of VMD0007 - BL-UP

Condition	**How the project meets the condition?**
The module must be applied to all project activities where the baseline agents of deforestation: (i) clear the land for settlements, crop production (agriculturalist), ranching, or aquaculture, where such clearing for crop production, ranching, or aquaculture does not amount to large scale industrial Agri/aquaculture activities; (ii) have no documented and uncontested legal right to deforest the land for these purposes; and (iii) are either resident in the region or immigrants.	In the basic scenario, deforestation agents convert land to livestock and small-scale agricultural production, where there is no legal right to clean the land for these purposes; agents are local residents of the region or immigrants seeking land for land use as pasture. See section 3.1.4 and 2.5.7
Where pre-project, unsustainable fuelwood collection is occurring within the project boundaries, Modules BL-DFW and LK-DFW must be used to determine potential leakage.	Unsustainable firewood collection has not been identified within the project boundary in the initial consultations with local stakeholders in PAI 01. This will be verified when consulting stakeholders in the other PAIs.

Table 23. Applicability conditions of VMD0009 - LK-ASP

Condition	**Project adherence**
The module is applicable for estimating the leakage emissions due to activity shifting from forest lands that are legally authorized and	The activities of the project involve avoiding planned deforestation (APD), because the project area has legal permissibility for land conversion,

documented to be converted to non-forest land, including activity shifting to a forested wetland that is drained or degraded as a consequence of project implementation.	so that the module is applicable. See section 2.5.7.
This tool must be used for projects in areas where planned deforestation happens on forested wetlands, regardless of the absence of wetlands within the project boundaries.	There are no wetlands in the project area.
The module is mandatory if Module BL-PL has been used to define the baseline, and the applicability conditions in Module BL-PL must be complied with in full.	The BL-PL module is applied to the project and meets the established applicability conditions.

Table 24. Applicability conditions of VMD0010 - LK-ASU

Condition	Project adherence
This Module is applicable for estimating carbon stock changes and greenhouse gas emissions related to the displacement of activities that cause deforestation of lands outside the Project Area due to the avoided unplanned deforestation in the Project Area. Activities subject to potential displacement are conversion of forest land to grazing lands, crop lands, and other land uses.	The activities of the project involve avoiding unplanned deforestation (AUDD), so the displacement of these activities should be monitored, since the pressure for deforestation in the project zone includes the conversion of forest land into to grazing lands and crop lands.
The module is mandatory if module BL-UP has been used to define the baseline and the applicability conditions in module BL-UP must be complied with in full.	The BL-UP module is applied to the project and meets the established applicability conditions.

Table 25. Applicability conditions of VMD0015 - M-REDD

Condition	How the project meets the condition?
Strata, as defined in the relevant baseline modules, are fixed and may not be changed without baseline revision. The module is mandatory for REDD, CIW-REDD, RWE-REDD, and stand-alone CIW project activities. Where selective logging is taking place in the project case: • Emissions from logging may be omitted if it can be demonstrated the emissions are *de minimis* using Tool T-SIG. • If emissions from logging are not omitted as *de minimis*, logging may only take place within forest management areas that possess and maintain a Forest Stewardship Council (FSC) certificate for the years when the selective logging occurs. • Logging operations may only conduct selective logging that maintains a land cover that meets the definition of forest within the project boundary. • All trees cut for timber extraction during logging operations must have a DBH greater than 30 cm. • During logging operations, only the bole/log of the felled tree may be removed. The top/crown of the tree must remain within the forested area. • The logging practices cannot include the piling and/or burning of the logging slash. • Volume of timber harvested must be measured and monitored.	The module is mandatory. In addition, the stratification is fixed ex-ante for the baseline and will not be changed and there are no selective logging activities taking place in the project area. The other conditions do not apply.

Applicability conditions of T-ADD – “tool for the demonstration and assessment of additionality in VCs agriculture, forestry, and other land use (AFOLU) project activities”

Table 26. Applicability conditions of VMD0016 - X-STR

Condition	***How the project meets the condition?***
Any module referencing strata must be used in combination with this module.	The module is applicable due to the variation of classes of Brazilian forests, considering the different phytophysiognomies as strata *i*.

Table 27. Applicability conditions of VMD0017 - X-UNC

Condition	How the project meets the condition?

This module is applicable for estimating the uncertainty of estimates of emissions and removals of CO_2-e generated from REDD and WRC project activities.	This module is mandatory when using methodology REDD+ MF, which is applied to the project.

Table 28. Applicability conditions of T-ADD

Condition	How the project meets the condition?
AFOLU activities the same or similar to the proposed project activity on the land within the proposed project boundary performed with or without being registered as the VCS AFOLU project shall not lead to violation of any applicable law even if the law is not enforced	There are no law violations within the land where the project activity is located, as mentioned under section 2.5.
The use of this tool to determine additionality requires the baseline methodology to provide for a stepwise approach justifying the determination of the most plausible baseline scenario. Project proponent(s) proposing new baseline methodologies shall ensure consistency between the determination of a baseline scenario and the determination of the additionality of project activity.	The VM0007 provides a stepwise approach for justifying the determination of the most plausible baseline scenario, as per section 6 of the referred methodology.

Table 29. Applicability conditions of T-BAR – "AFOLU non-permanence risk-tool

Condition	How the project meets the condition?
There are no internal applicability conditions	There are no internal applicability conditions

3.1.3 PROJECT BOUNDARY

3.1.3.1 SOURCES OF GHG EMISSIONS ASSOCIATED WITH THE BASELINE, PROJECT, AND LEAKAGE

GHG emission sources included in the project boundary are listed in *Table 30. Sources of GHG emissions included in or excluded from the AUDD and APD project activity boundary*. Justifications are provided when excluded from the project boundaries.

Table 30. Sources of GHG emissions included in or excluded from the AUDD and APD project activity boundary.

Source		Gas	Included?	Justification/Explanation
Baseline	Burning of woody biomass	CO_2	Included	CO2 emissions will be considered in the carbon stock changes.
		CH_4	No	It is conservative to exclude.

Source		Gas	Included?	Justification/Explanation
		N_2O	No	Non-CO_2 gases emitted from woody biomass burning – it is conservative to exclude
	Combustion of fossil fuels	CO_2	No	It is conservative to exclude
		CH_4	No	Potential emissions are negligible
		N_2O	No	Potential emissions are negligible
		Other	No	Potential emissions are negligible
	Use of fertilizers	CO_2	No	Excluded. No increase in fertilizer use is contemplated in the project case as part of leakage mitigation or any other activity.
		CH_4	No	
		N_2O	No	
Project	Burning of woody biomass	CO_2	Included	Carbon stock decreases due to burning are accounted as a carbon stock change
		CH_4	Included	Non-CO2 gases emitted from woody biomass burning – must be included if a fire occurs.
		N_2O	Included	Carbon stock decreases due to burning are accounted as a carbon stock change
		Other	No	Not applicable.
	Combustion of fossil fuels	CO_2	Included	Can be neglected if excluded from baseline accounting
		CH_4	Excluded	Potential emissions are negligible
		N_2O	Excluded	Potential emissions are negligible
	Use of fertilizers	CO_2	Excluded	Potential emissions are negligible
		CH_4	Excluded	Potential emissions are negligible
		N_2O	Included	Can be excluded if excluded from baseline accounting except in the situation where fertilizer
		Other	No	Not applicable.

3.1.3.2 CARBON STOCK ASSOCIATED WITH THE BASELINE, PROJECT AND LEAKAGE

This project will include the following carbon pools.

Table 31. Carbon Pools Included in the Project Boundary

Carbon pools	Included / Excluded	Justification/Explanation
Aboveground	Included	Mandatory to include. Tree biomass is included, which is the most significant pool. Non-tree woody biomass (e.g. shrubs) is less in the baseline (pasture and cropland) than the project case (forest) and is conservatively excluded.
Belowground	Included	Included and treated together with aboveground biomass for completeness to include whole tree (aboveground and belowground) biomass.
Dead Wood	Included	This pool was included with the intention of having a more complete vision of the carbon stock change in the area.

Harvested Wood Products	Excluded	Excluded as no commercial harvesting for wood products37 takes place in the baseline (as part of the forest conversion process) or with project scenarios.
Litter	Excluded	Conservatively omitted, as allowed by methodology.
Soil Organic Carbon	Excluded	Conservatively omitted, as allowed by methodology.

As noted in the table above, this project will consider three pools of carbon and the applicable modules include: CP-AB "VMD0001 Estimation of carbon stocks in the above- and belowground biomass in live tree and non-tree pools" and CP-D, "VMD0002 Estimation of carbon stocks in the dead-wood pool".

3.1.3.3 SPATIAL BOUNDARIES

The Project Area (PA) is initially composed of three different project activity instances, which are detailed below:

3.1.3.3.1 Project Area

PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

Serra Farm is presented in the following figures (Figure 85, Figure 86 and Figure 87), located in the municipality of Niquelândia - GO, which is under threat of deforestation. The total area of the farm is 4,092 hectares; however, the Project Accounting Area is project is 3,379.70 hectares and was 100% forested at the beginning of the project. The limits of the property were delineated by geospatial analysis and titration registrations of the property. The proponent distinguishes the project activities in AUDD and APD, carries out activities (see section 2.1.11) in and around the project area to mitigate deforestation pressures and stop deforestation, observing the guidelines of the applied methodology (VM0007) and their respective modules and tools.

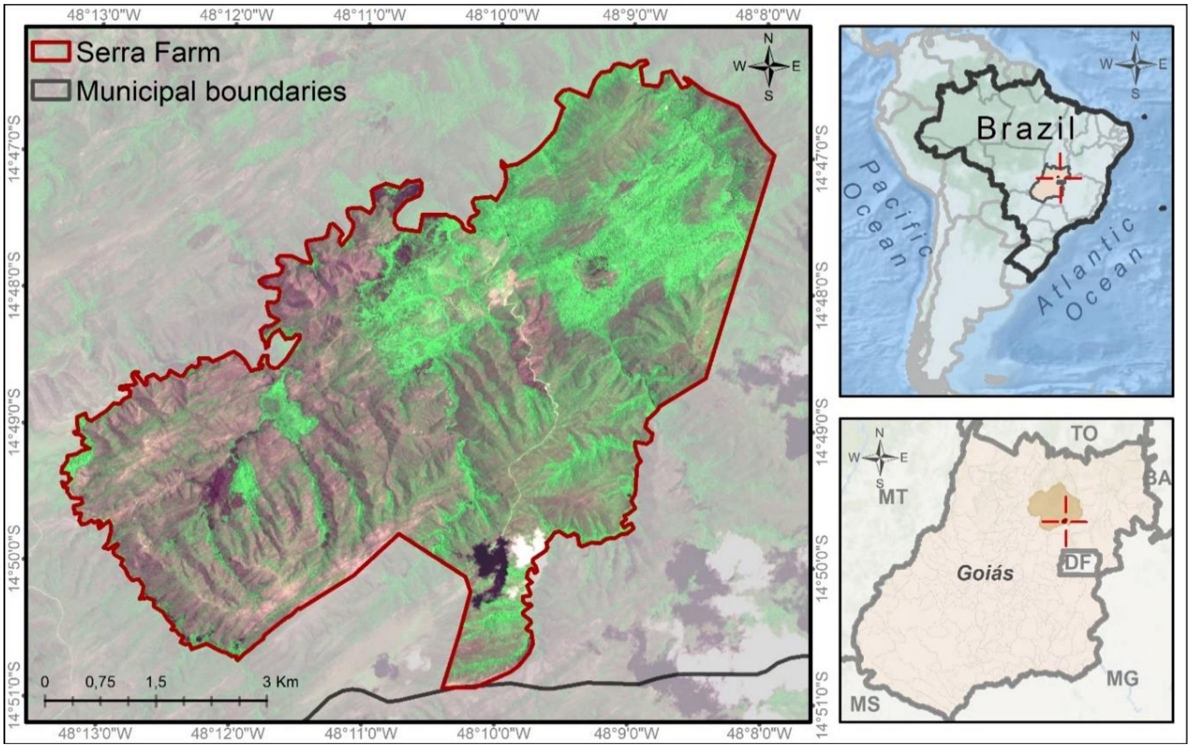

Figure 85. Location Map of the Serra Farm, which constitute PAI 01 in (Niquelândia - GO)

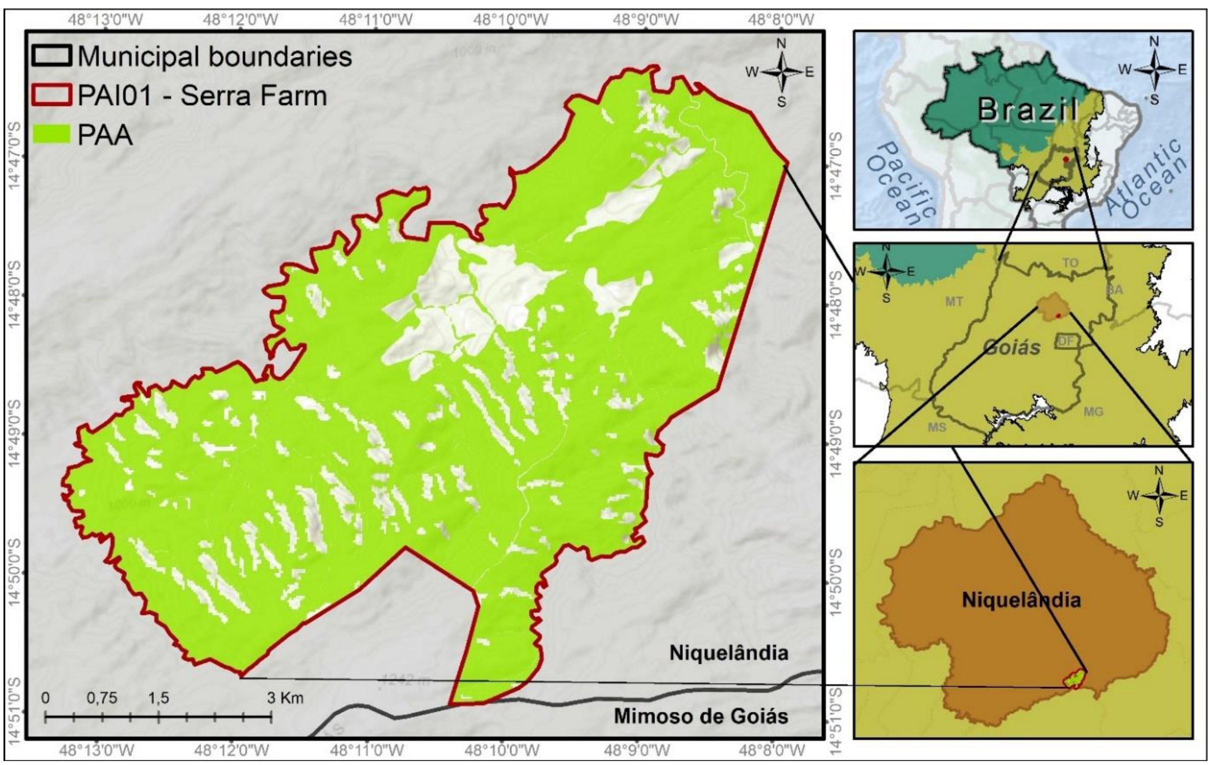

Figure 86. Project Accounting Area (PAA) of PAI 01 (Niquelândia - GO)

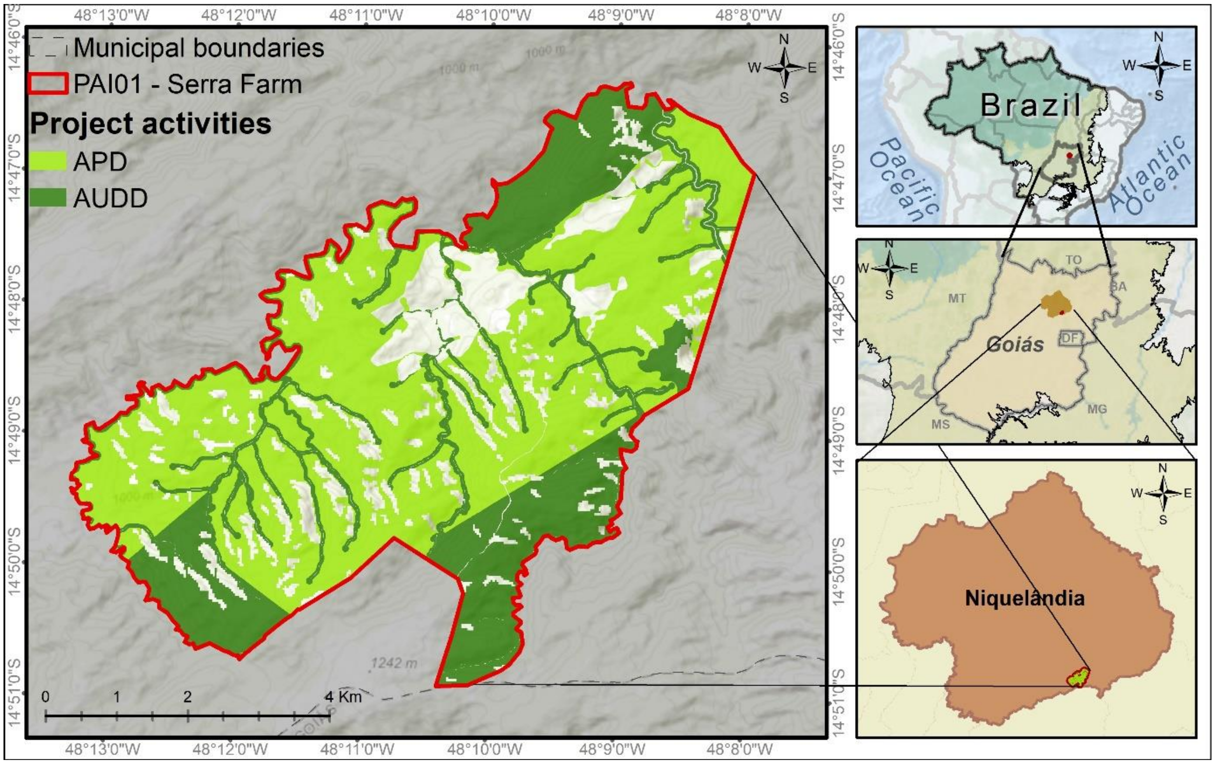

Figure 87. Areas of planned (APD) and unplanned (AUDD) deforestation in PAI 01, Niquelândia - GO

The project area within the Project Boundary - defined according to the methodology rules - as well as the Reference Region and the Leakage Belt presented in the table below:

Table 32. Project Area, Leakage Belt, and Reference Region Forest areas

Boundary	PAI 01
	Area (ha)
Project Area for AUDD activity	1,296
Project Area for APD activity	2,084
Leakage Belt	4,019
Reference Region (RRD)	98,401

PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

Bom Destino Farm is presented in the following figures (Figure 88, Figure 89 and Figure 90) located in the municipality of Rio Branco - AC, which is under threat of deforestation. The total area of the farm is 10,063 hectares; however, the Project Accounting Area is project is 8,904.5 hectares and was 100% forested at the beginning of the project. The limits of the property were delineated by geospatial analysis and titration registrations of the property. The proponent distinguishes the project activities in AUDD and APD, carries out activities (see section 2.1.11) in and around the project area to mitigate deforestation pressures and stop deforestation, observing the guidelines of the applied methodology (VM0007) and their respective modules and tools.

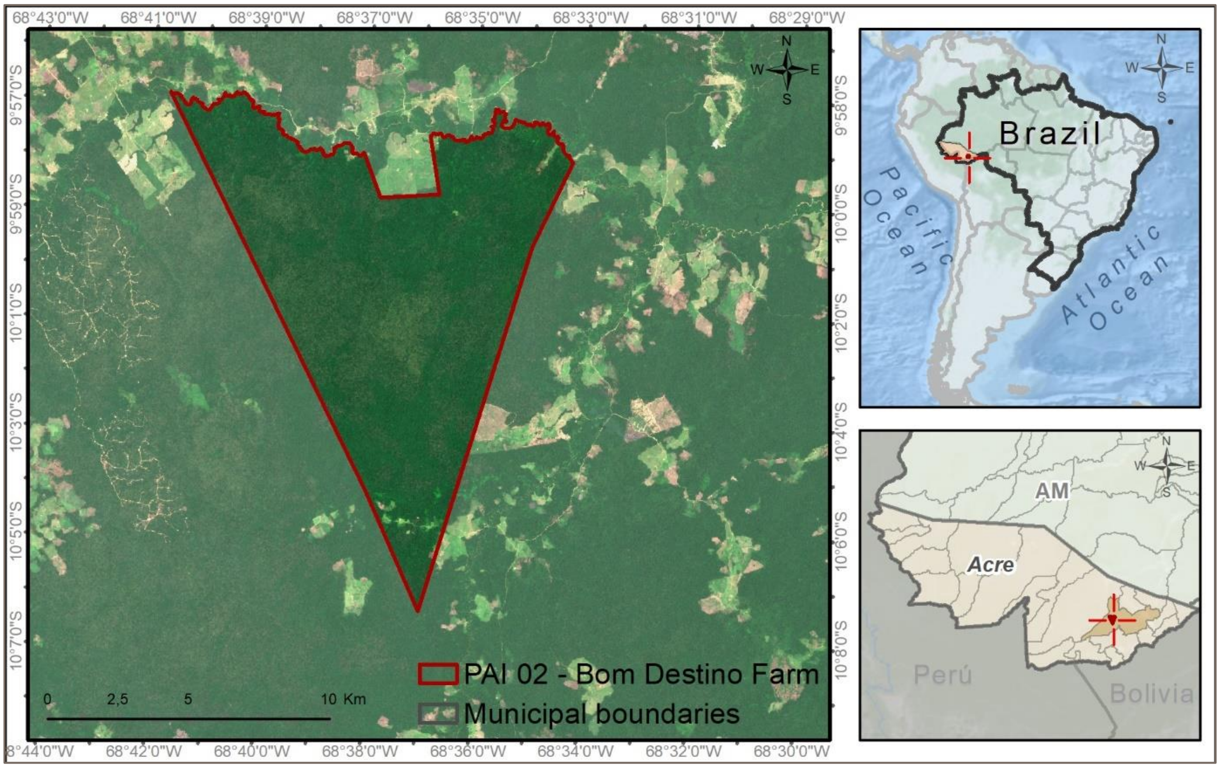

Figure 88. Location Map of the Bom Destino Farm, which constitutes PAI 02 in (Rio Branco - AC).

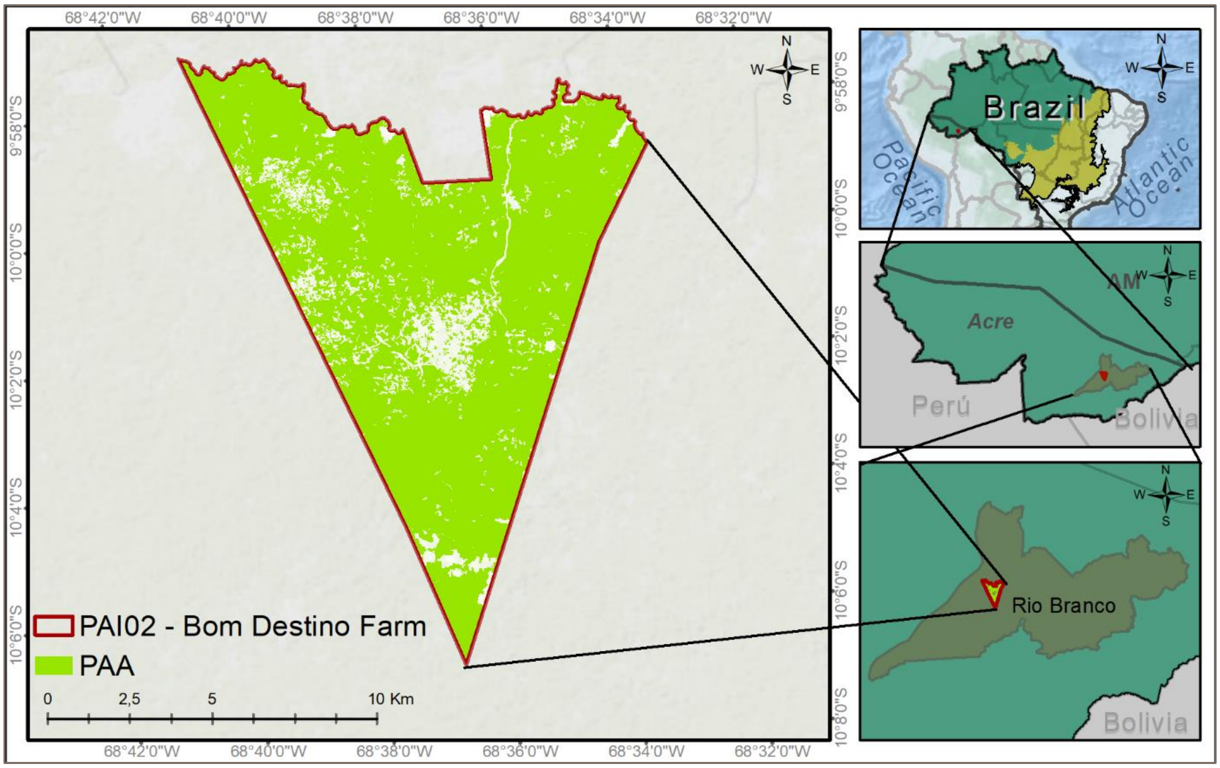

Figure 89. Project Accounting Area (PAA) of PAI 02 (Rio Branco - AC).

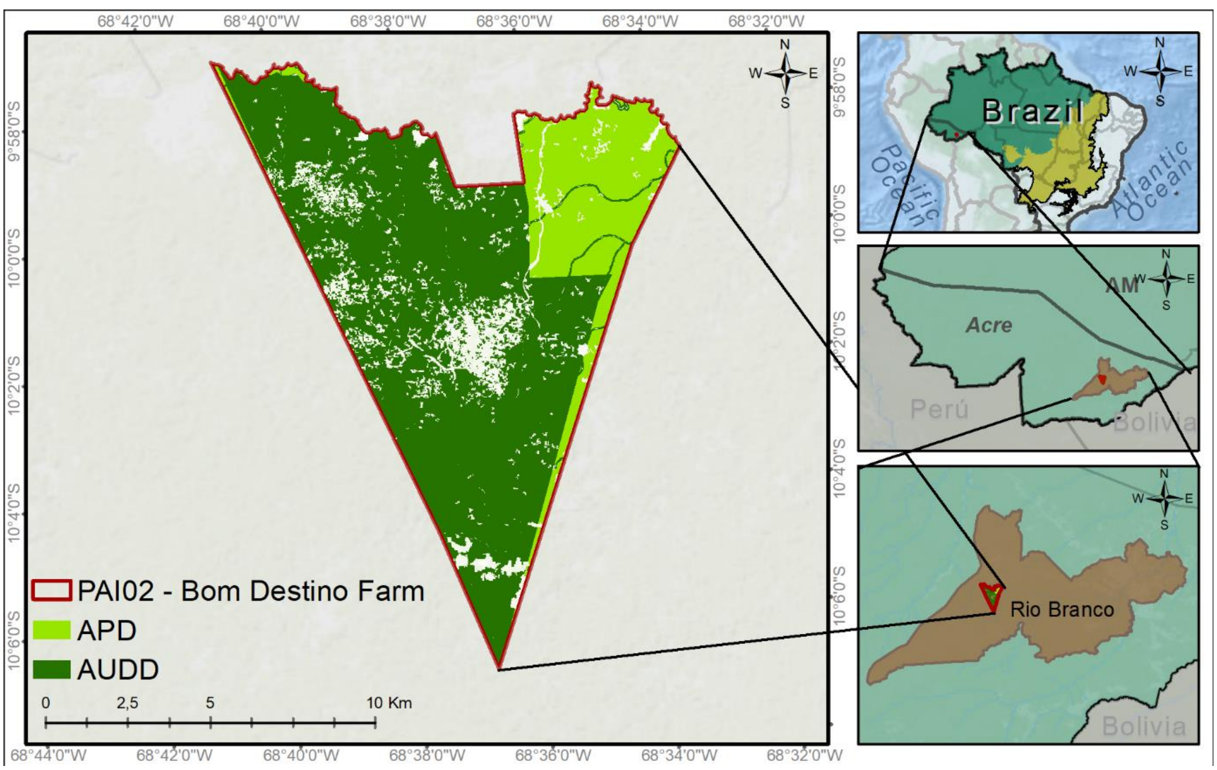

Figure 90. Areas of planned (APD) and unplanned (AUDD) deforestation in PAI 02, Rio Branco – AC.

The project area within the Project Boundary - defined according to the methodology rules - as well as the Reference Region and the Leakage Belt presented in the table below:

Table 33. Project Area, Leakage Belt, and Reference Region Forest areas

Boundary	PAI 02
	Area (ha)
Project Area for AUDD activity	6,954
Project Area for APD activity	1,950
Leakage Belt	8,890
Reference Region (RRD)	126,684

PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

Bodoquena Farm is presented in the following figures (Figure 91,Figure 92 and Figure 93) located in the municipality of Miranda - MS, which is under threat of deforestation. The total area of the farm is 36,909 hectares, however the Project Accounting Area is project is 8,902.7 hectares and was 100% forested at the beginning of the project. The limits of the property were delineated by geospatial analysis and titration registrations of the property. The proponent distinguishes the project activities in AUDD and APD, carries out activities (see section 2.1.11) in and around the project area to mitigate deforestation pressures and stop deforestation, observing the guidelines of the applied methodology (VM0007) and their respective modules and tools.

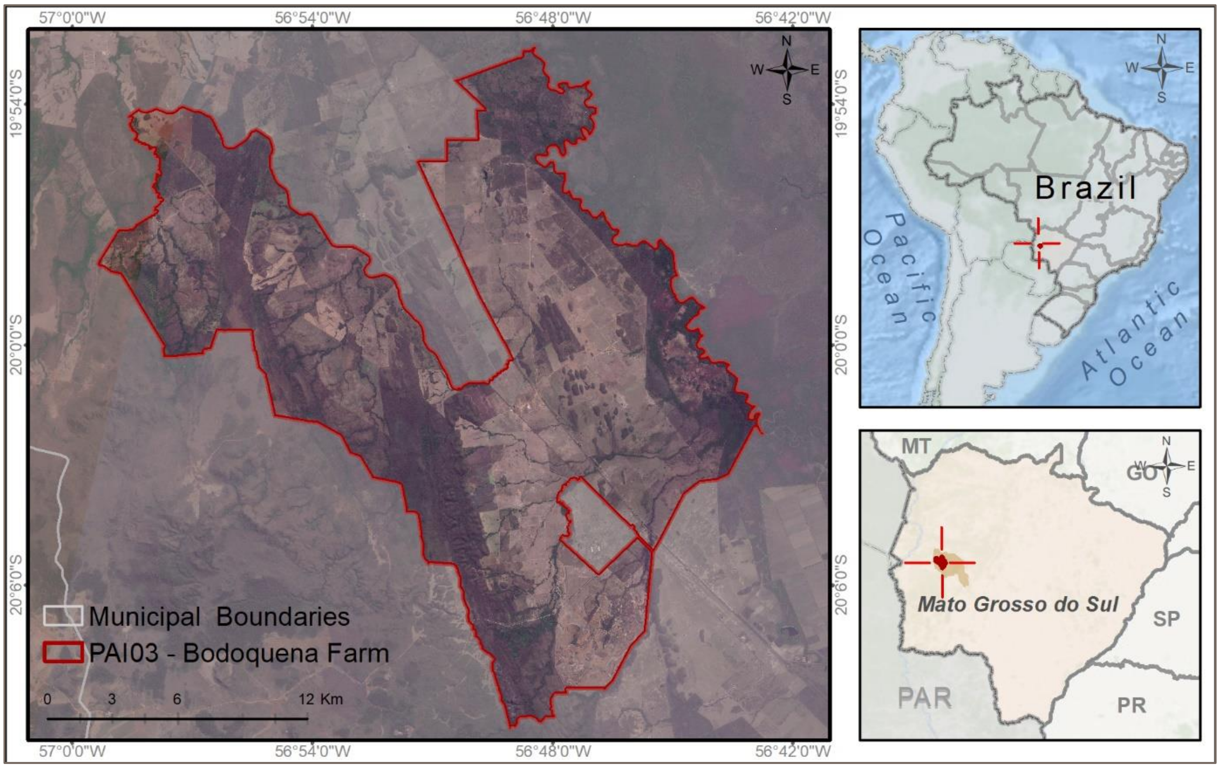

Figure 91. Location Map of the Serra Farm, which constitute PAI 03 in (Miranda - MS)

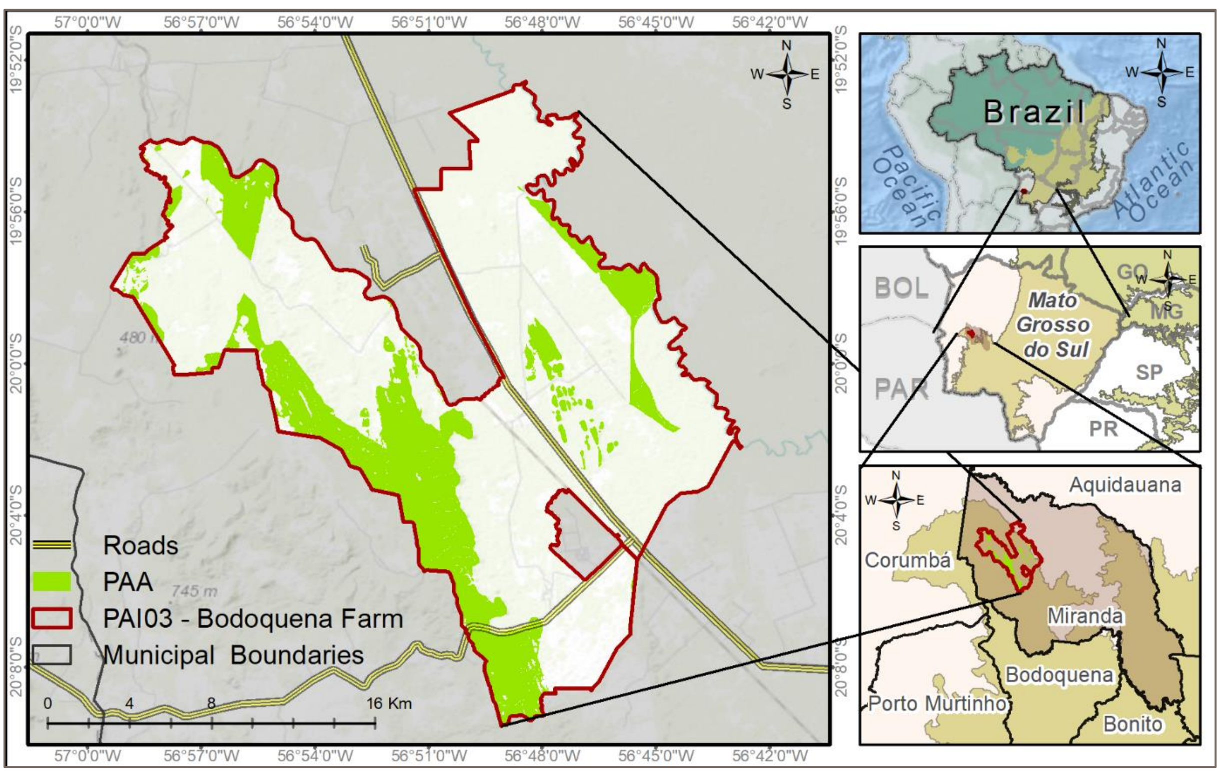

Figure 92. Project Accounting Area (PAA) of PAI 03 (Miranda - MS)

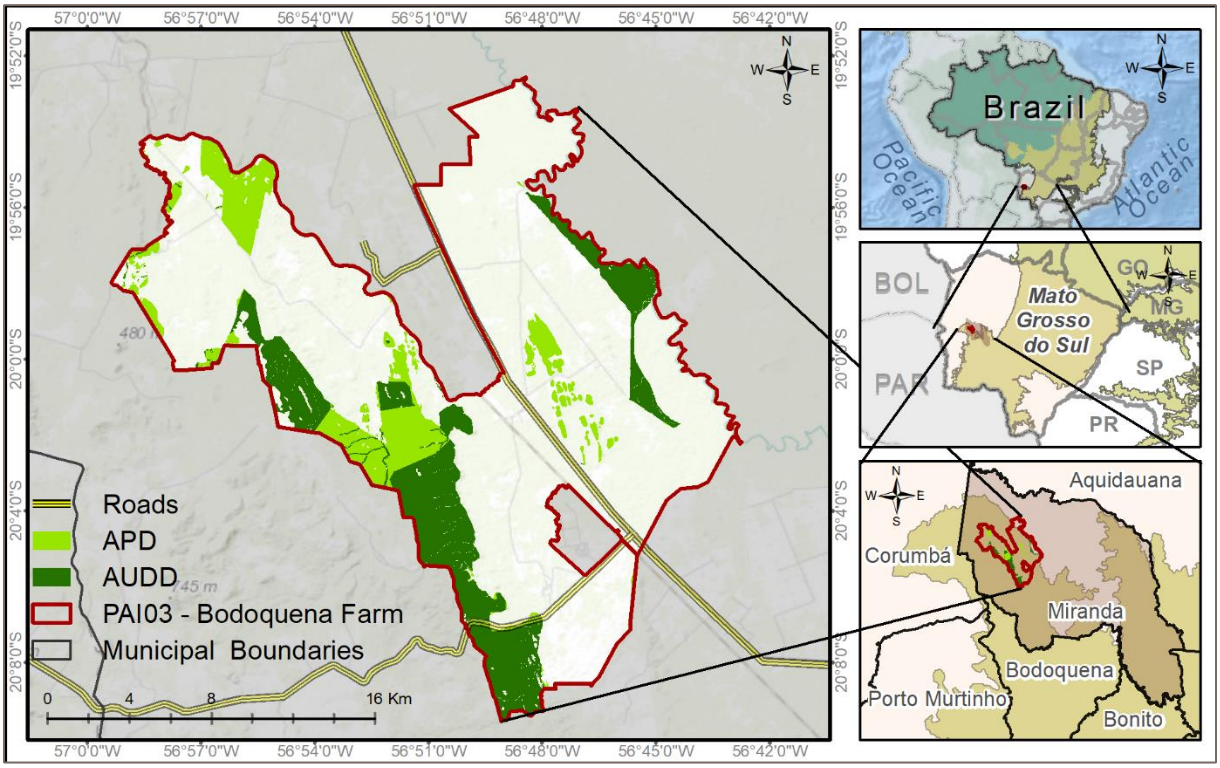

Figure 93. Areas of planned (APD) and unplanned (AUDD) deforestation in PAI 03, Miranda – MS.

The project area within the Project Boundary - defined according to the methodology rules - as well as the Reference Region and the Leakage Belt presented in the table below:

Table 34. Project Area, Leakage Belt, and Reference Region Forest areas

Boundary	PAI 03
	Area (ha)
Project Area for AUDD activity	5,541
Project Area for APD activity	3,362
Leakage Belt	8,917
Reference Region (RRD)	121,250

3.1.3.3.2 Reference Region for Projecting Rate of Deforestation

The RRD (Reference Region for Projecting Rate of Deforestation) is the only Reference Region defined for each PAI since the deforestation configuration in the Project Area is transitional and the BL-UP requirement is met[120].

To define the RRD, the proponent excluded the project area and the leakage belt, and all non-forested areas at the beginning of the historical reference period in the year 2012 (PAI 01 e PAI 03) and 2013 (PAI 02). In addition, the reference region was defined with knowledge of the agents and vectors of unplanned deforestation in Legal Reserve and Permanent Preservation Areas in the region.

The main agents of deforestation in both RRDs are small-scale farmers who intend to establish or expand pastures and agricultural crops through forest conversion. The ratio of farmers to pastoralists in the RRD that is the same as expected in the project area at baseline. Landscape factors (i.e., soil type, vegetation type, and slope) do not drive smallholder agricultural decisions. When elevation is important, it drives the decision to deforest rather than convert the land to cropland or pasture.

According to LAW No. 12,651 of May 25, 2012[121], the Brazilian Forest Code, all vegetation located in Permanent Preservation Areas and Legal Reserves must be maintained by the owner of the area, possessor, or occupant in any capacity, natural or legal person, public or private law, which shows that the main agents of deforestation lack the legal rights to use the land. Maps of landscape factors, including forest type, soil type, slope and elevation that were used to define the reference region and ensure similarity with the project area.

Land tenure was also used to help delineate the RRD. Specifically, municipal, state and federal forest conservation areas and indigenous reserves were excluded from the RRD as these differed from the privately owned project area.

According to the classification of Brazilian vegetation made by IBGE, both the Project Area and the RRD are entirely covered by native Cerrado vegetation in PAI 01 and PAI 03, and native Amazon vegetation in PAI 02.

The VMD0007 module BL UP states the following on infrastructure such as roads, riverways, and settlements, which increase the likelihood of deforestation, and which exist historically in the RRD should be comparable to those expected to exist in the project area. Similarity between RRD (PAI 01 and PAI 02) and respective PA parcels is assumed for the transportation network and human infrastructure factors, considering that overall, the supply of transportation infrastructure in Brazil is unsatisfactory when compared to the networks of countries of similar size. The paved road network is equivalent to a small portion of the total road network, and has shown moderate growth in recent years, due to little action regarding maintenance and improvement of the quality of paved roads, compromising productivity. Regarding the distribution in the territory, the federal paved road network has its greatest extension in the Northeast 29.7%, followed by the Southeast 22.3%, South 18.1%, Center-West 17.2% and North 12.7%.[122] It should also be noted that both the density of the transport networks and the social infrastructure are related to the large urban centers, especially in the Southeast and Northeast Regions, which, generally speaking, does not apply to the country's interior regions, where RRD and the respective PA portions are located.

[120] Location analysis is not required where it can be shown that ≥ 25% of the project geographic boundary is within 50m of land that has been anthropogenically deforested within the 10 years prior to the project start date

[121] https://www2.camara.leg.br/legin/fed/lei/2012/lei-12651-25-maio-2012-613076-normaatualizada-pl.pdf

[122] https://bibliodigital.unijui.edu.br:8443/xmlui/bitstream/handle/123456789/3003/O%20Transporte%20de%20Cargas%20no%20Brasil%20e%20sua%20Import%C3%A2ncia%20para%20a%20Economia.pdf?sequence=1&isAllowed=y

PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

The RRD for PAI 01 has a total area of 98,401 hectares. The map shown below identify the spatial boundaries of the Project and location (Figure 94).

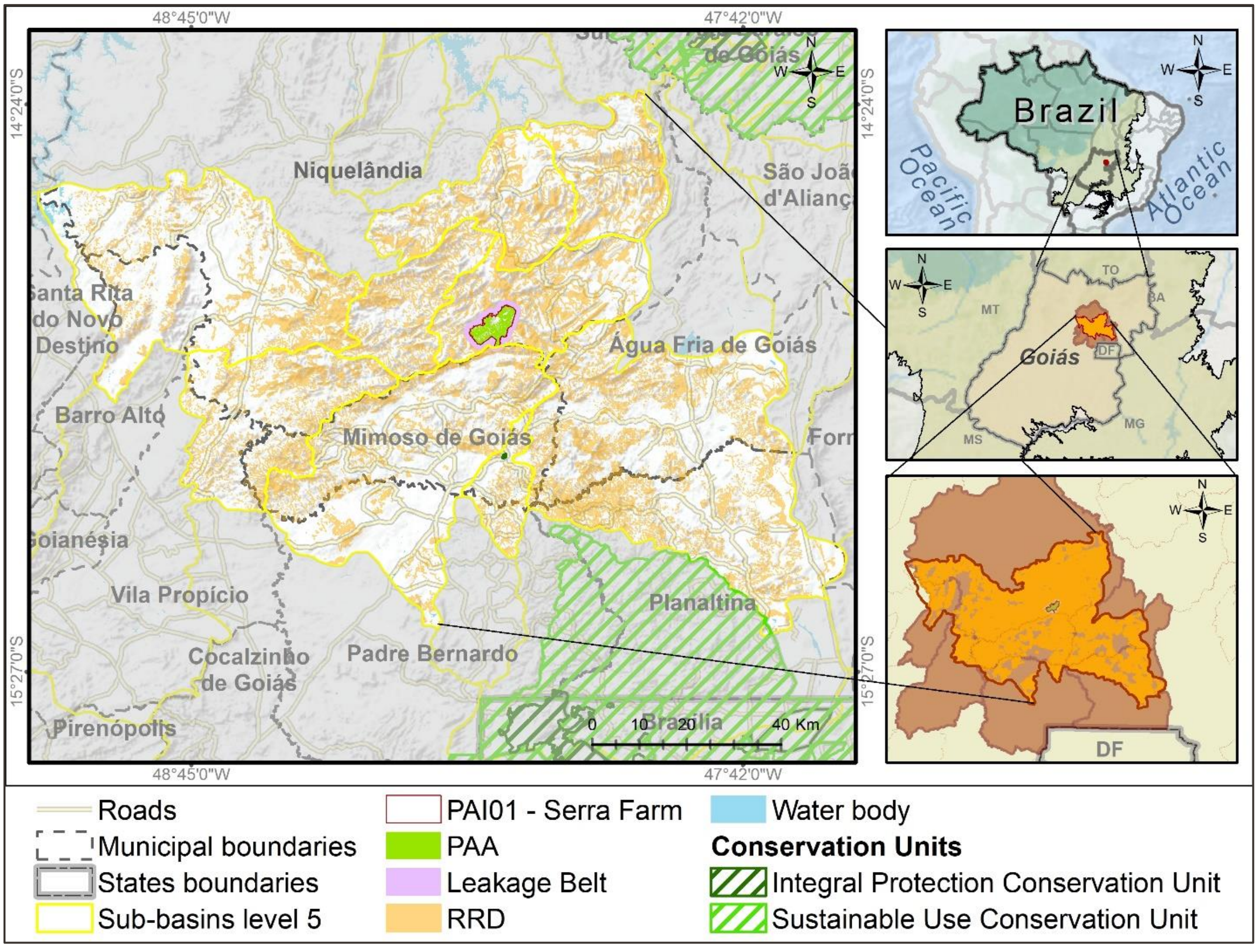

Figure 94. Reference Region for Projecting Rate of Deforestation in PAI 01.

The RRD in the Cerrado biome (PAI 01), includes forested areas in RL and APP scattered throughout the territory of Serra Passa Três, located in the municipality of Hidrolina in the state of Goiás. The Serra Passa Três mountain range is inserted in the Ceres micro-region.

The similarity between the Project Area and the RRD is evidenced in Table 35. Similarity between the Project Area in PAI 01 and their respective RRDs.

Table 35. Similarity between the Project Area in PAI 01 and their respective RRDs.

PAI 01			
Boundary	Forest Class	Area (ha)	%

PA	Wooded Savanna	3,380	100
RRD	Wooded Savanna	71,204	72
	Forested Savanna	2,582	3
	Savannah Park	24,615	25
	Soil	ha	%
PA	Neossolo	3,380	100
RRD	Argissolo	3,573	4
	Cambissolo	17,935	18
	Chernossolo	1,389	1
	Latossolo	27,017	27
	Neossolo	48,487	49
	Slope	ha	%
PA	>15	209.99	6
	<15	3,169.72	94
RRD	>15	22,234.56	23
	<15	76,166,92	77

PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

The RRD for PAI 02 has a total area of 126,684 hectares. The map shown below identify the spatial boundaries of the Project (Figure 95).

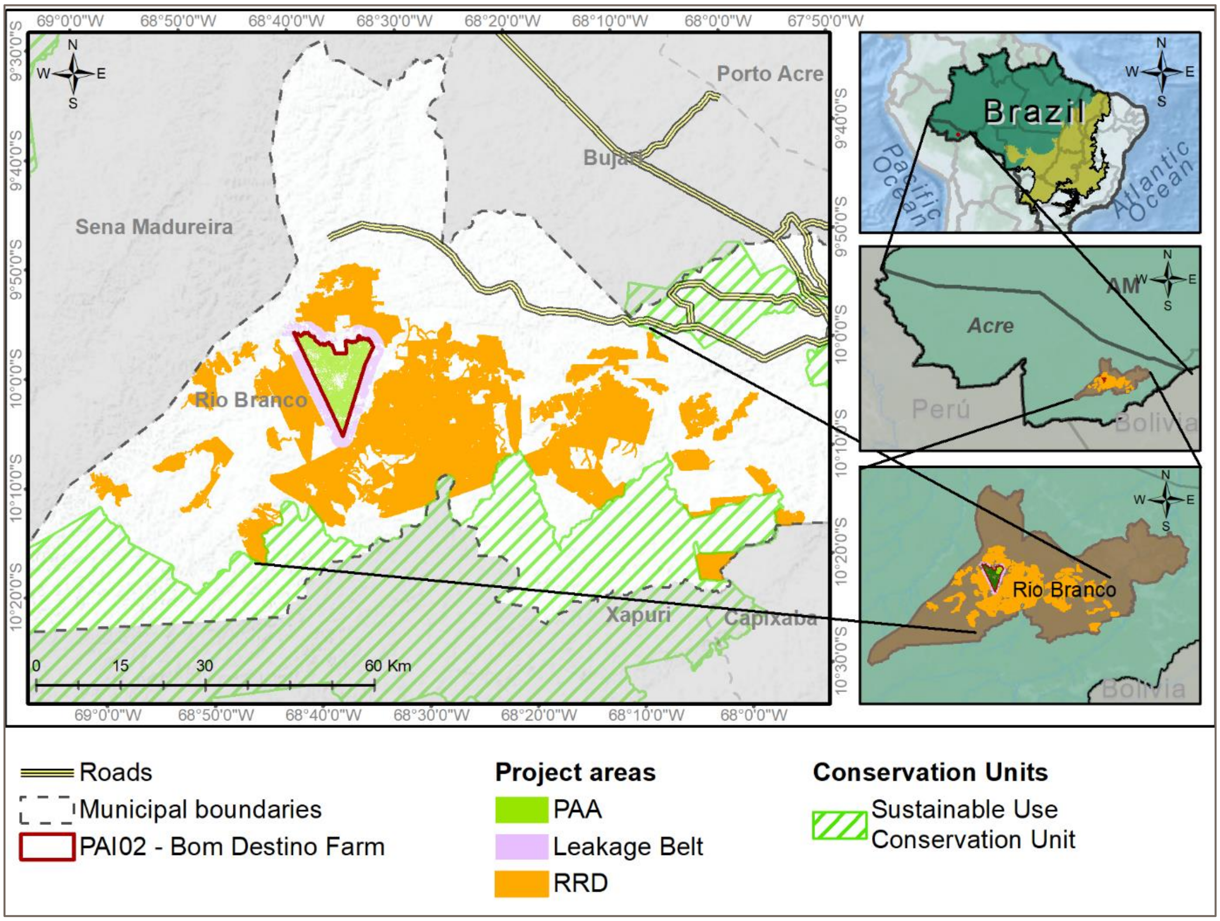

Figure 95. Reference Region for Projecting Rate of Deforestation in PAI 02.

The RRD in the Amazon biome (PAI 02), includes forested areas in RL and APP scattered the territory the municipality of Rio Branco.

The similarity between the Project Area and the RRD is evidenced in Table 36.

Table 36. Similarity between the Project Area in PAI 02 and their respective RRDs.

PAI 02			
Boundary	Forest Class	Area (ha)	%
PA	Alluvial Open Ombrophilous Forest	1,272.00	14
	Lowland Open Ombrophilous Forest	7,632.52	86
RRD	Alluvial Open Ombrophilous Forest	22,645.20	18
	Lowland Open Ombrophilous Forest	104,037.55	82
	Lowland Dense Ombrophilous Forest	0.55	0
	Soil	ha	%
PA	Argissolo	29.82	0

	Chernossolo	5,944.21	67
	Nitossolo	323.35	4
	Plintossolo	72.38	1
	Vertissolo	2,532.92	28
RRD	Argissolo	24,311.27	20
	Gleissolo	57,036.37	47
	Nitossolo	19,850.61	16
	Plintossolo	4,696.38	4
	Vertissolo	15,35.83	13
	Slope	ha	%
PA	>15	7,877.44	88%
	<15	1,027.07	12%
RRD	>15	109,218.04	86%
	<15	17,439.24	14%

PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

The RRD for PAI 03 has a total area of 121.250 hectares. The map shown below identify the spatial boundaries of the Project and location (Figure 96).

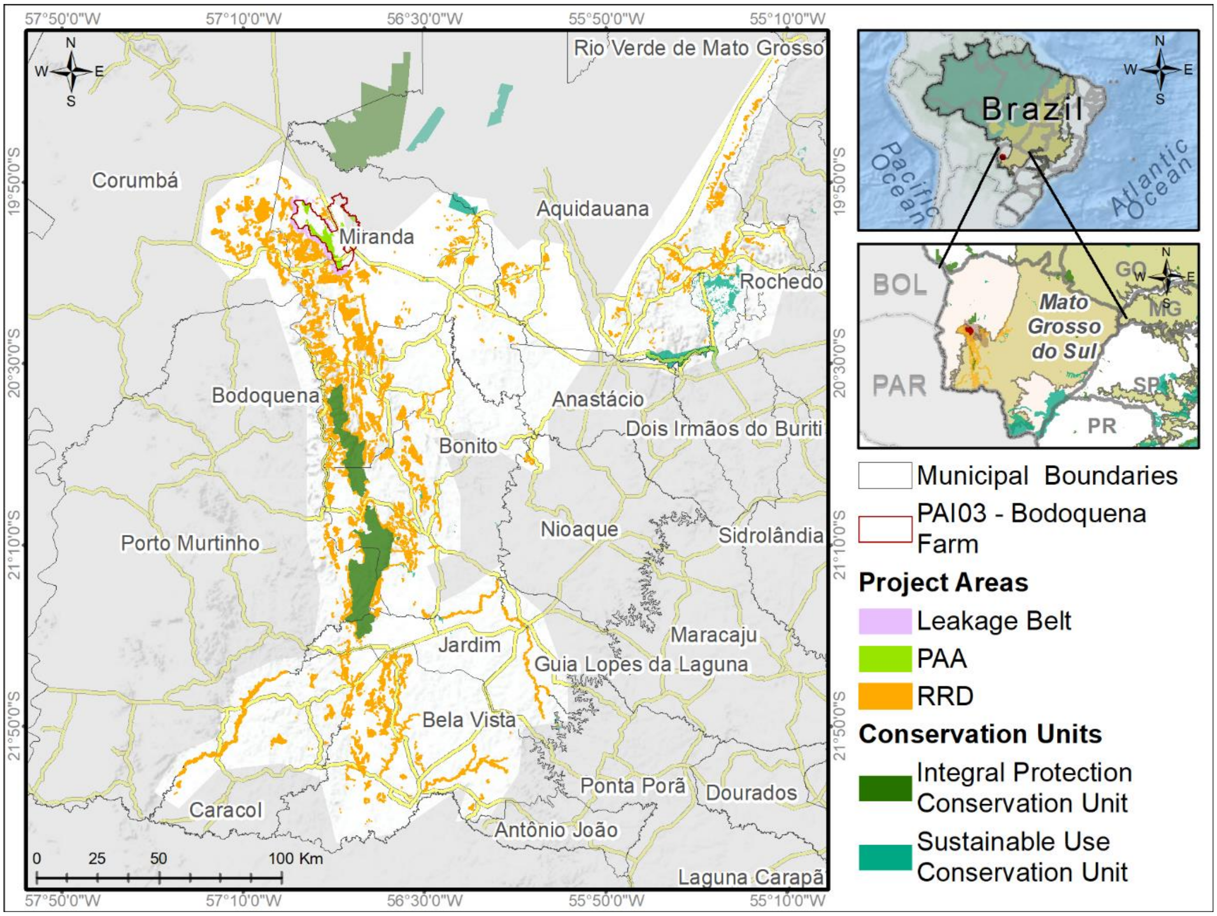

Figure 96. Reference Region for Projecting Rate of Deforestation in PAI 03.

The RRD in the Cerrado biome (PAI 03), includes forested areas in RL and APP scattered in the region near the municipality of Miranda, state of Goiás.

The similarity between the Project Area and the RRD is evidenced in Table 37

Table 37. Similarity between the Project Area in PAI 03 and their respective RRDs.

PAI 03			
Boundary	Forest Class	Area (ha)	%
PA	Wooded Savanna	228.60	3
	Submontane Seasonal Deciduous Forest	977.58	11
	Seasonal Semi-deciduous Alluvial Forest	308.40	3
	Forested Savanna	7,388.10	83
RRD	Wooded Savanna	10,574.05	9
	Submontane Seasonal Deciduous Forest	44,248.92	36
	Seasonal Semi-deciduous Alluvial Forest	20,310.03	17
	Forested Savanna	46,117.44	38

	Soil	ha	%
PA	Argissolo	29.82	0
	Chernossolo	5,944.21	67
	Nitossolo	323.35	4
	Plintossolo	72.38	1
	Vertissolo	2,532.92	28
RRD	Argissolo	24,311.27	20
	Chernossolo	57,036.37	47
	Nitossolo	19,850.61	16
	Plintossolo	4,696.38	4
	Vertissolo	15,35.83	13
	Slope	ha	%
PA	>15	4,947.13	58
	<15	3,605.73	42
RRD	>15	51,586.04	48
	<15	54,859.30	52

3.1.3.3.3 Leakage Belt

The leakage belts border the PAI and are in the most accessible and likely to be deforested areas. It is a forest area that to address "leakage" related displacement caused by Carbonflor REDD Project activities. It meets the following requirements as outlined in module VMD0007 BL-UP:

- *It is the closest forest area to the project area and meets the minimum area requirements (i.e. ≥90% of the project area).*
- *All parts of the leakage belt are accessible and reachable by the deforestation agents.*
- *The leakage belt is 100% forest at the beginning of the project.*

In addition, municipal, state, and federal forest conservation areas and indigenous reserves have been excluded from the leakage belt, as administrative policies and regulations in these areas differ from private areas.

The Project Area and the Leakage Belt are quantitatively ±20% similar, or otherwise qualitatively similar in important respects, relative to the factors determined by the VM0007 BL-UP module, specifically: forest types; elevation classes; slope classes; soil types; and road density, were rigorously observed for allocation of the leakage belt. Evidence of similarity between PA and Leakage Belt is observed below.

PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

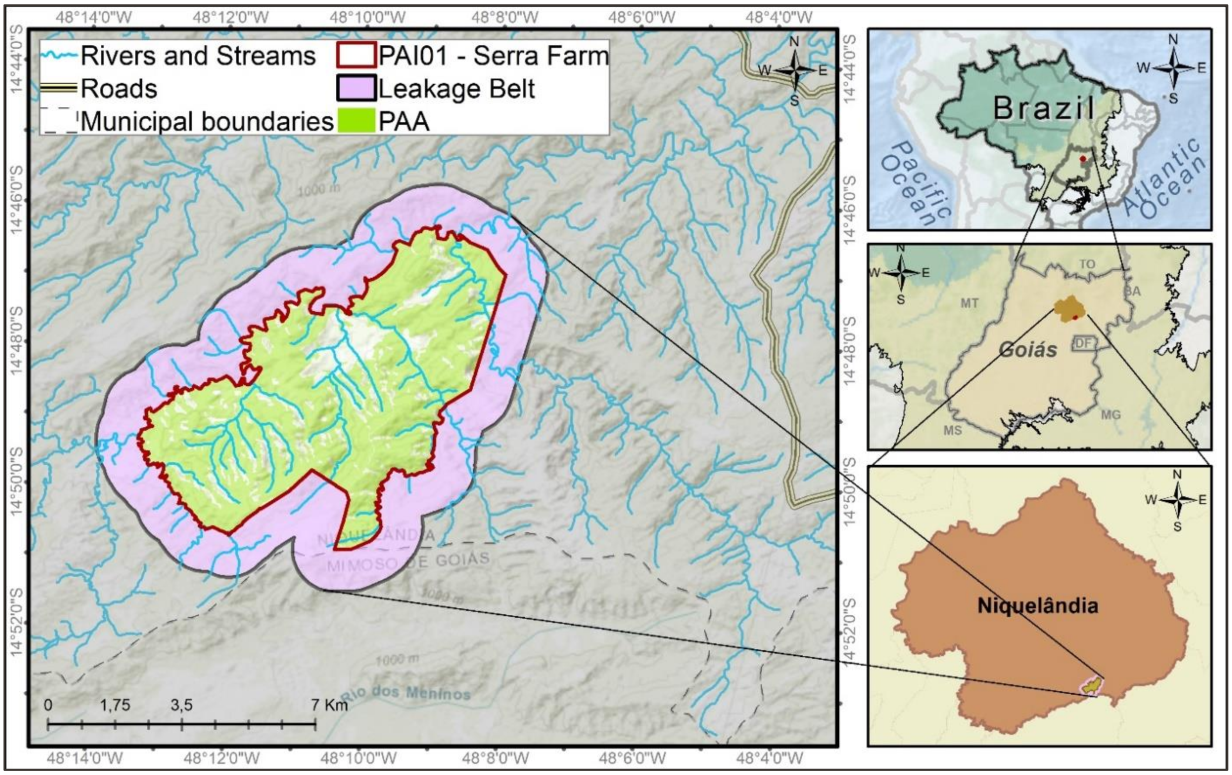

Figure 97. Leakage Belt in PAI 01.

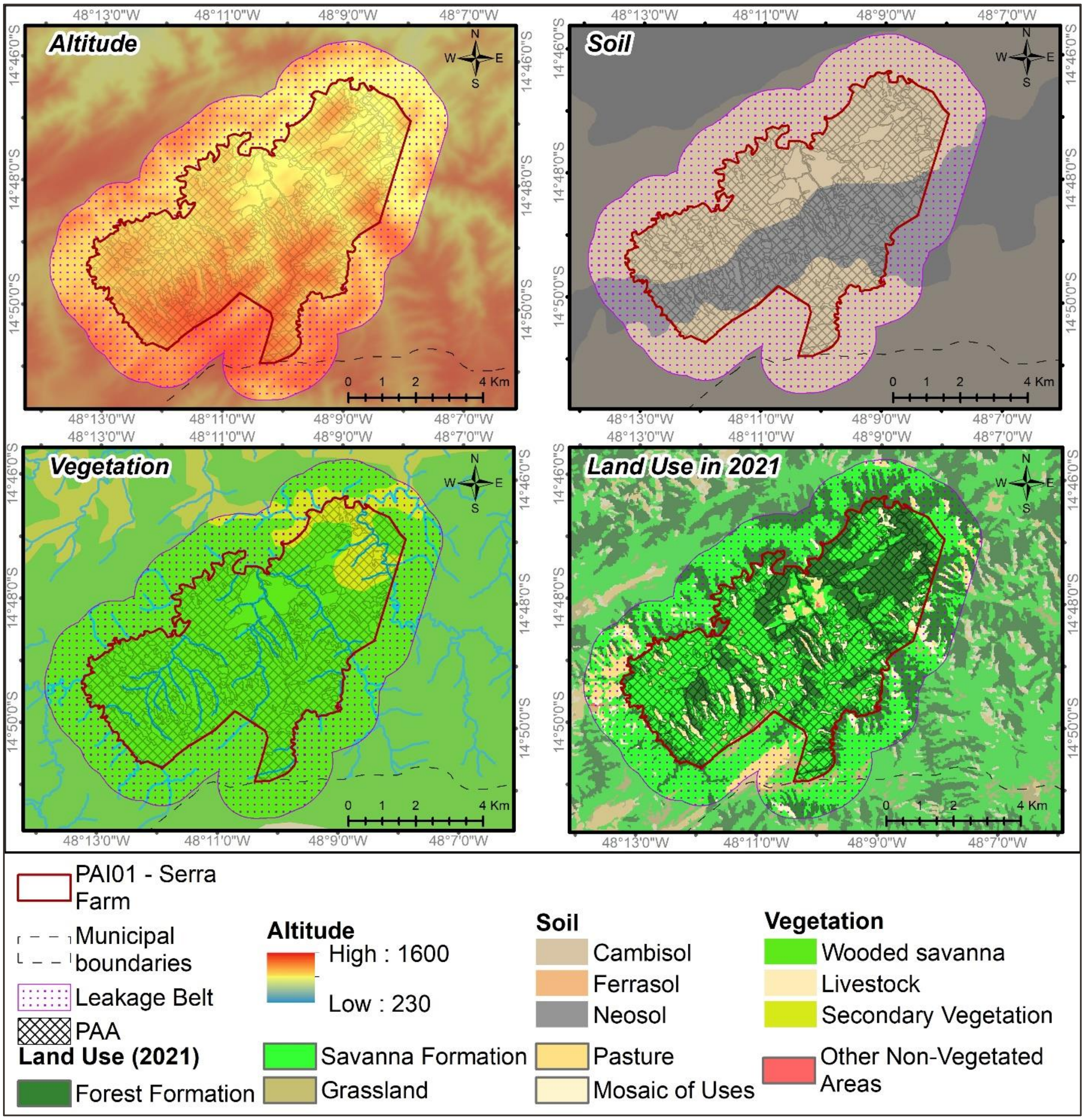

Figure 98. Similarity between PAI 01 and Leakage Belt.

Table 38. Similarity between PAI 01 and Leakage Belt - Forest Class

PAI	Forest Class	Leakage Belt	Project Area (AUDD+APD)
		Area (ha)	
PAI 01	Wooded Savanna	4,019 (100%)	3,380 (100%)

PAI 02 – Fazenda Bom Destino (Miranda, MS, Brazil)

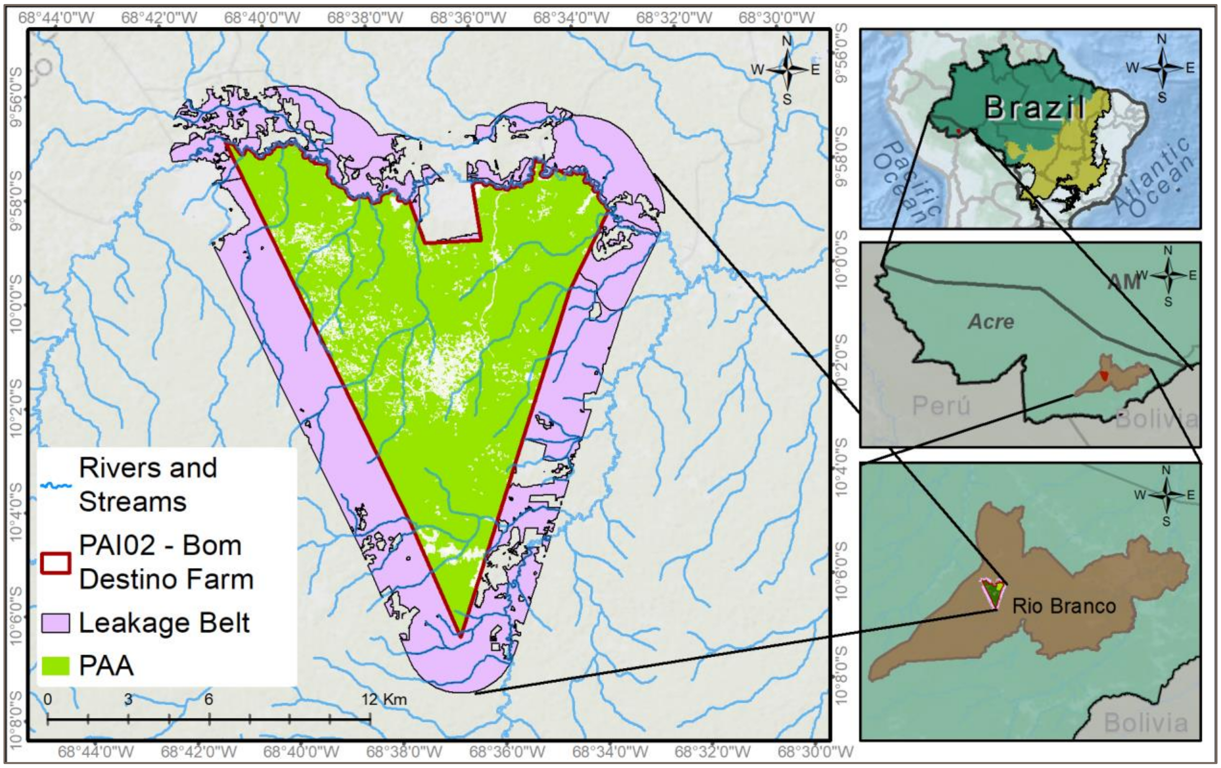

Figure 99. Leakage Belt in PAI 02.

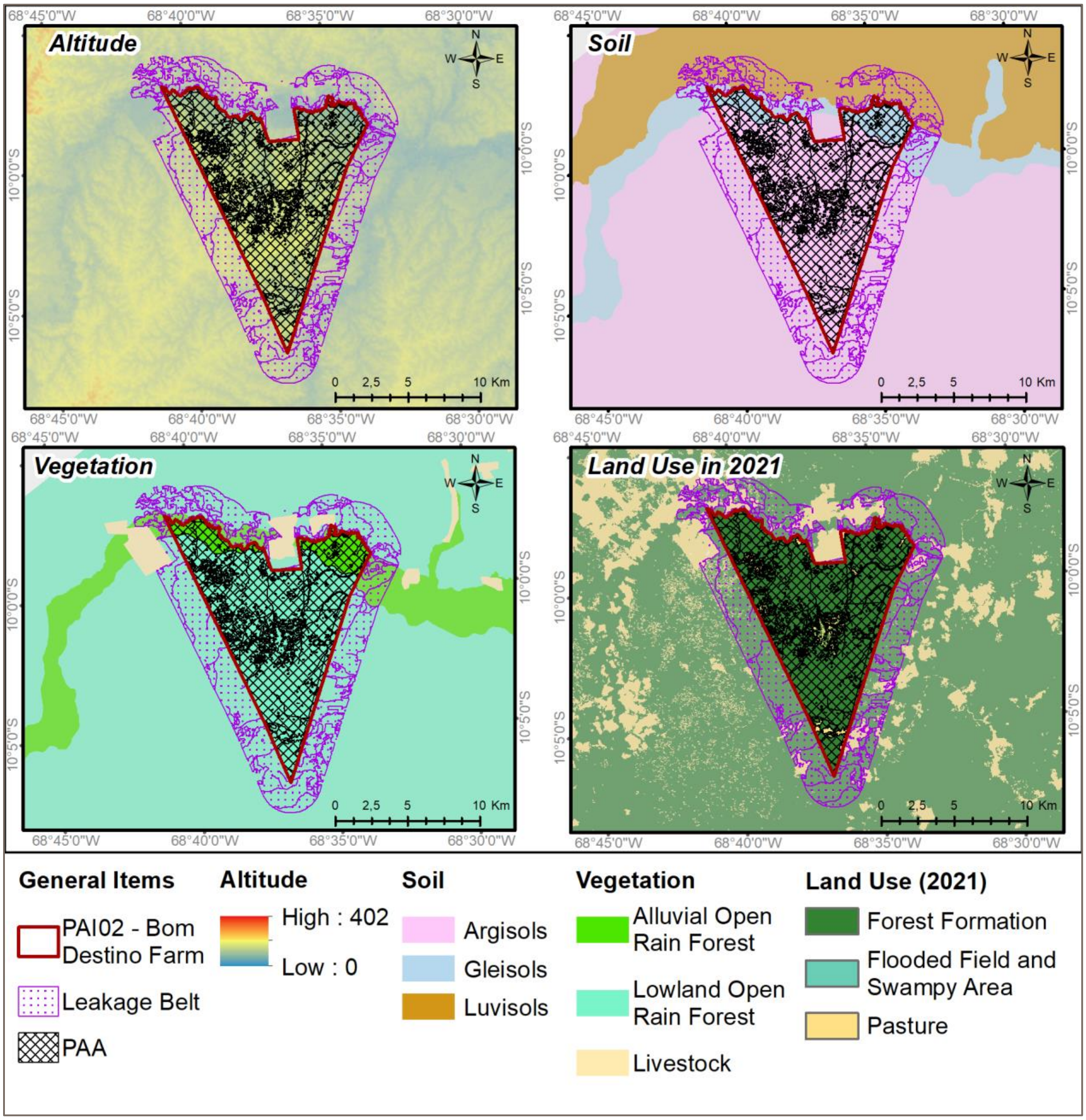

Figure 100. Similarity between PAI 02 and Leakage Belt.

Table 39. Similarity between PAI 02 and Leakage Belt - Forest Class

PAI	Forest Class	Leakage Belt	Project Area (AUDD+APD)
		Area (ha)	
PAI 02	Alluvial Open Ombrophilous Forest	1,126 (13%)	1,272 (14%)
	Lowland Open Ombrophilous Forest	7,764 (87%)	7,633 (86%)

PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

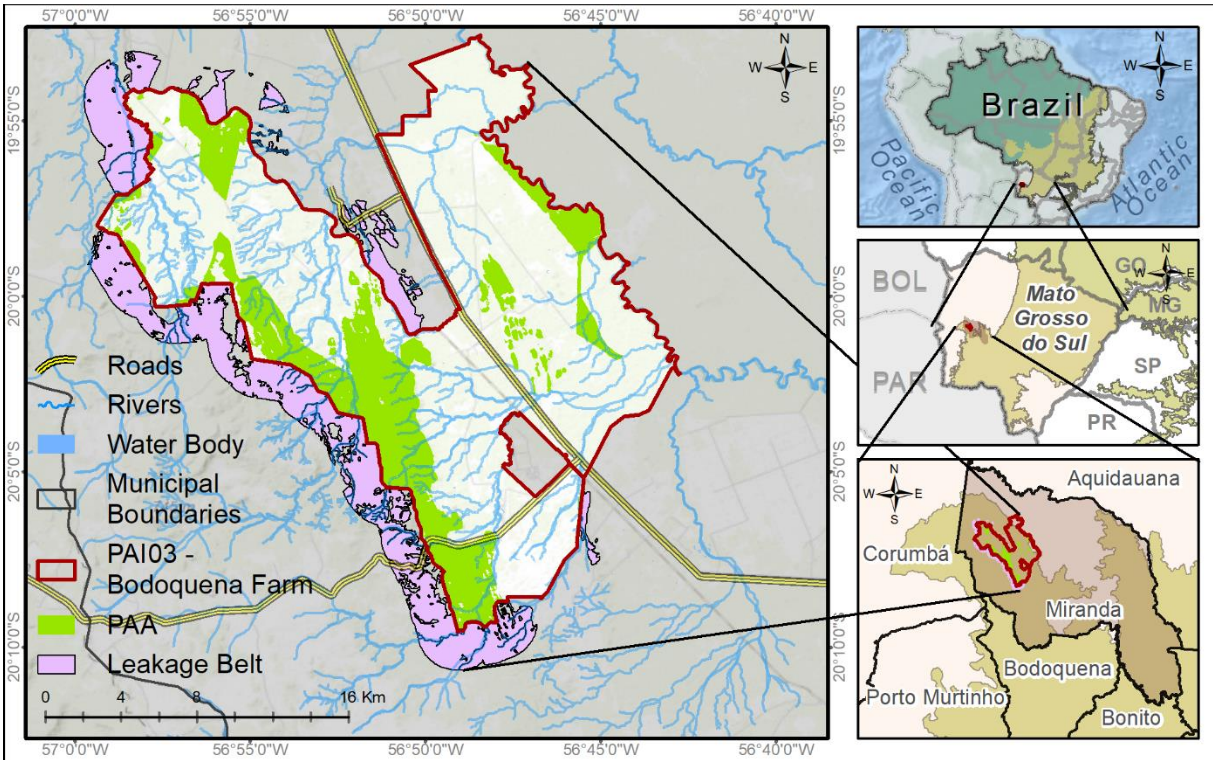

Figure 101. Leakage Belt in PAI 03.

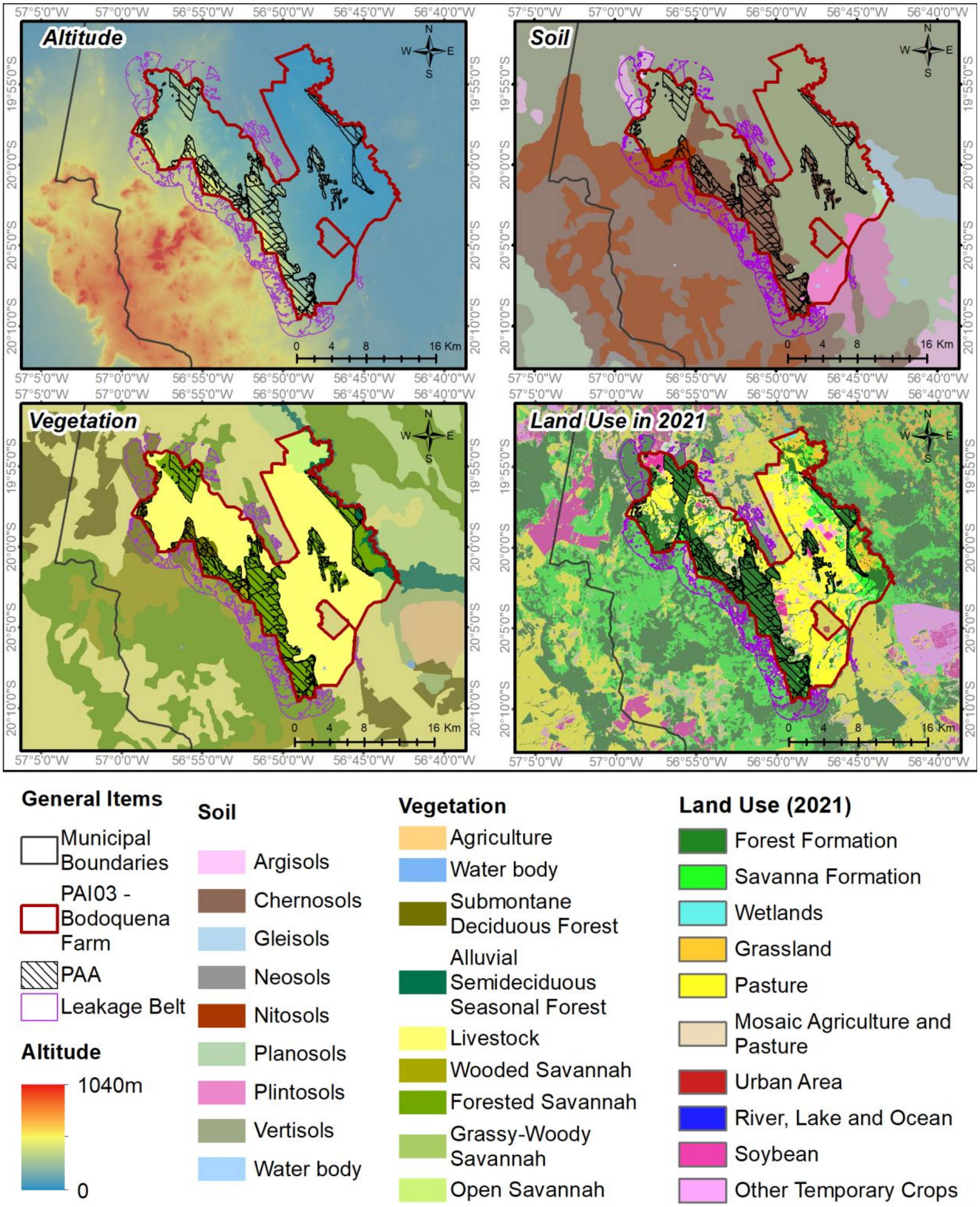

Figure 102. Similarity between PAI 03 and Leakage Belt.

Table 40.Similarity between PAI 03 and Leakage Belt - Forest Class

PAI	Forest Class	Leakage Belt	Project Area (AUDD+APD)
		Area (ha)	
PAI 03	Wooded Savanna	2.880 (32%)	228.60 (3%)
	Submontane Seasonal Deciduous Forest	0 (0%)	977.58 (11%)
	Seasonal Semi-deciduous Alluvial Forest	1.667 (19%)	308.40 (3%)
	Forested Savanna	0 (0%)	7,388.10 (83%)

3.1.3.4 TEMPORAL BOUNDARIES

The temporal domain from which information on historical deforestation was extracted, analyzed, and projected into the future was established in accordance with VMD0007 methodological requirements of annual data from 2012 to 2021.

The Carbonflor REDD project will begin on October 06, 2021, and end on October 05, 2051, comprising a project with a total crediting period of 30 years.

October 06, 2021, and October 05, 2031, configure start date and the end date of the first baseline period of the project.

3.1.4 BASELINE SCENARIO

In the baseline scenario, forest areas are expected to be converted to non-forest areas, in two baseline scopes: Avoided Unplanned Deforestation (AUDD) and Avoided Planned Deforestation (APD), as described below.

Table 41. Description of the scenarios. Business as usual, with no project, and with REDD Carbonflor project

Context and risks		Low enforcement of the law, no incentives towards conservation of forests, increased demand and prices for commodities, high value for converted land, vulnerable communities. Risk of illegal deforestation (AUDD) from land grabbers, from illegal wood harvesters, from landowners due to low enforcement of the law. Risk of legal deforestation (APD) due to pressure for conversion for agricultural activities and land appreciation.	
Scenarios		Business as usual (no project)	REDD Carbonflor
Climate	Deforestation / emissions	- Continue to rise both in areas eligible for APD and AUDD. - Landowner sees no immediate perceived benefit from conservation.	- There is no deforestation in project areas - Increased governance in private areas allow for combating illegal deforestation in farm areas
	Climate change mitigation	- Changes continue to occur with increased frequency of extreme events - Local climate is affected	- Native vegetation in project areas are maintained and improved, contributing to carbon sequestration

			- Local impacts of climate change is minimized
Community	Landowners	- Landowners have income from agricultural and ranching activities. Commodity prices and demand stimulate conversion (legal) and deforestation (illegal) as law enforcement is low. - Are affected by local changes in climate	- Conservation is a source of income, beyond agricultural and ranching activities. - Conservation provides a steady cashflow during the project period - Deforestation is less attractive, and farmers know of constant monitoring.
	Local communities (vulnerable/ at risk)	- Have little knowledge about climate change, limited access to basic services and information - Are affected by local changes in climate	- Participate in the decision-making process of what the project may bring to them as benefits. - Education about environmental issues helps change behavior
Biodiversity	Habitat	- Habitat for endangered species is lost due to deforestation and fire	- Habitat is protected in project areas, both in areas prone to illegal deforestation and to legal conversion. Additional positive impact from REDD
	Species	- Endemic species are at risk, due to deforestation, fire and habitat loss	- Risks to endemic species are minimized.

The baseline will be revised every 6 years in accordance with the latest VCS rules.

<u>AUDD</u>

The data, from the MapBiomas Alerta system, cross-references information from five real-time satellite deforestation detection systems and validates them with high-resolution images with the aid of artificial intelligence. The cross-referencing shows that almost all the deforestation alerts issued last year have one or more indications of illegality: 99.8% of them, equivalent to 95% of the deforested area, are unauthorized or overlap with protected areas or violate the Forest Code[123]. Considering all Brazilian biomes, the probable illegality rate is 98.9% of the total area of alerts in 2020. In the Cerrado, this rate is 97.76%. In the Amazon, the probable irregularities are 99.43%[124].

However, the number of deforestation warnings that had a response from the federal government is very low: only 2% of the alerts and 5% of the area deforested between 2019 and 2020 suffered fines or embargoes by Ibama. In the case of the Amazon, in the 52 municipalities considered critical by the policies of the Ministry of Environment, 2% of the alerts and 9.3% of the deforested area had punishment actions. In the 11 municipalities defined by the Amazon Council as having the highest priority, 3% of the alerts and 12% of the deforested area were subject to this type of action.

In at least two-thirds of the alerts, it is possible to identify those responsible for deforestation: 68.3% of the validated detections have a total or partial overlap with areas registered in the CAR, the Rural Environmental Registry. In Amazon, this number is even higher: 69.2%. In other words, in theory, these

[123] https://s3.amazonaws.com/alerta.mapbiomas.org/rad2020/RAD2020_MapBiomasAlerta_FINAL.pdf
[124] https://s3.amazonaws.com/alerta.mapbiomas.org/rad2020/RAD2020_MapBiomasAlerta_FINAL.pdf

landowners could be fined even by mail, since to be registered in the CAR it is necessary to provide the applicant's data.

Although the land use within the Project boundary is forest, it is unlikely that this land use will continue in the future, given the patterns of use land change, and deforestation pressures in the area.[125] Given the recent increase in deforestation in the region, parts of the Project area are increasingly likely to be cleared and converted to pasture and cropland by smallholder farmers, by land grabbers, or local residents.[126]

As the agents of deforestation are other residents and not the property owners, this deforestation is unplanned. This deforestation is illegal because these agents of deforestation, or landowners are not allowed to convert legally protected forest (Legal Reserve and Permanent Protection Areas) into pasture or cropland; however, this deforestation is rarely prosecuted by the authorities. The most likely baseline scenario is the continued conversion of humid tropical forests to pasture and cropland by smallholder farmers, by land grabbers, or local residents.

Non-compliance with private property laws is widespread and laws are not systematically enforced throughout Brazil. Numerous inquiries have been made to the relevant state and local authorities to obtain data on enforcement levels (or for example, percentage of illegal land invasions resolved) of private property laws. To our knowledge, no institution currently systematically tracks these cases. Studies from the late 2010s, indicate that even the few areas which suffered embargoes of fines, did not comply with the embargo or pay fines. Recent reports[127, 128] show that only a small fraction of environmental fines are ever paid.

In the baseline scenario, forest is expected to be converted to non-forest by the agents of deforestation acting in the reference region, project area and leakage belt, as described previously. Therefore, the project falls into the AFOLU-REDD category, specifically: avoided unplanned deforestation (AUDD). The revenue from the REDD Carbonflor project is essential to maintain these areas as standing forests, as described in the Additionality of the Project, and to carry out the present project’s leakage management activities.

APD

The Brazilian Forest Code (Federal Law 12.651/2012) defines the percentage that must be preserved in each rural property, according to the biome in which the property is located (Table 13). The surplus of forest on these properties is subject to legal deforestation according to federal legislation. States may have additional laws that regulate how the process takes place (see section 2.5.7.2 for state specific legislations). A legitimate landowner which has their property with 100% native vegetation can request an authorization for legal deforestation up to the amount allowed by the forest code or state regulation. There is no limit on the size of legal deforestation, if the landowners ensure there are enough areas of legal reserve and permanent protection areas as stipulated by the Forest Code.

However, common practice is that the state environmental agencies are very slow in issuing deforestation licenses, they do not visit the areas to enforce existing legislation, which results in these areas eligible for

[125] http://combateaodesmatamento.mma.gov.br/images/conteudo/PPCerrado_2aFase.pdf
[126] http://r1.ufrrj.br/geac/portal/wp-content/uploads/2012/03/MARGULIS-CausasDesmatamento2001.pdf
[127] https://g1.globo.com/jornal-nacional/noticia/2022/06/25/infratores-pagam-apenas-uma-em-cada-100-multas-ambientais-aplicadas-pelo-icmbio-no-pais.ghtml
[128] https://news.mongabay.com/2019/05/dismantling-of-brazilian-environmental-protections-gains-pace/

legal deforestation to be deforested without a permission. As stated by a recent report[129] over 96% of deforestation is illegal, however some of that corresponds to areas which lack a deforestation license.

In these cases, the baseline scenario is the conversion of forest areas into non-forest areas for commercial purposes such as pastures and agriculture, the agent owns the land and as permitted by law (even though, often without license), it is considered as planned deforestation (APD). Landowners can request a license of up to 100% of the eligible areas for legal deforestation.

In case of absence of the project, the owners of PAI 01 and PAI 03 could request the deforestation of 80% of the property for conversion to pasture or agriculture since these areas are in the Cerrado outside the Legal Amazon. In case of absence of the project, the owner of PAI 02 could request the deforestation of 20% of the property for conversion to pasture or agriculture since the area is in the Amazon biome.

The efforts made to implement the Carbonflor REDD in the area and the revenue generated by the project ensure that the property maintains the surplus of native Cerrado and Amazon vegetation, avoiding planned deforestation (APD) and its associated emissions. In that sense, and taking into consideration that credits are issued only once, the rate of deforestation for APD should be based on either exiting deforestation licenses for the property or on the licenses issued in neighboring areas (see Appendix 8: APD Rates).

3.1.5 ADDITIONALITY

Project additionality and the area of the baseline scenario evaluated for the Project Activities Instances (PAIs), so that all additional PAIs meet the Eligibility Criteria as additional.

Step 1. Identification of alternative scenarios

Step 1a. Define alternative scenarios to the proposed CDM project activity

The tool, TOOL 02 (United Nations Framework Convention on Climate Change, Clean Development Mechanism) - Combined tool to identify the baseline scenario and demonstrate additionality. Version 07.0, from September 22, 2017, was applied to identify the baseline scenario of the project and demonstrate additionality. As a result, the following alternative land use scenarios were identified:

Avoiding Unplanned Deforestation and Degradation (AUDD)

1. **Continued pre-project land use with the constant threat of illegal deforestation:** cross-referencing shows that almost all deforestation alerts issued last year have one or more indications of illegality: 99.8% of them, equivalent to 95% of the deforested area, are unauthorized or overlap with protected areas or violate the Forest Code. The probability rate of illegality is higher than 95% in all biomes. It is higher in the Cerrado, where 97.78% of the area of deforestation alerts have at least one indication of irregularity[130].
2. **Project activity in the area within the project boundaries carried out without being registered as a VCS AFOLU Project:** although the preservation of native vegetation, Legal Reserve areas and Permanent Protection Areas is required by law, this scenario foresees the implementation of extra monitoring and active prevention and control of deforestation, which makes the conservation activity costly to landowners, denoting low attractiveness and adherence by them. Since law enforcement is low, farmers often do not invest in conservation measures in APP and RL areas.

[129] https://s3.amazonaws.com/alerta.mapbiomas.org/rad2020/RAD2020_MapBiomasAlerta_FINAL.pdf
[130] See:https://s3.amazonaws.com/alerta.mapbiomas.org/rad2020/RAD2020_MapBiomasAlerta_FINAL.pdf

3. **Illegal conversion of land in the APP and RL areas to pasture, agriculture or other commercial purposes**: The entire project zone is under pressure from deforestation for commercial purposes. In the case of unplanned deforestation, the conversion agent is a local resident who does not represent the owner of the land, since the APP and RL areas must be legally protected, as mandated by the Brazilian Forestry Code.

<u>Avoid Planned Deforestation (APD)</u>

1. **Maintenance of surplus native forest in the area within the project boundaries carried out without being registered as a VCS AFOLU Project:** Maintaining native vegetation cover in areas subject to legal deforestation represents high costs for landowners. The owner must also be aware of fiscal and regulatory issues, paying rural taxes in the area and ensuring the adequacy of documents, such as the Rural Environmental Registry (CAR) and the Rural Property Registry (CCIR), for example. However, if there is a lack of conservation finance lines in the area, commercial farming is more profitable than philanthropic conservation. Furthermore, the legal deforestation, even if for the implementation of pasture areas, results in significant increase n land value (+200-500%), this maintain surplus native vegetation without any conservation finance is highly unlikely. The scenario is credible but unlikely, since through legal deforestation the farmer can implement profitable activities (agriculture and ranching) or even sell the land at a much higher price.
2. **Forest is converted to pasture and agriculture:** As described in section 3.1.4 above, these are portions of private property where it is legally permissible to deforest legally for other land uses. The high rates of expansion of livestock and crop production in the Cerrado and Amazonia biomes make this scenario credible and highly likely to occur.
3. **Farm sale to private investors followed by regional BAU:** The sale of private property is a credible scenario for the project, as it brings financial resources to the landowner. Investors commonly look for potential areas for land use conversion to regional BAU.

Step 1b. Consistency with mandatory applicable laws and regulations

<u>Avoiding Unplanned Deforestation and Degradation (AUDD)</u>

<u>Scenario 1.</u> <u>Continuation of pre-project land use with the constant threat of illegal deforestation:</u> In addition to meeting the fiscal and regulatory issues mentioned above, there are no strong legal constraints to this scenario. However, beyond the main issue of the social function of property, according to the Brazilian Federal Constitution of 1988, which states that the owner must give a useful designation to his area; there are also other pressures involved. Thus, the probability of the property being maintained with native vegetation cover is very low, considering the properties and the region (Cerrado and Amazon Biome) where the Project is implemented, it is a free zone of agricultural and economic expansion.

<u>Scenario 2.</u> <u>Project activity in the area within the project boundaries conducted without being registered as VCS AFOLU Project:</u> There are legal limitations, in a broad sense, to the maintenance of standing forest in Legal Reserve and Permanent Preservation Areas, the preservation of native vegetation in these areas is a legal requirement for land title regularization of the properties, however, all costs are financed by the landowner. The owner must also be aware of fiscal and regulatory issues, paying the area's rural taxes, and ensuring the adequacy of documents, such as the Rural Environmental Registry (Cadastro Ambiental Rural - CAR) and the Rural Property Registry (CCIR), for example. Low enforcement of the law, lack of

Environmental agency's presence in the area, limited enforcement activities to comb at illegal deforestation, low number of application of fines and even lower of them being paid, are indicators that the law is not respected. Illegal deforestation in LR and APP occurs as there is limited consequence.

Scenario 3. Illegal conversion of land in the APP and RL areas to pasture, agriculture or other commercial purposes: In Brazil, the Forest Code (Law No. 12,651/2012) is responsible for delimiting the protection of Permanent Preservation Areas and Legal Reserves on private properties. That is, rural properties must have a percentage of preserved vegetation area (RL), as well as the vegetation on the banks of rivers, springs and other watercourses preserved (APP). However, even protected by law, such areas are still under pressure from illegal deforestation, since inspection of such areas, which are the responsibility of state environmental agencies, is quite outdated. Thus, illegal land use conversion in these protected areas can be identified on rural properties throughout the project zone. This is a result of low enforcement of the law, lack of Environmental agency's presence in the area, limited enforcement activities to comb at illegal deforestation, low number of application of fines and even lower of them being paid, are indicators that the law is not respected. Illegal deforestation in LR and APP occurs as there is limited consequence.

Avoiding Planned Deforestation (APD)

Scenario 1. Maintenance of surplus native forest in the area within the project boundaries, carried out without being registered as VCS AFOLU Project: There are no legal limitations, in a broad sense, to maintaining standing forest, with the costs being financed by the landowner, if the vegetation cover respects the protected areas provided for in the legislation and the landowner complies with all regulatory instruments, including the Forest Code. The landowner must also be aware of fiscal and regulatory issues, paying the rural taxes for the area, and ensuring the adequacy of documents, such as the Rural Environmental Registry (Cadastro Ambiental Rural - CAR) and the Rural Property Registry (CCIR), for example. Farmers are not stimulated to keep native vegetation beyond legal requirements as that characterizes "unproductive" land, and the rate for annual land tax is very high.

Scenario 2. Forest is converted to pasture and agriculture: The forest is converted into pasture. In this scenario, the owner is authorized to convert up to 80% of the rural property in the Cerrado into pasture, 35% in areas of savanna formation in the Amazon biome and 20% in forest formations in the Amazon. The remainder must be maintained as Legal Reserves and Permanent Preservation Areas, protected by the Forest Code, as described above. Farmer can deforest up to the legal limit and pooften do so without a proper license, due to the state's ineficent implementation of the law.

Scenario 3: Farm sale to private investors followed by regional BAU: In this scenario, the owner is legally entitled to sell his private property to interested investors.

Step 2. Barrier Analysis

Step 2a - Identify barriers that would prevent the implementation of alternative scenarios

Investment barriers

Grain culture has a high investment cost. It varies depending on the area, and in the Cerrado, it has a higher cost due to soil conditions. Brazil's Agriculture and Livestock Confederation (Confederação da Agricultura e Pecuária do Brasil) estimates that, in the state of Goias, it costs around R$3,277.00 per hectare to cultivate soy, the main grain cultivated in the region.[131] According to another study,[132] the cost of producing soy was R$2,490.44 in the 2019/2020 harvest but has shown a tendency to increase significantly. These values do not consider the costs to remove the trees to make way for the cultivation, meaning that the costs in the project area would be significantly higher.

Cattle raising requires not only the purchase of livestock but also the investment in feeding the animals, which can create a high investment scenario. In Brazil, it costs around R$500 to maintain one cow for 100 days.[133] Considering the need to have several cattle to have a profitable business, it is easily perceived that there is a high cost to begin a raising cattle-raising business.

Technological barriers

Grain production in Brazil is directly connected to the high level of investment in technologies required to improve productivity. In Cerrado, especially at the beginning of the production, when small changes in the weather can affect the future of crop productivity, for cultivating soybeans, for example, it is necessary to invest in different types of technologies. Most of the soy production in Brazil uses genetically modified organisms (GMO) seeds, so, the farmers must buy the seeds, besides that, it is necessary to invest in irrigation systems, harvesters and other necessary machinery, drones and monitoring systems, specific fertilizers for each soil composition, and others.

According to the Institute for the Strengthening of Agriculture and Cattle Raising of Goiás (Instituto para Fortalecimento da Agropecuária em Goiás - IFAG in Portuguese), the 2022/2023 production costs an average of 7,931.22 reais per hectare in the state of Goiás[134], most of the expenses go to the technologies needed for production, since the entire production chain is automated, depending very little on human labor. Thus, the need for high investment in technologies to ensure the productivity of grain crops is evident.

Step 2b - Eliminate alternative scenarios which are prevented by the identified barriers

AUDD: Considering the barrier analysis, in Step 2a, the alternative Scenarios 2 and 3 are prevented by investment and technological barriers.

Since the problems of illegal deforestation in Brazil are inherent to these rural activities, added to the lack of monitoring and effectiveness of public policies, vegetation conservation is only carried out with the VCS Project.

Given that there are not multiple alternatives to the preservation of vegetation without the CDM Project, the outcome shows that no investment analysis is required by the applicable Tool (TOOL02 v.7.0).

APD: Considering the barrier analysis, in Step 2a, the alternative Scenarios 2 and 3 are impeded by investment and technology barriers.

[131] Available on: https://www.cnabrasil.org.br/noticias/cna-e-cepea-levantam-custos-de-producao-de-graos-em-goias-e-no-parana
[132] Available on: https://ainfo.cnptia.embrapa.br/digital/bitstream/item/229027/1/CUSTOS-PRODUCAO-SOJA-GOIAS-2021.pdf
[133] Available on: http://www.custoseagronegocioonline.com.br/numero1v9/Bovino.pdf
[134] Available on: http://ifag.org.br/custo-de-producao-soja/

However, the conservation of areas of native vegetation on the properties also reflect high costs for the owner, which makes conversion the most usual way. Thus, the conservation of vegetation is carried out only with the CDM Project.

Given that there are not multiple alternatives for vegetation preservation without the CDM Project, the result shows that no investment analysis is required by the applicable Tool (TOOL02 v.7.0).

The outcome of TOOL02 v.7.0 step 2:

Is Project without CDM the only alternative remaining?	
~~YES~~	**APD: NO** **AUDD: NO**
Are there multiple alternatives remaining?	
~~YES~~	**APD: NO** **AUDD: NO**
~~Step 3 – Investment Analysis.~~	No investment analysis
Can the service or product only be provided by the Project Proponent?	
APD: Yes **AUDD: Yes**	**~~NO~~**
The baseline scenario is the last emissions scenario.	~~The baseline emission is the emission benchmark.~~
Is the emission level of the baseline scenario higher than that of the proposed project activity?	
APD: YES **AUDD: YES**	**~~NO~~**
The project activity is additional	~~The project activity is not additional.~~

Step 4 - Common practice analysis

The conservation of native vegetation, particularly in the Cerrado and Amazon biomes is not a common practice, even in areas protected by law, as in the case of Legal Reserves and Permanent Preservation Areas.

Although some public conservation initiatives have achieved some success in maintaining the native vegetation cover, the same does not occur when we consider a private property that does not have access to incentives that make the act of conserving forests attractive in relation to other land uses. As shown above, private conservation projects in the Cerrado and the Amazon are still scarce.

Also, in the APD component, it is possible to mention the establishment of private reserves defined as Private Reserve of Natural Heritage ("RPPN"). However, they are mostly small-sized areas with no associated income.

In this way, the conservation of native vegetation in the APD and AUDD components is not a common practice, thus, the Carbonflor REDD project is additional.

In Brazil, the public bodies are responsible for the issuance of licenses or authorization for the suppression of vegetation. These bodies must follow the applicable legislation, rules and law principles and the licenses or authorizations are granted after an administrative process, also regulated by the legislation.

The issuance of such documents involves a great number of public employees and authorities, as well as private costs for the preparation of studies, reports and tax payments.

Regarding the applicable law principles, we highlight the principle of morality, the principle of efficiency and the principle of purpose. The first one establishes that the public body must act according to moral guidelines such as honesty, fairness, and equity. The second principle establishes that the public body must achieve its goals at the lowest possible cost. Last, the third principle defines that the public body must act for a specific and defined purpose to avoid deviation. In this sense, when a landowner requests authorizations or licenses for vegetation suppression without the intention of performing such activity, this landowner may create an unnecessary public cost and the deviation of the abovementioned principles.

In that sense, if we can show that farmers have a legal right to deforest, as they have native vegetation areas beyond the legal requirements, these areas are eligible for APD activities at a rate which is consistent with their possibilities and resources. As shown earlier, many farms which have the legal right to deforest do so without a license, due to lack of efficiency and transparency of the environmental authorities. Unfortunately, over 95% of deforestation occurs illegally or without a license.

3.1.6 METHODOLOGY DEVIATIONS

No methodology deviation was adopted in application of methodology.

3.2 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.2.1 BASELINE EMISSIONS

The net baseline carbon stock changes and greenhouse gas emissions of the project were calculated through two different modules of the VM0007 Methodology (BL-UP e BL-PL).

The project area was stratified, according to the X-STR module, using geoprocessing tools and vegetation cover data from the MapBiomas Project - collection 7 [135] of the annual series of maps of land cover and land use in Brazil, intersected with official data on Vegetation and phytophysiognomies obtained from the Environmental Information Database - BDiA, from the Brazilian Institute of Geography and Statistics - IBGE (BRASIL, 2012)[136]. The strata were allocated according to the activity category of the project. The table below displays the strata and the area corresponding to the AUDD and APD activity for each PAI, respectively.

Table 42. Strata in the Project Area

Stratum	AUDD Area (ha)	APD Area (ha) (Aplanned,i)	Leakage (ha)
PAI 01			
Wooded Savanna	1,296	2,084	4,019
PAI 02			
Alluvial Open Ombrophilous Forest	517	755	1,126
Lowland Open Ombrophilous Forest	6,437	1,195	7,764

[135] See: https://plataforma.brasil.mapbiomas.org/

[136] BRASIL. Ibge - Instituto Brasileiro de Geografia e Estatística. Ministério da Economia (org.). Banco de Dados de Informações Ambientais (BDiA): vegetalção. Vegetalção. 2012. Disponível em: https://bdiaweb.ibge.gov.br/#/home Acesso em: 11 jan. 2023.

PAI 03			
Wooded Savanna	29	199	1,667
Submontane Seasonal Deciduous Forest	601	376	3,014
Seasonal Semi-deciduous Alluvial Forest	304	5	0
Forested Savanna	4,607	2.781	4,265
Total Project Area	13,791	7,395	21,855

To estimate the baseline emissions related to APD, being forest lands in which the proponents have the legal permissibility for forest conversion at a rate of up to 80% of the area, outside the Legal Amazon (PAI 01 and PAI 03), while they can convert up to 20% in the the Amazon Biome (PAI 02) (see Table 13), supported by Law No. 12,651, of May 25, 2012, the Brazilian Forest Code, considering such assumptions, the module VMD0006 (BL- PL) "Estimation of Baseline Carbon Stock Changes and Greenhouse Gas Emissions from Planned Deforestation and Planned Degradation" was applied.

The baseline net GHG emissions for planned deforestation were determined using equation 1 of this module (BL-PL):

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

Where:

$\Delta C_{BSL,planned}$	Net greenhouse gas emissions in the baseline from planned deforestation up to year *t**; t CO_2e
$\Delta_{CBSL,i,t}$	Net carbon stock changes in all pools in the baseline stratum i in year t; t CO_2e
$GHG_{BSL,E,i,t}$	Greenhouse gas emissions because of deforestation activities within the project boundary in the baseline stratum i in year t; t CO_2-e yr-1
i 1, 2, 3, …	M strata
t 1, 2, 3, …	*t** years elapsed since the projected start of the project activity

3.2.1.1 CALCULATING ANNUAL AREA OF PLANNED BASELINE DEFORESTATION

The BL-PL module requires knowledge of the rate (area deforested per year) at which planned areas will be deforested to give an area per stratum (i) per year (t) over the project period.

To this end, six proxy areas were defined for PAI 01, eight for PAI02, and six for PAI03, all under the deforestation agent class of the project area, with same practices of conversion and land use, similarity in forest classes, soil classes, and slope and elevation classes, as well as all other criteria required in accordance with that module (BL-PL). These criteria are shown in tables in the following subitems for each PAI.

To assess the risk of abandonment, proxy areas with conversions of at least ten years prior to the Project Start Date were selected and analyzed in accordance with the criteria outlined in VMD0006 v1.3 and none of the areas analyzed were abandoned for forest regeneration. Therefore, the VMD0006 Module v1.3 (BL PL) is applicable to this Project.

The analysis of the proxy areas was carried out by collecting existing and directly applicable data generated from the deforestation (INPE[137]) and land use and land cover (MapBiomas[138]) monitoring platforms. The suitability for conversion of the project area to non-forest is shown in Table 47 for PAI01, Table 54 for PAI02 and Table 61 for PAI03.

The baseline deforestation rate for each PAI was calculated using equation 4 of the VMD0006 BL-PL module:

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

Where:

D%planned,i,t	= Projected annual proportion of land that will be deforested in stratum i during year t. If actual annual proportion is known and documented (e.g. 25% per year for 4 years), set to proportion; %
D%pn	= Percent of deforestation in land parcel9 pn etc of a proxy area because of planned deforestation as defined in this module; %
Yrspn,	= Number of years over which deforestation occurred in land parcel pn in proxy area; years
n	= Total number of land parcels examined
Pn	1, 2, 3, …n* land parcels examined in proxy area
I	1, 2, 3, …M strata

The annual area of deforestation in the baseline for each PAI was calculated using equation 5 of the VMD0006 BL-PL module:

$$\mathrm{AAplanned, i, t,} = (\mathrm{Aplanned, i,} * \mathrm{D\%planned, i, t}\,) * \mathrm{L - Di}$$

Where:

$\mathrm{AAplanned, i, t,}$	= Annual area of baseline planned deforestation for stratum i at time t; ha
$\mathrm{Aplanned, i}$	= Total area of planned deforestation over the baseline period for stratum i; ha
$\mathrm{D\%planned, i, t}$	= Projected annual proportion of land that will be deforested in stratum i during year t. If actual annual proportion is known and documented (e.g. 25% per year for 4 years), set to proportion; %
$\mathrm{L - Di}$	= Likelihood of deforestation for stratum i; %

[137] http://terrabrasilis.dpi.inpe.br/app/map/deforestation?hl=pt-br
[138] https://plataforma.brasil.mapbiomas.org/

The parameter Aplanned,i was shown in Table 42 for each PAI, while the parameter D%planned,i,t is calculated in Table 48 for PAI01, Table 55 for PAI02, and Table 62 for PAI03. L-Di is considered 100%, according to VMD0006, which states: “For all other planned deforestation areas (i.e. areas not both under government control and zoned for deforestation), L-Di must be equal to 100%”.

The calculation and values of AAplanned,i,t and other parameters are shown in the subitems below for PAI01, PAI02, and PAI03. To consider only the deforestation after the Projects’ Start Dates (which are not on January 1st), the AAplanned,i,t for the first year of each PAI was multiplied by the proportion of days in which there would be deforestation in the first year. The same was done for the last year of the Projects.

3.2.1.1.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

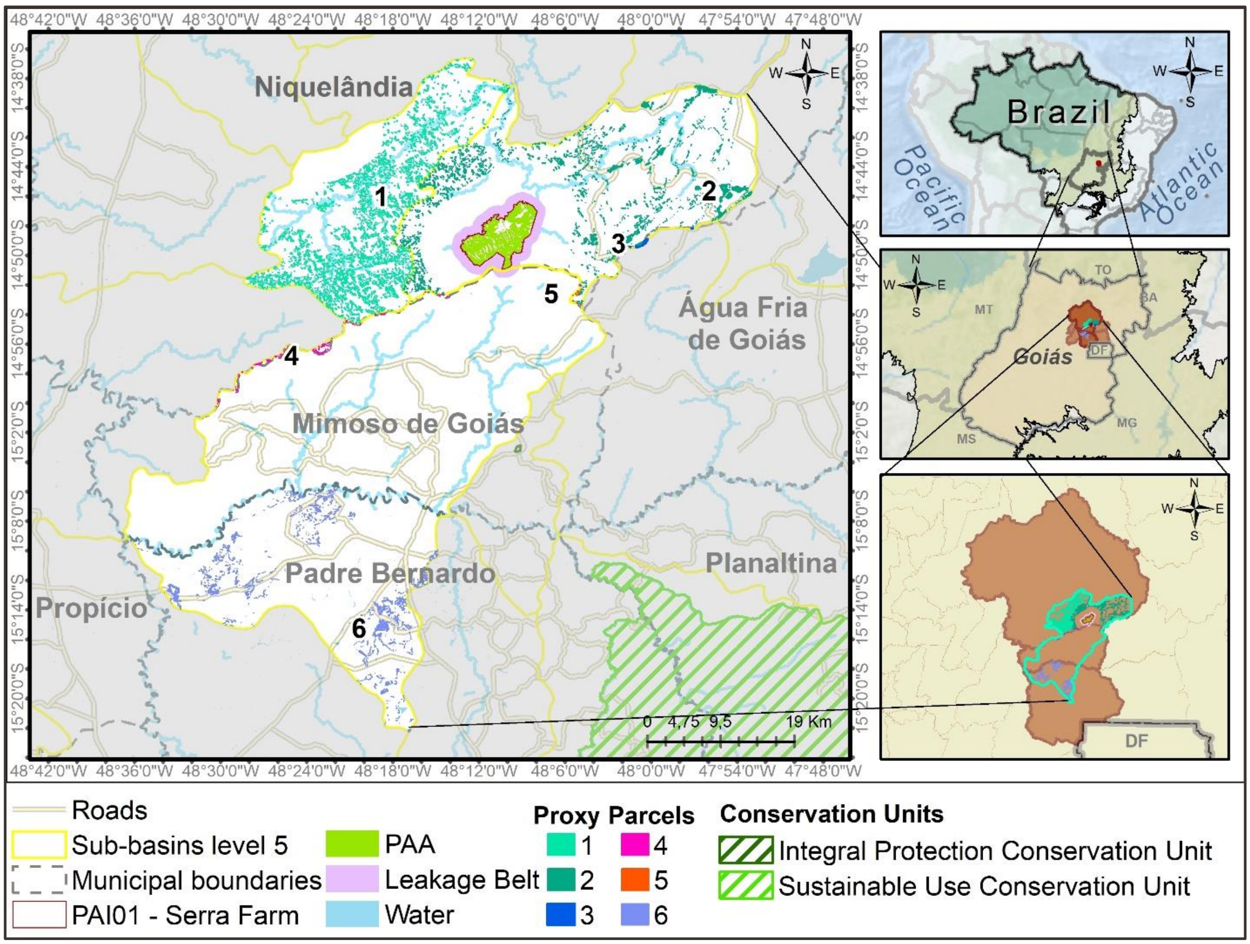

Figure 103. Location of proxy areas related to the analysis of planned deforestation in PAI 01

Table 43. Proxy criteria: Forest Classes – PAI01

PAI 01			
Boundary	Forest Class	Area (ha)	%
PA	Wooded Savanna	3,380	100

	Savana Park	0	0
Plot 1	Wooded Savanna	1,529	99
	Savana Park	14	1
Plot 2	Wooded Savanna	1,461	91
	Savana Park	150	9
Plot 3	Wooded Savanna	16	99
	Savana Park	0.10	1
Plot 4	Wooded Savanna	33	99
	Savana Park	0.34	1
Plot 5	Wooded Savanna	2	100
	Savana Park	0	0
Plot 6	Wooded Savanna	279	36
	Savana Park	372	48

Table 44. Proxy criteria: Soil – PAI01

PAI 01			
Boundary	Soil	Area (ha)	%
PA	Argissolo	0	0
	Cambissolo	0	0
	Chernossolo	0	0
	Latossolo	0	0
	Neossolo	3,380	100
Plot 1	Argissolo	0	0
	Cambissolo	0	0
	Chernossolo	0	0
	Latossolo	0	0
	Neossolo	1,543	100
Plot 2	Argissolo	0	0
	Cambissolo	602	37
	Chernossolo	0	0
	Latossolo	522	32
	Neossolo	487	30
Plot 3	Argissolo	0	0
	Cambissolo	16	100
	Chernossolo	0	0
	Latossolo	0	0

	Neossolo	0	0
Plot 4	Argissolo	0	0
	Cambissolo	0	0
	Chernossolo	0	0
	Latossolo	0	0
	Neossolo	34	100
Plot 5	Argissolo	0	0
	Cambissolo	0	0
	Chernossolo	0	0
	Latossolo	0	0
	Neossolo	2	100
Plot 6	Argissolo	460	59
	Cambissolo	0	0
	Chernossolo	0	0
	Latossolo	139	18
	Neossolo	184	23

Table 45. Proxy criteria: Altitude – PAI01

PAI 01			
	Altitude Class (m)	Area (ha)	%
PA	414 - 500	0	0
	500 - 1000	2,229	66
	1000 - 1379	1,151	34
Proxy Area	414 - 500	0	0
	500 - 1000	2,381	64
	1000 - 1379	1,356	36

Table 46. Proxy criteria: Slope – PAI01

PAI 01			
	Slope Class	Area (ha)	%
PA	>15%	210	6
	<15%	3,170	94
Proxy Area	>15%	1,428	36
	<15%	2,559	64

Table 47. Characterization of the transition from forest to non-forest areas in the Project Zone - Proxy Areas Analysis in the reference period between 2012-2021 – PAI01

LandUse - PAI 01		
Classes	Proxy (ha) 2012	Proxy (ha) 2021
Forest Formation	586	0
Savanna Formation	2,770	0
Wetland	1.6	0
Grassland	629	0
Pasture	0	1,600
Mosaic of Uses	0	1,762
Soybean	0	625

Table 48. Baseline deforestation rate in Project Area – Proxys – PAI01

PAI 01							
Proxy Area	Deforested Area (ha)	Average Deforestation (ha/year)	D%pn	Yrspn	D%pn/ Yrspn	**n**	D%planned,i,t
Plot 1	1,543	17	100%	9	100%	6	12.57%
Plot 2	1,610	179	100%	9	100%		
Plot 3	16	2	100%	7	100%		
Plot 4	34	4	100%	9	100%		
Plot 5	2	0.3	100%	6	100%		
Plot 6	782	87	100%	9	100%		
Total	3,987	-	-	-	-		

Table 49. Annual baseline deforestation for the Project Area from planned deforestation over the project duration, in each of the Project Area's strata – PAI01

Annual baseline deforestation from planned deforestation (AAplanned,i,t))		
Wooded Savanna		
Year	ha/year	ha (cumulative)
2021	380	380
2022	1,450	1,830
2023	253	2,083
2024		2,083
2025		2,083

2026		2,083
2027		2,083
2028		2,083
2029		2,083
2030		2,083
2031		2,083
2032		2,083
2033		2,083
2034		2,083
2035		2,083
2036		2,083
2037		2,083
2038		2,083
2039		2,083
2040		2,083
2041		2,083
2042		2,083
2043		2,083
2044		2,083
2045		2,083
2046		2,083
2047		2,083
2048		2,083
2049		2,083
2050		2,083
2051		2,083

3.2.1.1.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

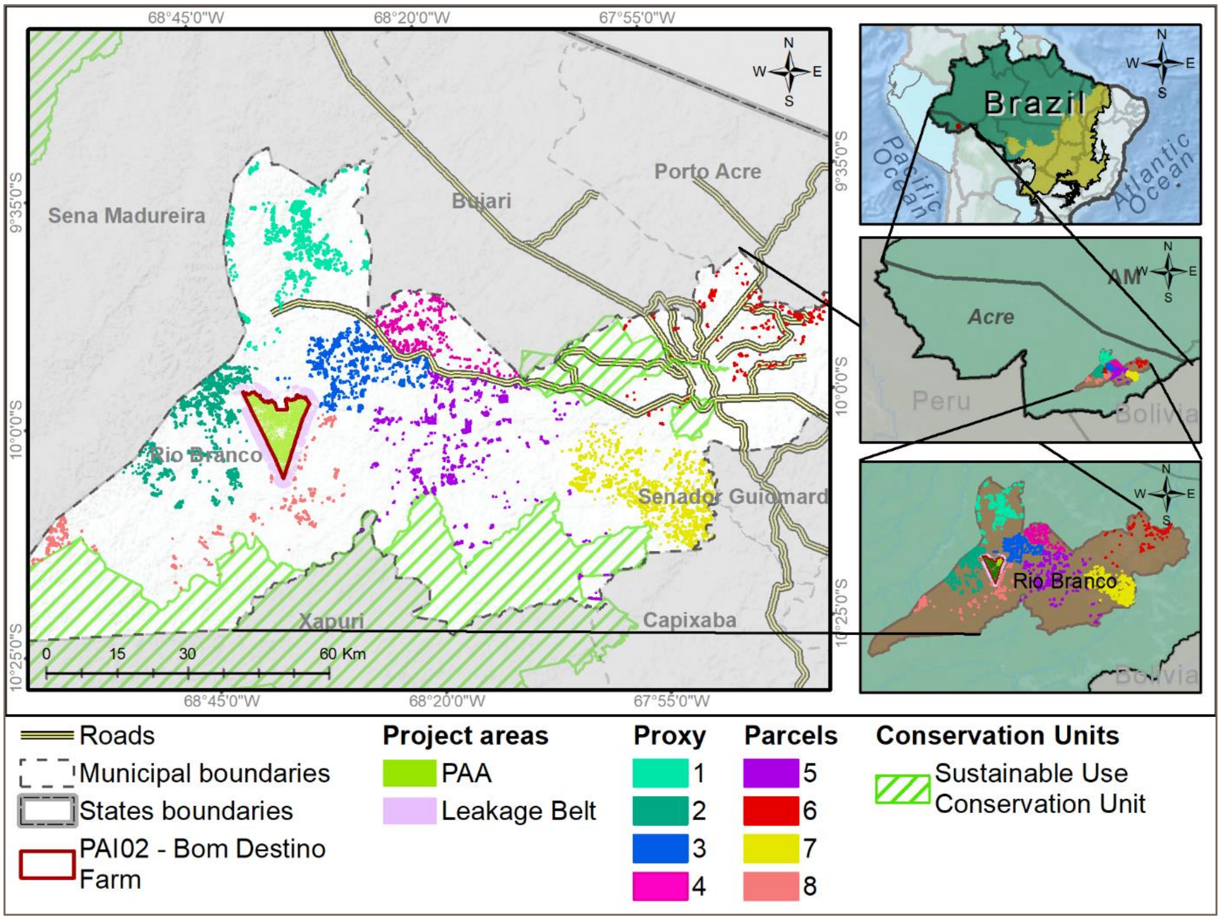

Figure 104. Location of proxy areas related to the analysis of planned deforestation in PAI 02

Table 50. Proxy criteria: Forest Classes – PAI02

PAI 02			
Proxy Area	Forest Class	Area (ha)	%
PA	Alluvial Open Ombrophilous Forest	1,272	14
	Lowland Open Ombrophilous Forest	7,633	86
Plot 1	Alluvial Open Ombrophilous Forest	70	3
	Lowland Open Ombrophilous Forest	2,227	97
Plot 2	Alluvial Open Ombrophilous Forest	61	4
	Lowland Open Ombrophilous Forest	1.543	96
Plot 3	Alluvial Open Ombrophilous Forest	10	1
	Lowland Open Ombrophilous Forest	1,212	99
Plot 4	Alluvial Open Ombrophilous Forest	0	0
	Lowland Open Ombrophilous Forest	552	100
Plot 5	Alluvial Open Ombrophilous Forest	190	16

	Lowland Open Ombrophilous Forest	988	84
Plot 6	Alluvial Open Ombrophilous Forest	163	54
	Lowland Open Ombrophilous Forest	141	46
Plot 7	Alluvial Open Ombrophilous Forest	694	48
	Lowland Open Ombrophilous Forest	738	52
Plot 8	Alluvial Open Ombrophilous Forest	14	3
	Lowland Open Ombrophilous Forest	488	97

Table 51. Proxy criteria: Soil – PAI02

PAI 02			
Proxy Area	Soil	Area (ha)	%
PA	Argissolo	7,627	86
	Gleissolo	1,271	14
	Luvissolo	7	0
Plot 1	Argissolo	1.841	80
	Gleissolo	70	3
	Luvissolo	386	17
Plot 2	Argissolo	900	56
	Gleissolo	61	4
	Luvissolo	643	40
Plot 3	Argissolo	90	7
	Gleissolo	42	3
	Luvissolo	1.090	89
Plot 4	Argissolo	547	99
	Gleissolo	0	0
	Luvissolo	5	1
Plot 5	Argissolo	537	46
	Gleissolo	89	8
	Luvissolo	552	47
Plot 6	Argissolo	59	19
	Gleissolo	46	15
	Luvissolo	199	65
Plot 7	Argissolo	1.250	87
	Gleissolo	180	13
	Luvissolo	2	0
Plot 8	Argissolo	490	98

	Gleissolo	12	2
	Luvissolo	0	0

Table 52. Proxy criteria: Altitude – PAI02

PAI 02			
Boundary	Altitude Class (m)	Area (ha)	%
PA	0-500	8,90	100
Proxy Area	0-500	9,07	100

Table 53. Proxy criteria: Slope – PAI02

PAI 02			
Proxy Area	Slope Class	Area (ha)	%
PA	>15%	7,88	88
	<15%	1,03	12
Proxy Area	>15%	6,85	76
	<15%	2,22	24

Table 54. Characterization of the transition from forest to non-forest areas in the Project Zone - Proxy Areas Analysis in the reference period between 2012-2021 – PAI02

LandUse - PAI 02				
Classes	Proxy (ha) 2013	Proxy (ha) 2016	Proxy (ha) 2019	Proxy (ha) 2021
Forest Formation	9,022	5,526	2,834	0
Grassland	70	36	31	0
Pasture	0	3,526	6,223	9,09
Urban Area	0	0	0	0
River, Lake and Ocean	0	4	4	0
Total	9,091	9,091	9,091	9,091

Table 55. Baseline deforestation rate in Project Area – Proxys – PAI02

PAI 02							
Proxy Area	Deforested Area (ha)	Average Deforestation (ha/year)	D%pn	Yrspn	D%pn/Yrspn	**n**	D%planned,i,t
Plot 1	2,373	297	100%	8	13%	8	12,50%

Plot 2	1,741	218	100%	8	13%		
Plot 3	1,310	164	100%	8	13%		
Plot 4	600	75	100%	8	13%		
Plot 5	1,240	155	100%	8	13%		
Plot 6	326	41	100%	8	13%		
Plot 7	1,518	190	100%	8	13%		
Plot 8	550	69	100%	8	13%		
Total	9,656	-	-	-	-		

Table 56. Annual baseline deforestation for the Project Area from planned deforestation over the project duration, in each of the Project Area's strata – PAI02

Annual baseline deforestation from planned deforestation (AAplanned,i,t)				
	Alluvial Open Ombrophilous Forest		Lowland Open Ombrophilous Forest	
Year	ha/year	ha (cumulative)	ha/year	ha (cumulative)
2022	17	17	27	27
2023	94	111	149	176
2024	94	206	149	325
2025	94	300	149	475
2026	94	394	149	624
2027	94	489	149	774
2028	94	583	149	923
2029	94	677	149	1,073
2030	78	755	123	1,195
2031	-	755	-	1,195
2032	-	755	-	1,195
2033	-	755	-	1,195
2034	-	755	-	1,195
2035	-	755	-	1,195
2036	-	755	-	1,195
2037	-	755	-	1,195
2038	-	755	-	1,195
2039	-	755	-	1,195
2040	-	755	-	1,195
2041	-	755	-	1,195
2042	-	755	-	1,195
2043	-	755	-	1,195

2044	-	755	-	1,195
2045	-	755	-	1,195
2046	-	755	-	1,195
2047	-	755	-	1,195
2048	-	755	-	1,195
2049	-	755	-	1,195
2050	-	755	-	1,195
2051	-	755	-	1,195
2052	-	755	-	1,195

3.2.1.1.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

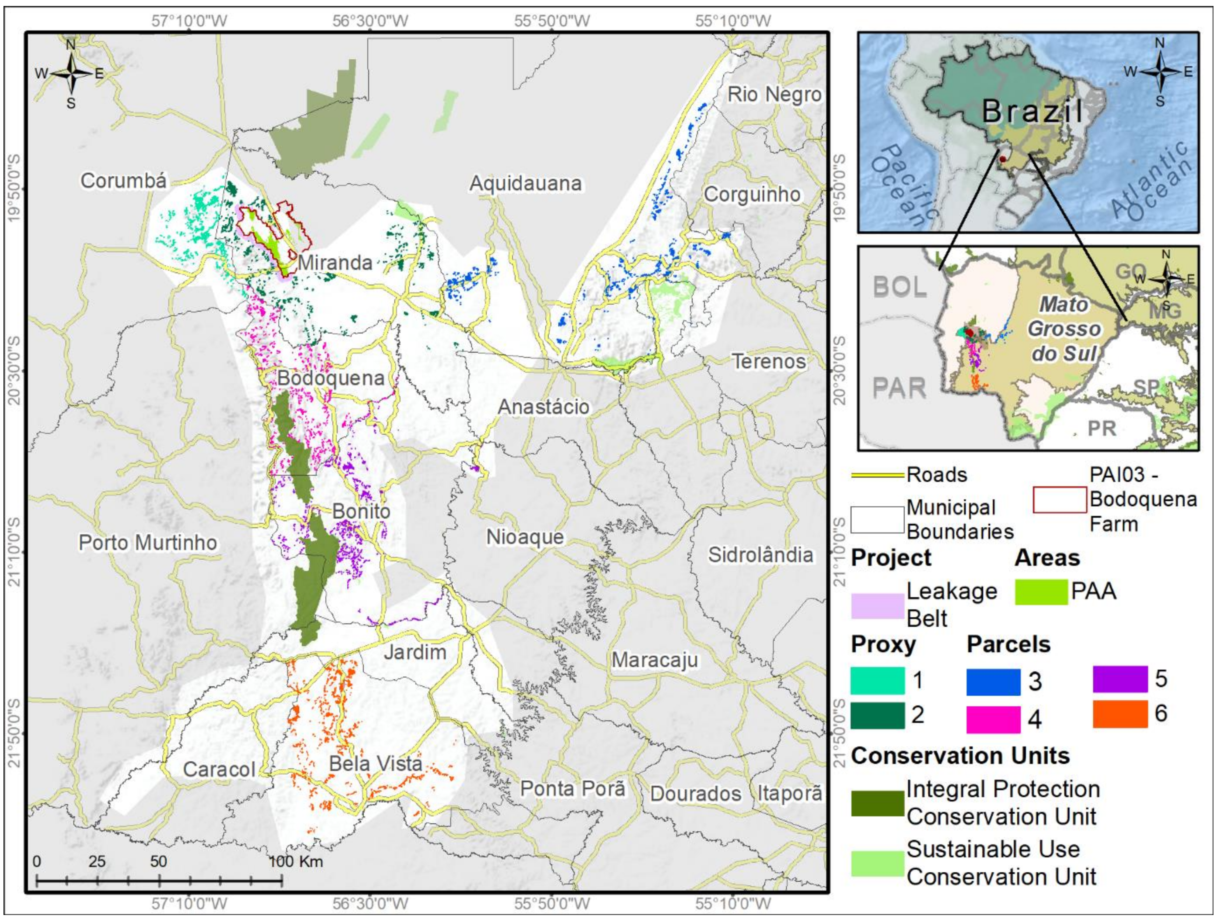

Figure 105. Location of proxy areas related to the analysis of planned deforestation in PAI 03

Table 57. Proxy criteria: Forest Classes – PAI03

PAI 03

Proxy Area	Forest Class	Area (ha)	%
PA	Wooded Savanna	229	3
	Submontane Seasonal Deciduous Forest	978	11
	Seasonal Semi-deciduous Alluvial Forest	308	3
	Forested Savanna	7,388	83
Plot 1	Wooded Savanna	50	3
	Submontane Seasonal Deciduous Forest	1.327	75
	Seasonal Semi-deciduous Alluvial Forest	0	0
	Forested Savanna	388	22
Plot 2	Wooded Savanna	177	11
	Submontane Seasonal Deciduous Forest	370	22
	Seasonal Semi-deciduous Alluvial Forest	55	3
	Forested Savanna	1.055	64
Plot 3	Wooded Savanna	450	23
	Submontane Seasonal Deciduous Forest	0	0
	Seasonal Semi-deciduous Alluvial Forest	195	10
	Forested Savanna	1.296	67
Plot 4	Wooded Savanna	1	0
	Submontane Seasonal Deciduous Forest	560	56
	Seasonal Semi-deciduous Alluvial Forest	77	8
	Forested Savanna	361	36
Plot 5	Wooded Savanna	0	0
	Submontane Seasonal Deciduous Forest	161	14
	Seasonal Semi-deciduous Alluvial Forest	109	9
	Forested Savanna	915	77
Plot 6	Wooded Savanna	447	20
	Submontane Seasonal Deciduous Forest	447	20
	Seasonal Semi-deciduous Alluvial Forest	360	16
	Forested Savanna	971	44

Table 58. Proxy criteria: Soil – PAI03

PAI 03			
Proxy Area	Soil	Area (ha)	%
PA	Argissolo	30	0
	Chernossolo	5,944	67
	Nitossolo	323	4

	Plintossolo	72	1
	Vertissolo	2,533	28
Plot 1	Argissolo	49	3
	Chernossolo	634	36
	Nitossolo	218	12
	Plintossolo	0	0
	Vertissolo	865	49
Plot 2	Argissolo	805	49
	Chernossolo	266	16
	Nitossolo	199	12
	Plintossolo	9	1
	Vertissolo	378	23
Plot 3	Argissolo	1,941	100
	Chernossolo	0	0
	Nitossolo	0	0
	Plintossolo	0	0
	Vertissolo	0	0
Plot 4	Argissolo	1	0
	Chernossolo	882	88
	Nitossolo	91	9
	Plintossolo	0	0
	Vertissolo	25	2
Plot 5	Argissolo	6	1
	Chernossolo	534	45
	Nitossolo	580	49
	Plintossolo	64	5
	Vertissolo	0	0
Plot 6	Argissolo	1,265	57
	Chernossolo	0	0
	Nitossolo	821	37
	Plintossolo	139	6
	Vertissolo	1,265	57

Table 59. Proxy criteria: Altitude – PAI03

PAI 03			
Proxy Area	Altitude Class (m)	Area (ha)	%

PA	0-500	8,553	100
	500-1000	0	0
Proxy Area	0-500	9,161	94
	500-1000	613	6

Table 60. Proxy criteria: Slope – PAI03

PAI 03			
Proxy Area	Slope Class	Area (ha)	%
PA	>15%	4,947	58
	<15%	3,606	42
Proxy Area	>15%	5,387	70
	<15%	2,319	30

Table 61. Characterization of the transition from forest to non-forest areas in the Project Zone - Proxy Areas Analysis in the reference period between 2012-2021 – PAI03

Land Use - PAI 03				
Classes	Proxy (ha) 2012	Proxy (ha) 2015	Proxy (ha) 2018	Proxy (ha) 2021
Forest Formation	5,558	3,828	2,368	0
Savanna Formation	3,758	2,371	1,475	0
Wetland	421	387	368	0
Grassland	37	22	14	0
Forest Plantation	0	0	0	8
Pasture	0	1,292	3,705	4,915
Mosaic of Uses	0	1,808	1,753	4,809
Other non-Vegetated Areas	0	2	3	5
Mining	0	7	14	37
River, Lake, and Ocean	0	0	1	0
Soybean	0	54	72	0
Other Temporary Crops	0	3	0	0

Table 62. Baseline deforestation rate in Project Area – Proxys – PAI03

PAI 03							
Proxy Area	Area (ha)	Average Deforestation (ha/year)	D%pn	Yrspn	D%pn/ Yrspn	**n**	D%planned,i,t
Plot 1	1,766	196	100%	9	11%	6	10,66%

Plot 2	1,630	181	98%	9	11%		
Plot 3	1,886	210	97%	9	11%		
Plot 4	982	109	98%	9	11%		
Plot 5	1,073	119	91%	9	10%		
Plot 6	2,030	226	91%	9	10%		
Total	9,366	-	-	-	-		

Table 63. Annual baseline deforestation for the Project Area from planned deforestation over the project duration, in each of the Project Area's strata – PAI03

Annual baseline deforestation from planned deforestation (AAplanned,i,t)								
	Wooded Savanna		Submontane Seasonal Deciduous Forest		Seasonal Semi-deciduous Alluvial Forest		Forested Savanna	
Year	ha/year	ha (cumulative)	ha/year	ha (cumulative)	ha/year	ha (cumulative)	ha/year	ha (cumulative)
2021	3	3	5	5	0,06	0.06	36	36
2022	21	24	40	45	0,52	0.58	296	332
2023	21	45	40	85	0,52	1.10	296	629
2024	21	66	40	125	0,52	1.62	296	925
2025	21	88	40	165	0,52	2.14	296	1,221
2026	21	109	40	205	0,52	2.65	296	1,518
2027	21	130	40	246	0,52	3.17	296	1,814
2028	21	151	40	286	0,52	3.69	296	2,111
2029	21	173	40	326	0,52	4.21	296	2,407
2030	21	194	40	366	0,52	4.73	296	2,704
2031	6	199	10	376	0,14	4.86	78	2,781
2032	-	199	-	376	-	4.86	-	2,781
2033	-	199	-	376	-	4.86	-	2,781
2034	-	199	-	376	-	4.86	-	2,781
2035	-	199	-	376	-	4.86	-	2,781
2036	-	199	-	376	-	4.86	-	2,781
2037	-	199	-	376	-	4.86	-	2,781
2038	-	199	-	376	-	4.86	-	2,781
2039	-	199	-	376	-	4.86	-	2,781
2040	-	199	-	376	-	4.86	-	2,781
2041	-	199	-	376	-	4.86	-	2,781
2042	-	199	-	376	-	4.86	-	2,781

2043	-	199	-	376	-	4.86	-	2,781
2044	-	199	-	376	-	4.86	-	2,781
2045	-	199	-	376	-	4.86	-	2,781
2046	-	199	-	376	-	4.86	-	2,781
2047	-	199	-	376	-	4.86	-	2,781
2048	-	199	-	376	-	4.86	-	2,781
2049	-	199	-	376	-	4.86	-	2,781
2050	-	199	-	376	-	4.86	-	2,781
2051	-	199	-	376	-	4.86	-	2,781

3.2.1.2 ESTIMATION OF THE ANNUAL AREAS OF UNPLANNED BASELINE DEFORESTATION IN THE RRD AND CALCULATION OF THE UNPLANNED DEFORESTATION RATE

The deforestation rate was derived from an analysis of deforestation occurring within the RRD during the historical reference period, 2012 to 2021 for PAI01 and PAI03, and 2013 to 2021 for PAI02.

Deforestations were analyzed during the historical reference period within the respective identified RRDs based on the following data:

• PRODES: PRODES (Deforestation Monitoring Project by Satellite) monitors clear-cut deforestation by satellite - a forestry practice in which all or most trees in an area are uniformly cut down - by satellite in the Amazon and Cerrado since 2000 .

• DETER: This data is generated from an alert system for areas of degradation and deforestation from 2008 onwards for the Amazon and from 2018 onwards for the Cerrado. The mapping uses Landsat or similar satellite images to record and quantify the alert areas produced in the DETER project (Real Time Deforestation Detection).

• SAD: The SAD (Deforestation Alert System) is a monthly and automatic monitoring system that provides alerts for suppression of native vegetation throughout the Cerrado and Amazon biome, starting in 2022. The system uses advanced image processing techniques of the Sentinel-2 satellite (10 m resolution) to detect, validate and refine the alerts.

• MapBiomas Alert: It is a system for validating and refining deforestation alerts (such as SAD and DETER) with high resolution images where each alert is validated, refined and defined in a time window of occurrence. For each validated alert, a report is generated where images of before and after deforestation are identified.

RRD annual deforestation estimates were obtained by calculating the amount of area (ha) deforested in Legal Reserves and Permanent Preservation Areas within the RRD boundaries of the deforestation layer from 2012 to 2021 for PAI01 and PAI03, and from 2013 to 2021 for PAI02. By summing the data described above, we ensured that there were no overlapping deforestation polygons and the result was the amount of deforestation within the RRD during the year-to-year historical reference period.

Since neither the linear nor the nonlinear regressions resulted in a model with $r^2 > 0.75$, the average area deforested over the historical reference period ($A_{BSL,RRD,unplanned,t}$), is used for each year in the base period.

3.2.1.2.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

Table 64. Annual deforestation estimates from the RRD over the reference period between 2013 and 2022 - PAI 01

Year	Deforested forest area in de RRD (ha)
2013	0
2014	1,111
2015	481
2016	420
2017	415
2018	435
2019	332
2020	277
2021	457
2022	1,428
Average ($A_{BSL,RRD,unplanned,t}$)	535.5
Unplanned Deforestation Rate	0.54%

3.2.1.2.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

Table 65. Annual deforestation estimates from the RRD over the reference period between 2013 and 2022 - PAI 02

Year	Deforested forest area in de RRD (ha)
2013	0,01
2014	671
2015	1,455
2016	699
2017	689
2018	652
2019	1,276
2020	3,001
2021	2,419
2022	-
Average ($A_{BSL,RRD,unplanned,t}$)	1086

Unplanned Deforestation Rate	0.86%

3.2.1.2.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

Table 66. Annual deforestation estimates from the RRD over the reference period between 2012 and 2021 - PAI 03

Year	Deforested forest area in de RRD (ha)
2012	-
2013	278
2014	189
2015	189
2016	176
2017	164
2018	191
2019	159
2020	231
2021	1,255
Average ($A_{BSL,RRD,unplanned,t}$)	314
Unplanned Deforestation Rate	0.26%

3.2.1.3 ESTIMATION OF ANNUAL AREAS OF UNPLANNED BASELINE DEFORESTATION IN THE PROJECT AREA

3.2.1.3.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

Since the deforestation location analysis was not necessarily due to the fact that it is transitional deforestation and the VMD0007-BL-UP requirement is met[139], according to VMD0007, it is not needed to prepare data sets for spatial analysis, prepare deforestation risk maps, nor select the most accurate deforestation risk map (steps 3.1, 3.2, and 3.3 of VMD0007). Furthermore, the following conservative approach is defined as mandatory according to the methodology: Future deforestation is assumed to occur first in the strata with the lowest carbon stocks (across all carbon pools).

[139] In the case of a transition configuration, location analysis is not required where it can be shown that ≥ 25% of the project geographic boundary is within 50m of land that has been anthropogenically deforested within the 10 years prior to the project start date

The projected unplanned baseline deforestation in the project area is estimated as follows (only used where spatial modeling is not applied):

$$A_{\mathrm{BSL,PA,unplanned,t}} = A_{\mathrm{BSL,RRD,unplanned,t}} * P_{PA}$$

Where:

$A_{\mathrm{BSL,PA,unplanned,t}}$	= Projected area of unplanned baseline deforestation in the project area in year *t;* ha
$A_{\mathrm{BSL,RRD,unplanned,t}}$	= Projected area of unplanned baseline deforestation in the RRD in year *t;* ha
P_{PA}	= Ratio of the project area to the total area of RRD; dimensionless
t	=1, 2, 3, … *t** years elapsed since the projected start of the project activity

To consider only the deforestation after the Projects' Start Dates (which are not on January 1st), the calculated deforested area for the first year of each PAI was multiplied by the proportion of days in which there would be deforestation in the first year. The same was done for the last year of the Projects.

Table 67. Amount of Baseline AUDD Deforestation (ha) in the Project Area by stratum – PAI01

Wooded Savanna		
Year	ha/year	ha (cumulative)
2021	1.68	1.68
2022	7.04	8.72
2023	7.00	15.73
2024	6.97	22.70
2025	6.93	29.62
2026	6.89	36.52
2027	6.85	43.37
2028	6.82	50.18
2029	6.78	56.96
2030	6.74	63.71
2031	6.71	70.41
2032	6.67	77.08
2033	6.63	83.71
2034	6.60	90.31
2035	6.56	96.87
2036	6.53	103.40
2037	6.49	109.89
2038	6.45	116.34
2039	6.42	122.76
2040	6.38	129.14
2041	6.35	135.49
2042	6.31	141.81
2043	6.28	148.09
2044	6.25	154.33
2045	6.21	160.55
2046	6.18	166.72
2047	6.14	172.87
2048	6.11	178.98
2049	6.08	185.06
2050	6.05	191.10
2051	4.58	195.68

3.2.1.3.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

Since the deforestation location analysis was not necessarily since it is transitional deforestation and the VMD0007-BL-UP requirement is met[140], according to VMD0007, it is not needed to prepare data sets for spatial analysis, prepare deforestation risk maps, nor select the most accurate deforestation risk map (steps 3.1, 3.2, and 3.3 of VMD0007). Furthermore, the following conservative approach is defined as mandatory according to the methodology: Future deforestation is assumed to occur first in the strata with the lowest carbon stocks (across all carbon pools).

The projected unplanned baseline deforestation in the project area is estimated as follows (only used where spatial modeling is not applied):

$$A_{\mathrm{BSL,PA,unplanned,t}} = A_{\mathrm{BSL,RRD,unplanned,t}} * P_{PA}$$

Where:

$A_{\mathrm{BSL,PA,unplanned,t}}$	= Projected area of unplanned baseline deforestation in the project area in year *t;* ha
$A_{\mathrm{BSL,RRD,unplanned,t}}$	= Projected area of unplanned baseline deforestation in the RRD in year *t;* ha
P_{PA}	= Ratio of the project area to the total area of RRD; dimensionless
t	=1, 2, 3, … *t** years elapsed since the projected start of the project activity

To consider only the deforestation after the Projects' Start Dates (which are not on January 1st), the calculated deforested area for the first year of each PAI was multiplied by the proportion of days in which there would be deforestation in the first year. The same was done for the last year of the Projects.

[140] In the case of a transition configuration, location analysis is not required where it can be shown that ≥ 25% of the project geographic boundary is within 50m of land that has been anthropogenically deforested within the 10 years prior to the project start date

Table 68. Amount of Baseline AUDD Deforestation (ha) in the Project Area by stratum – PAI02

	$A_{BSL,PA,unplanned,t}$		Alluvial Open Ombrophilous Forest		Lowland Open Ombrophilous Forest	
Year	ha/year	ha (cumulative)	ha/year	ha (cumulative)	ha/year	ha (cumulative)
2022	11	11	11	11	-	-
2023	60	70	60	70	-	-
2024	59	129	59	129	-	-
2025	59	188	59	188	-	-
2026	58	246	58	246	-	-
2027	58	303	58	303	-	-
2028	57	360	57	360	-	-
2029	57	417	57	417	-	-
2030	56	473	56	473	-	-
2031	56	528	44	517	11	11
2032	55	584	-	517	55	66
2033	55	638	-	517	55	121
2034	54	692	-	517	54	175
2035	54	746	-	517	54	229
2036	53	799	-	517	53	282
2037	53	852	-	517	53	335
2038	52	904	-	517	52	387
2039	52	956	-	517	52	439
2040	51	1,008	-	517	51	490
2041	51	1,059	-	517	51	541
2042	51	1,109	-	517	51	592
2043	50	1,159	-	517	50	642
2044	50	1,209	-	517	50	692
2045	49	1,258	-	517	49	741
2046	49	1,307	-	517	49	790
2047	48	1,355	-	517	48	838
2048	48	1,403	-	517	48	886
2049	48	1,451	-	517	48	934
2050	47	1,498	-	517	47	981
2051	47	1,545	-	517	47	1,028
2052	38	1,583	-	517	38	1,066

3.2.1.3.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

Since the deforestation location analysis was not necessarily since it is transitional deforestation and the VMD0007-BL-UP requirement is met[141], according to VMD0007, it is not needed to prepare data sets for spatial analysis, prepare deforestation risk maps, nor select the most accurate deforestation risk map (steps 3.1, 3.2, and 3.3 of VMD0007). Furthermore, the following conservative approach is defined as mandatory according to the methodology: Future deforestation is assumed to occur first in the strata with the lowest carbon stocks (across all carbon pools).

The projected unplanned baseline deforestation in the project area is estimated as follows (only used where spatial modeling is not applied):

$$A_{\mathrm{BSL,PA,unplanned,t}} = A_{\mathrm{BSL,RRD,unplanned,t}} * P_{PA}$$

Where:

$A_{\mathrm{BSL,PA,unplanned,t}}$	= Projected area of unplanned baseline deforestation in the project area in year *t;* ha
$A_{\mathrm{BSL,RRD,unplanned,t}}$	= Projected area of unplanned baseline deforestation in the RRD in year *t;* ha
P_{PA}	= Ratio of the project area to the total area of RRD; dimensionless
t	=1, 2, 3, … *t** years elapsed since the projected start of the project activity

To consider only the deforestation after the Projects' Start Dates (which are not on January 1st), the calculated deforested area for the first year of each PAI was multiplied by the proportion of days in which there would be deforestation in the first year. The same was done for the last year of the Projects.

[141] In the case of a transition configuration, location analysis is not required where it can be shown that ≥ 25% of the project geographic boundary is within 50m of land that has been anthropogenically deforested within the 10 years prior to the project start date

Table 69. Amount of Baseline AUDD Deforestation (ha) in the Project Area by stratum – PAI03

	$A_{BSL,PA,unplanned,t}$		Wooded Savanna		Submontane Seasonal Deciduous Forest		Seasonal Semi-deciduous Alluvial Forest		Forested Savanna	
Year	ha/year	ha (cumulative)	ha/year	ha (cumulative)	ha/year	ha (cumulative)	ha/year	ha (cumulative)	ha/year	ha (cumulative)
2021	1.7	1.7	1.7	1.7		-	-	-	-	-
2022	14.4	16.1	14.4	16.1	-	-	-	-	-	-
2023	14.3	30.4	13.2	29.3	1	1	-	-	-	-
2024	14.3	44.7	0.0	29.3	14	15	-	-	-	-
2025	14.3	59.0	0.0	29.3	14	30	-	-	-	-
2026	14.2	73.2	0.0	29.3	14	44	-	-	-	-
2027	14.2	87.4	0.0	29.3	14	58	-	-	-	-
2028	14.1	101.5	0.0	29.3	14	72	-	-	-	-
2029	14.1	115.6	0.0	29.3	14	86	-	-	-	-
2030	14.1	129.7	0.0	29.3	14	100	-	-	-	-
2031	14.0	143.7	0.0	29.3	14	114	-	-	-	-
2032	14.0	157.7	0.0	29.3	14	128	-	-	-	-
2033	14.0	171.7	0.0	29.3	14	142	-	-	-	-
2034	13.9	185.6	0.0	29.3	14	156	-	-	-	-
2035	13.9	199.5	0.0	29.3	14	170	-	-	-	-
2036	13.9	213.3	0.0	29.3	14	184	-	-	-	-
2037	13.8	227.2	0.0	29.3	14	198	-	-	-	-
2038	13.8	240.9	0.0	29.3	14	212	-	-	-	-
2039	13.7	254.7	0.0	29.3	14	225	-	-	-	-
2040	13.7	268.4	0.0	29.3	14	239	-	-	-	-
2041	13.7	282.1	0.0	29.3	14	253	-	-	-	-
2042	13.6	295.7	0.0	29.3	14	266	-	-	-	-
2043	13.6	309.3	0.0	29.3	14	280	-	-	-	-
2044	13.6	322.9	0.0	29.3	14	294	-	-	-	-
2045	13.5	336.4	0.0	29.3	14	307	-	-	-	-
2046	13.5	349.9	0.0	29.3	13	321	-	-	-	-
2047	13.5	363.4	0.0	29.3	13	334	-	-	-	-
2048	13.4	376.8	0.0	29.3	13	348	-	-	-	-
2049	13.4	390.2	0.0	29.3	13	361	-	-	-	-
2050	13.4	403.5	0.0	29.3	13	374	-	-	-	-
2051	11.7	415.3	0.0	29.3	12	386	-	-	-	-

3.2.1.4 ESTIMATION OF CARBON STOCK CHANGES AND GHG EMISSIONS

For all forest types the carbon stock values (t $C.ha^{-1}$) were obtained from the literature, specifically, these are the emission factors officially published by Brazil in the Fourth National Communication on Brazil's Biennial Update Report to the United Nations Framework Convention on Climate Change - Reference Report: Land Use Sector, Land Use Change and Forests, 2020[142], the values for the carbon stocks for the different strata within the project area are presented in in Table 70, for PAI01, Table 72 for PAI02, and Table 74 for PAI03..

To calculate the carbon pools (in above and below ground trees and dead wood) for each stratum, the total carbon from the total area of each stratum was multiplied by 44/12 (conversion factor tC to tCO2)[143].

To calculate the Parameters for each stratum, each carbon pool was divided by the total area of the corresponding forest class in accordance with formulas (2) and (6) of VMD0001, v1.1E.

Carbon pools and parameters for each stratum are shown separately for each PAI in the subitems below.

According to VMD0006, to calculate the carbon stock change first are calculated the Baseline carbon stock changes for aboveground tree biomass (Δ*CAB_tree,i*), belowground tree biomass (Δ*CBB_tree,i*), and dead wood (Δ*CDW,i*). To calculate these parameters, it is needed to know the post-deforestation carbon stock for each of these scenarios (aboveground and belowground tree biomass and dead wood), but since we have the total post-deforestation carbon stock (shown in Table 82, Table 85 and Table 88), we first calculated the carbon stocks before deforestation (baseline emissions) to then subtract the carbon stocks post-deforestation, reaching the value for the Baseline carbon stock change in all terrestrial pools (Δ*CBSL,i,t*).

3.2.1.4.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

Table 70. Carbon Stock by stratum – PAI01

Stratum	AUDD (ha)	APD (ha)	Total (ha)	Proportion (%)	Above-ground ($tC.ha^{-1}$)	Below-ground ($tC.ha^{-1}$)	Dead wood ($tC.ha^{-1}$)
Wooded Savanna	1,296	2.084	3,380	100%	12.03	24.54	1,68
Total	1,296	2.084	3,380	100%	-	-	-

Stratum	Total above-ground per stratum (t)	Total below-ground per stratum (t)	Total deadwood per stratum (t)
Wooded Savanna	40,657	82,938	5,677

[142] https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/sirene/publicacoes/comunicacoes-nacionais-do-brasil-a-unfccc
[143] VMD0001v1.1.pdf (verra.org)

Total	40,657	82,938	5,677

Table 71. Carbon Pools by stratums in Project Area

Carbon Pools			
Stratum	Above-ground per stratum (tCO2eq)	Below-ground per stratum (tCO2eq)	Dead wood per stratum (tCO2eq)
Wooded Savanna	149,079	304,106	20,819
Total	149,079	304,106	20,819
Parameter			
Stratum	$C_{AB\_tree,bsl,i}$	$C_{BB\_tree,bsl,i}$	$C_{DW,bsl,i}$
Wooded Savanna	44.11	89.98	6.16

3.2.1.4.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

Table 72. Carbon Stock by stratum – PAI02

Stratum	AUDD (ha)	APD (ha)	Total (ha)	Proportion (%)	Above-ground ($tC.ha^{-1}$)	Below-ground ($tC.ha^{-1}$)	Dead wood ($tC.ha^{-1}$)
Alluvial Open Ombrophilous Forest	517	755	1,272	14%	117.3	11.7	9.5
Lowland Open Ombrophilous Forest	6,437	1,195	7,633	86%	133.9	13.4	10.9
Total	6,954	1,950	8,905	100%	-	-	-

Stratum	Total above-ground per stratum (t)	Total below-ground per stratum (t)	Total deadwood per stratum (t)
Alluvial Open Ombrophilous Forest	149,205	14,882	12,084
Lowland Open Ombrophilous Forest	1,021,994	102,276	83,194
Total	1,171,200	117,158	95,278

Table 73. Carbon Pools by stratums in Project Area – PAI02

Carbon Pools

Stratum	Above-ground per stratum (tCO2eq)	Below-ground per stratum (tCO2eq)	Dead wood per stratum (tCO2eq)
Alluvial Open Ombrophilous Forest	547,086	54,569	44,308
Lowland Open Ombrophilous Forest	3,747,313	375,011	305,046
Total	4,294,399	429,580	349,354
Parameter			
Stratum	$C_{AB\_tree,bsl,I}$ (tCO2eq/ha)	$C_{BB\_tree,bsl,i}$ (tCO2eq/ha)	$C_{DW,bsl,i}$ (tCO2eq/ha)
Alluvial Open Ombrophilous Forest	430.10	42.90	34.83
Lowland Open Ombrophilous Forest	490.97	49.13	39.97

3.2.1.4.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

Table 74. Carbon Stock by stratum – PAI03

Stratum	AUDD (ha)	APD (ha)	Total (ha)	Proportion (%)	Above-ground (tC.ha^{-1})	Below-ground (tC.ha^{-1})	Dead wood (tC.ha^{-1})
Wooded Savanna	29	199	229	3%	12.03	24.54	1.68
Submontane Seasonal Deciduous Forest	601	376	978	11%	41.4	15.3	6.21
Seasonal Semi-deciduous Alluvial Forest	304	5	308	3%	56.89	11.38	6.26
Forested Savanna	4,607	2,781	7,388	83%	69.2	15.22	7.61
Total	5,541	3,362	8,903	100%	-	-	-

Stratum	Total above-ground per stratum (t)	Total below-ground per stratum (t)	Total deadwood per stratum (t)
Wooded Savanna	2,750	5,610	384
Submontane Seasonal Deciduous Forest	40,472	14,957	6,071
Seasonal Semi-deciduous Alluvial Forest	17,545	3,510	1,931
Forested Savanna	511,257	112,447	56,223
Total	572,023	136,523	64,609

Table 75. Carbon Pools by stratums in Project Area – PAI03

Carbon Pools			
Stratum	Above-ground per stratum (tCO2eq)	Below-ground per stratum (tCO2eq)	Dead wood per stratum (tCO2eq)
Wooded Savanna	10,084	20,570	1,408
Submontane Seasonal Deciduous Forest	148,397	54,842	22,259
Seasonal Semi-deciduous Alluvial Forest	64,332	12,869	7,079
Forested Savanna	1,874,607	412,305	206,153
Total	2,097,419	500,586	236,899
Parameter			
Stratum	$C_{AB\_tree,bsl,I}$ (tCO2eq/ha)	$C_{BB\_tree,bsl,i}$ (tCO2eq/ha)	$C_{DW,bsl,i}$ (tCO2eq/ha)
Wooded Savanna	44.11	89.98	6.16
Submontane Seasonal Deciduous Forest	151.80	56.10	22.77
Seasonal Semi-deciduous Alluvial Forest	208.60	41.73	22.95
Forested Savanna	253.73	55.81	27.90

3.2.1.5 BASELINE EMISSIONS FROM UNPLANNED DEFORESTATION

Regarding the estimation of baseline emissions from unplanned deforestation, where agents of deforestation clear the land for ranching as final land use, the VMD0007 module (BL-UP) was applied: “Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation and unplanned wetland degradation”, using the simple historic approach.

The baseline net GHG emissions for unplanned deforestation were determined as:

$$\Delta C_{\mathrm{BSL,unplanned}} = \Delta C_{\mathrm{BSL,PA,unplanned}} + GHG_{BSL,E}$$

$\Delta C_{BSL,unplanned}$	= Net greenhouse gas emissions in the baseline from unplanned deforestation up to year *t**; t CO2e
$\Delta C_{BSL,PA,unplanned}$	= Net CO2 emissions in the baseline from unplanned deforestation in the project area up to year *t**; t CO2e
$GHG_{BSL,E}$	= Greenhouse gas emissions because of deforestation activities within the project boundary in the baseline up to year *t**; t CO2e

To estimate the emissions from unplanned deforestation in the baseline, the estimated annual area of deforestation for each stratum was multiplied by the carbon stocks in aboveground tree biomass, which was then summed with the respective emissions for that year from belowground tree biomass and dead wood, which were calculated by considering an annual emission rate of 1/10th of the stock change for 10 years, as described in VMD0007.

The results of this procedure are presented for each PAI in Table 76, Table 77 and Table 78.

3.2.1.5.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

Table 76. Emissions from unplanned deforestation in the baseline by stratum – PAI01

	Wooded Savanna		Emissions – Sum of strata	
Year	ha/year	ha (cumulative)	tCO2/year	tCO2
2021	1.68	1.68	90.31	90.31
2022	7.04	8.72	394.54	484.85
2023	7.00	15.73	460.20	945.04
2024	6.97	22.70	525.49	1,470.54
2025	6.93	29.62	590.43	2,060.97
2026	6.89	36.52	655.02	2,715.98
2027	6.85	43.37	719.25	3,435.24
2028	6.82	50.18	783.14	4,218.38
2029	6.78	56.96	846.68	5,065.05
2030	6.74	63.71	909.87	5,974.92
2031	6.71	70.41	956.56	6,931.48
2032	6.67	77.08	951.35	7,882.83
2033	6.63	83.71	946.17	8,829.00
2034	6.60	90.31	941.02	9,770.02
2035	6.56	96.87	935.90	10,705.93
2036	6.53	103.40	930.81	11,636.73
2037	6.49	109.89	925.74	12,562.48
2038	6.45	116.34	920.70	13,483.18
2039	6.42	122.76	915.69	14,398.88
2040	6.38	129.14	910.71	15,309.59
2041	6.35	135.49	905.75	16,215.34
2042	6.31	141.81	900.82	17,116.16
2043	6.28	148.09	895.92	18,012.09
2044	6.25	154.33	891.05	18,903.13
2045	6.21	160.55	886.20	19,789.33
2046	6.18	166.72	881.37	20,670.70
2047	6.14	172.87	876.58	21,547.28

2048	6.11	178.98	871.81	22,419.08
2049	6.08	185.06	867.06	23,286.15
2050	6.05	191.10	862.34	24,148.49
2051	4.58	195.68	780.66	24,929.15

3.2.1.5.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

Table 77. Emissions from unplanned deforestation in the baseline by stratum – PAI02

	Alluvial Open Ombrophilous Forest		Lowland Open Ombrophilous Forest		Emissions – Sum of strata	
Year	ha/year	ha (cumulative)	ha/year	ha (cumulative)	tCO2/year	tCO2
2022	11	11	-	-	4,649	4,649
2023	60	70	-	-	26,151	30,800
2024	59	129	-	-	26,390	57,191
2025	59	188	-	-	26,628	83,818
2026	58	246	-	-	26,863	110,681
2027	58	303	-	-	27,096	137,777
2028	57	360	-	-	27,327	165,104
2029	57	417	-	-	27,556	192,660
2030	56	473	-	-	27,783	220,444
2031	44	517	11	11	28,710	249,153
2032	-	517	55	66	31,578	280,732
2033	-	517	55	121	31,370	312,102
2034	-	517	54	175	31,164	343,266
2035	-	517	54	229	30,960	374,226
2036	-	517	53	282	30,757	404,983
2037	-	517	53	335	30,556	435,539
2038	-	517	52	387	30,357	465,896
2039	-	517	52	439	30,159	496,055
2040	-	517	51	490	29,963	526,018
2041	-	517	51	541	29,756	555,775
2042	-	517	51	592	29,501	585,276
2043	-	517	50	642	29,248	614,524
2044	-	517	50	692	28,997	643,521
2045	-	517	49	741	28,749	672,270
2046	-	517	49	790	28,502	700,773

2047	-	517	48	838	28,258	729,031
2048	-	517	48	886	28,016	757,046
2049	-	517	48	934	27,775	784,822
2050	-	517	47	981	27,537	812,359
2051	-	517	47	1,028	27,301	839,660
2052	-	517	38	1,066	22,950	862,610

3.2.1.5.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

Table 78. Emissions from unplanned deforestation in the baseline by stratum – PAI03

	Wooded Savanna		Submontane Seasonal Deciduous Forest		Seasonal Semi-deciduous Alluvial Forest		Forested Savanna		Emissions – Sum of strata	
Year	ha/ year	ha (cumulative)	ha/ year	ha (cumulative)	ha/ year	ha (cumulative)	ha/ year	ha (cumulative)	tCO2/ year	tCO2
2021	1.7	1.7		-	-	-	-	-	4,649	4,649
2022	14.4	16.1	-	-	-	-	-	-	26,151	30,800
2023	13.2	29.3	1	1	-	-	-	-	26,390	57,191
2024	0.0	29.3	14	15	-	-	-	-	26,628	83,818
2025	0.0	29.3	14	30	-	-	-	-	26,863	110,681
2026	0.0	29.3	14	44	-	-	-	-	27,096	137,777
2027	0.0	29.3	14	58	-	-	-	-	27,327	165,104
2028	0.0	29.3	14	72	-	-	-	-	27,556	192,660
2029	0.0	29.3	14	86	-	-	-	-	27,783	220,444
2030	0.0	29.3	14	100	-	-	-	-	28,710	249,153
2031	0.0	29.3	14	114	-	-	-	-	31,578	280,732
2032	0.0	29.3	14	128	-	-	-	-	31,370	312,102
2033	0.0	29.3	14	142	-	-	-	-	31,164	343,266
2034	0.0	29.3	14	156	-	-	-	-	30,960	374,226
2035	0.0	29.3	14	170	-	-	-	-	30,757	404,983
2036	0.0	29.3	14	184	-	-	-	-	30,556	435,539
2037	0.0	29.3	14	198	-	-	-	-	30,357	465,896
2038	0.0	29.3	14	212	-	-	-	-	30,159	496,055
2039	0.0	29.3	14	225	-	-	-	-	29,963	526,018
2040	0.0	29.3	14	239	-	-	-	-	29,756	555,775
2041	0.0	29.3	14	253	-	-	-	-	29,501	585,276

2042	0.0	29.3	14	266	-	-	-	-	29,248	614,524
2043	0.0	29.3	14	280	-	-	-	-	28,997	643,521
2044	0.0	29.3	14	294	-	-	-	-	28,749	672,270
2045	0.0	29.3	14	307	-	-	-	-	28,502	700,773
2046	0.0	29.3	13	321	-	-	-	-	28,258	729,031
2047	0.0	29.3	13	334	-	-	-	-	28,016	757,046
2048	0.0	29.3	13	348	-	-	-	-	27,775	784,822
2049	0.0	29.3	13	361	-	-	-	-	27,537	812,359
2050	0.0	29.3	13	374	-	-	-	-	27,301	839,660
2051	0.0	29.3	12	386	-	-	-	-	22,950	862,610

3.2.1.6 BASELINE EMISSIONS FROM PLANNED DEFORESTATION

To estimate emissions from planned deforestation that would occur in the Project Area at baseline, the estimated annual area of deforestation for each stratum was multiplied by the carbon stocks in aboveground tree biomass, which was then summed with the respective emissions for that year from belowground tree biomass and dead wood, which were calculated by considering an annual emission rate of 1/10th of the stock change for 10 years, as described in VMD0006.

The result of this procedure is presented for each PAI in Table 79, Table 80 and Table 81.

3.2.1.6.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

The result of this procedure is presented in the tables below.

Table 79. Emissions from planned deforestation in the baseline by stratum – PAI01

	Wooded Savanna		Emissions – Sum of strata	
Year	ha/year	ha(cumulative)	tCO2/year	tCO2
2021	380	380	20,415	20,415
2022	1,450	1,830	81,553	101,968
2023	254	2,084	31,234	133,203
2024	-	2,084	20,035	153,237
2025	-	2,084	20,035	173,272
2026	-	2,084	20,035	193,307
2027	-	2,084	20,035	213,341
2028	-	2,084	20,035	233,376
2029	-	2,084	20,035	253,411
2030	-	2,084	20,035	273,445
2031	-	2,084	16,381	289,827
2032	-	2,084	2,441	292,268

2033	-	2,084	-	292,268
2034	-	2,084	-	292,268
2035	-	2,084	-	292,268
2036	-	2,084	-	292,268
2037	-	2,084	-	292,268
2038	-	2,084	-	292,268
2039	-	2,084	-	292,268
2040	-	2,084	-	292,268
2041	-	2,084	-	292,268
2042	-	2,084	-	292,268
2043	-	2,084	-	292,268
2044	-	2,084	-	292,268
2045	-	2,084	-	292,268
2046	-	2,084	-	292,268
2047	-	2,084	-	292,268
2048	-	2,084	-	292,268
2049	-	2,084	-	292,268
2050	-	2,084	-	292,268
2051	-	2,084	-	292,268

3.2.1.6.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

Table 80. Emissions from planned deforestation in the baseline by stratum – PAI02

	Alluvial Open Ombrophilous Forest		Lowland Open Ombrophilous Forest		Emissions – Sum of strata	
Year	ha/year	ha(cumulative)	ha/year	ha(cumulative)	tCO2/year	tCO2
2022	17	17	27	27	20,660	20,660
2023	94	111	149	176	116,384	137,044
2024	94	206	149	325	118,449	255,493
2025	94	300	149	475	120,514	376,007
2026	94	394	149	624	122,579	498,585
2027	94	489	149	774	124,644	623,229
2028	94	583	149	923	126,708	749,937
2029	94	677	149	1,073	128,773	878,711
2030	78	755	123	1,195	110,178	988,889
2031	-	755	-	1,195	16,520	1,005,408
2032	-	755	-	1,195	16,152	1,021,560

2033	-	755	-	1,195	14,087	1,035,647
2034	-	755	-	1,195	12,022	1,047,669
2035	-	755	-	1,195	9,957	1,057,626
2036	-	755	-	1,195	7,892	1,065,518
2037	-	755	-	1,195	5,827	1,071,345
2038	-	755	-	1,195	3,762	1,075,107
2039	-	755	-	1,195	1,697	1,076,804
2040	-	755	-	1,195	-	1,076,804
2041	-	755	-	1,195	-	1,076,804
2042	-	755	-	1,195	-	1,076,804
2043	-	755	-	1,195	-	1,076,804
2044	-	755	-	1,195	-	1,076,804
2045	-	755	-	1,195	-	1,076,804
2046	-	755	-	1,195	-	1,076,804
2047	-	755	-	1,195	-	1,076,804
2048	-	755	-	1,195	-	1,076,804
2049	-	755	-	1,195	-	1,076,804
2050	-	755	-	1,195	-	1,076,804
2051	-	755	-	1,195	-	1,076,804
2052	-	755	-	1,195	-	1,076,804

3.2.1.6.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

Table 81. Emissions from planned deforestation in the baseline by stratum – PAI03

	Wooded Savanna		Submontane Seasonal Deciduous Forest		Seasonal Semi-deciduous Alluvial Forest		Forested Savanna		Emissions – Sum of strata	
Year	ha/ year	ha cumulative	ha/ year	ha cumulative	ha/ year	ha cumulative	ha/ year	ha cumulative	tCO2/ year	tCO2
2021	3	3	5	5	0.06	0.06	36	36	10,290	10,290
2022	21	24	40	45	0.52	0.58	296	332	85,720	96,010
2023	21	45	40	85	0.52	1.10	296	629	88,726	184,735
2024	21	66	40	125	0.52	1.62	296	925	91,731	276,466
2025	21	88	40	165	0.52	2.14	296	1,221	94,737	371,203
2026	21	109	40	205	0.52	2.65	296	1,518	97,742	468,945
2027	21	130	40	246	0.52	3.17	296	1,814	100,748	569,693
2028	21	151	40	286	0.52	3.69	296	2,111	103,753	673,446

2029	21	173	40	326	0.52	4.21	296	2,407	106,759	780,205
2030	21	194	40	366	0.52	4.73	296	2,704	109,764	889,969
2031	6	199	10	376	0.14	4.86	78	2,781	49,380	939,349
2032	-	199	-	376	-	4.86	-	2,781	24,831	964,180
2033	-	199	-	376	-	4.86	-	2,781	21,825	986,005
2034	-	199	-	376	-	4.86	-	2,781	18,820	1,004,825
2035	-	199	-	376	-	4.86	-	2,781	15,814	1,020,639
2036	-	199	-	376	-	4.86	-	2,781	12,808	1,033,447
2037	-	199	-	376	-	4.86	-	2,781	9,803	1,043,250
2038	-	199	-	376	-	4.86	-	2,781	6,797	1,050,047
2039	-	199	-	376	-	4.86	-	2,781	3,792	1,053,839
2040	-	199	-	376	-	4.86	-	2,781	786	1,054,626
2041	-	199	-	376	-	4.86	-	2,781	-	1,054,626
2042	-	199	-	376	-	4.86	-	2,781	-	1,054,626
2043	-	199	-	376	-	4.86	-	2,781	-	1,054,626
2044	-	199	-	376	-	4.86	-	2,781	-	1,054,626
2045	-	199	-	376	-	4.86	-	2,781	-	1,054,626
2046	-	199	-	376	-	4.86	-	2,781	-	1,054,626
2047	-	199	-	376	-	4.86	-	2,781	-	1,054,626
2048	-	199	-	376	-	4.86	-	2,781	-	1,054,626
2049	-	199	-	376	-	4.86	-	2,781	-	1,054,626
2050	-	199	-	376	-	4.86	-	2,781	-	1,054,626
2051	-	199	-	376	-	4.86	-	2.781	-	1,054,626

3.2.1.7 **POST – DEFORESTATION CARBON POOLS IN THE BASELINE**

For the calculation of the carbon stock remaining on the land after deforestation, we applied the standard values adopted by the country in the Fourth National Communication on Brazil's Biennial Update Report to the United Nations Framework Convention on Climate Change - Reference Report: Land Use Sector, Land Use Change and Forests, 2020s, for both AUDD and APD components. To determine the carbon stock of post-deforestation land-use, the Simple approach was used (from Step 4.2.2 of VMD0007), so the land-use with the highest carbon stock is considered representative of future post-deforestation land-use classes. As pasture has the highest carbon stock among the post-deforestation uses, as seen in the Table below, it is considered the post-deforestation land use for this step.

3.2.1.7.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

Table 82. Carbon Stock in Post-deforestation strata – PAI01

Post-deforestation strata	t C.ha-1	t CO2eq.ha-1
	PAI 01	PAI 01
Pasture	7.57	27.76
Mosaic of agriculture and pasture	7.57	27.76
Soybean	5.14	18.85

The table below summarizes the results obtained for the carbon pools for pasture in the baseline scenario, for 30 years of the project.

Table 83. Carbon pools for pasture in the baseline scenario – AUDD – PAI01

Baseline Pasture Carbon Pool			Sum of Strata - AUDD	
Year	ha/year	ha(cumulative)	tCO2/year	tCO2
2021	1.68	1.68	47	47
2022	7.04	8.72	195	242
2023	7.00	15.73	194	437
2024	6.97	22.70	193	630
2025	6.93	29.62	192	822
2026	6.89	36.52	191	1,014
2027	6.85	43.37	190	1,204
2028	6.82	50.18	189	1,393
2029	6.78	56.96	188	1,581
2030	6.74	63.71	187	1,768
2031	6.71	70.41	186	1,954
2032	6.67	77.08	185	2,140
2033	6.63	83.71	184	2,324
2034	6.60	90.31	183	2,507
2035	6.56	96.87	182	2,689
2036	6.53	103.40	181	2,870
2037	6.49	109.89	180	3,050
2038	6.45	116.34	179	3,229
2039	6.42	122.76	178	3,407
2040	6.38	129.14	177	3,585
2041	6.35	135.49	176	3,761
2042	6.31	141.81	175	3,936
2043	6.28	148.09	174	4,110
2044	6.25	154.33	173	4,284

2045	6.21	160.55	172	4,456
2046	6.18	166.72	171	4,628
2047	6.14	172.87	171	4,798
2048	6.11	178.98	170	4,968
2049	6.08	185.06	169	5,137
2050	6.05	191.10	168	5,304
2051	4.58	195.68	127	5,432

Table 84. Carbon pools for pasture in the baseline scenario – APD – PAI01

Baseline Pasture Carbon Pool			Sum of Strata - APD	
Year	ha/year	ha(cumulative)	tCO2/year	tCO2
2021	380	380	10,548	10,548
2022	1,450	1,830	40,247	50,795
2023	254	2,084	7,048	57,842
2024	-	2,084	-	57,842
2025	-	2,084	-	57,842
2026	-	2,084	-	57,842
2027	-	2,084	-	57,842
2028	-	2,084	-	57,842
2029	-	2,084	-	57,842
2030	-	2,084	-	57,842
2031	-	2,084	-	57,842
2032	-	2,084	-	57,842
2033	-	2,084	-	57,842
2034	-	2,084	-	57,842
2035	-	2,084	-	57,842
2036	-	2,084	-	57,842
2037	-	2,084	-	57,842
2038	-	2,084	-	57,842
2039	-	2,084	-	57,842
2040	-	2,084	-	57,842
2041	-	2,084	-	57,842
2042	-	2,084	-	57,842
2043	-	2,084	-	57,842
2044	-	2,084	-	57,842
2045	-	2,084	-	57,842

2046	-	2,084	-	57,842
2047	-	2,084	-	57,842
2048	-	2,084	-	57,842
2049	-	2,084	-	57,842
2050	-	2,084	-	57,842
2051	-	2,084	-	57,842

3.2.1.7.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

Table 85. Carbon Stock in Post-deforestation strata – PAI02

Post-deforestation strata	t C.ha-1	t CO_2eq.ha-1
	PAI 02	PAI 02
Pasture	10.00	36.67
Mosaic of agriculture and pasture	7.57	27.76
Soybean	5.14	18.85

The table below summarizes the results obtained for the carbon pools for pasture in the baseline scenario, for 30 years of the project.

Table 86. Carbon pools for pasture in the baseline scenario – AUDD – PAI02

Baseline Pasture Carbon Pool			Sum of Strata - AUDD	
Year	ha/year	ha(cumulative)	tCO_2/year	tCO_2
2022	11	11	389	389
2023	60	70	2,183	2,572
2024	59	129	2,164	4,736
2025	59	188	2,146	6,882
2026	58	246	2,127	9,009
2027	58	303	2,109	11,118
2028	57	360	2,091	13,209
2029	57	417	2,073	15,282
2030	56	473	2,055	17,338
2031	56	528	2,038	19,375
2032	55	584	2,020	21,395
2033	55	638	2,003	23,398
2034	54	692	1,986	25,384
2035	54	746	1,969	27,352

2036	53	799	1,952	29,304
2037	53	852	1,935	31,239
2038	52	904	1,918	33,158
2039	52	956	1,902	35,060
2040	51	1,008	1,886	36,945
2041	51	1,059	1,869	38,815
2042	51	1,109	1,853	40,668
2043	50	1,159	1,838	42,506
2044	50	1,209	1,822	44,328
2045	49	1,258	1,806	46,134
2046	49	1,307	1,791	47,924
2047	48	1,355	1,775	49,700
2048	48	1,403	1,760	51,460
2049	48	1,451	1,745	53,205
2050	47	1,498	1,730	54,935
2051	47	1,545	1,715	56,650
2052	38	1,583	1,399	58,049

Table 87. Carbon pools for pasture in the baseline scenario – APD – PAI02

Baseline Pasture Carbon Pool			Sum of Strata - APD	
Year	ha/year	ha(cumulative)	tCO_2/year	tCO_2
2022	43	43	1,592	1,592
2023	244	287	8,939	10,531
2024	244	531	8,939	19,470
2025	244	775	8,939	28,409
2026	244	1,019	8,939	37,348
2027	244	1,262	8,939	46,287
2028	244	1,506	8,939	55,226
2029	244	1,750	8,939	64,166
2030	200	1,950	7,347	71,513
2031	-	1,950	-	71,513
2032	-	1,950	-	71,513
2033	-	1,950	-	71,513
2034	-	1,950	-	71,513
2035	-	1,950	-	71,513
2036	-	1,950	-	71,513

2037	-	1,950	-	71,513
2038	-	1,950	-	71,513
2039	-	1,950	-	71,513
2040	-	1,950	-	71,513
2041	-	1,950	-	71,513
2042	-	1,950	-	71,513
2043	-	1,950	-	71,513
2044	-	1,950	-	71,513
2045	-	1,950	-	71,513
2046	-	1,950	-	71,513
2047	-	1,950	-	71,513
2048	-	1,950	-	71,513
2049	-	1,950	-	71,513
2050	-	1,950	-	71,513
2051	-	1,950	-	71,513
2052	-	1,950	-	71,513

3.2.1.7.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

Table 88. Carbon Stock in Post-deforestation strata – PAI03

Post-deforestation strata	t C.ha-1	t CO2eq.ha-1
	PAI 02	PAI 02
Pasture	7.57	27.76
Mosaic of agriculture and pasture	7.57	27.76
Soybean	5.14	18.85

The table below summarizes the results obtained for the carbon pools for pasture in the baseline scenario, for 30 years of the project.

Table 89. Carbon pools for pasture in the baseline scenario – AUDD – PAI03

Baseline Pasture Carbon Pool			Sum of Strata - AUDD	
Year	ha/year	ha(cumulative)	tCO2/year	tCO2
2021	1.73	1.73	48	48
2022	14.36	16.10	399	447
2023	14.33	30.42	398	844

2024	14.29	44.72	397	1,241
2025	14.25	58.97	396	1,637
2026	14.22	73.18	395	2,031
2027	14.18	87.36	394	2,425
2028	14.14	101.51	393	2,817
2029	14.11	115.61	392	3,209
2030	14.07	129.68	391	3,600
2031	14.03	143.72	390	3,989
2032	14.00	157.71	388	4,378
2033	13.96	171.67	387	4,765
2034	13.92	185.60	386	5,152
2035	13.89	199.48	385	5,537
2036	13.85	213.34	384	5,922
2037	13.82	227.15	383	6,305
2038	13.78	240.93	382	6,687
2039	13.74	254.68	382	7,069
2040	13.71	268.39	381	7,450
2041	13.67	282.06	380	7,829
2042	13.64	295.70	379	8,208
2043	13.60	309.30	378	8,585
2044	13.57	322.87	377	8,962
2045	13.53	336.40	376	9,337
2046	13.50	349.90	375	9,712
2047	13.46	363.36	374	10,086
2048	13.43	376.79	373	10,458
2049	13.39	390.18	372	10,830
2050	13.36	403.53	371	11,201
2051	11.72	415.25	325	11,526

Table 90. Carbon pools for pasture in the baseline scenario – APD – PAI03

Baseline Pasture Carbon Pool			Sum of Strata - APD	
Year	ha/year	ha(cumulative)	tCO2/year	tCO2
2021	43	43	1,199	1,199
2022	358	402	9,946	11,145
2023	358	760	9,946	21,091
2024	358	1,118	9,946	31,037

2025	358	1,476	9,946	40,983
2026	358	1,835	9,946	50,929
2027	358	2,193	9,946	60,875
2028	358	2,551	9,946	70,820
2029	358	2,910	9,946	80,766
2030	358	3,268	9,946	90,712
2031	94	3,362	2,602	93,314
2032	-	3,362	-	93,314
2033	-	3,362	-	93,314
2034	-	3,362	-	93,314
2035	-	3,362	-	93,314
2036	-	3,362	-	93,314
2037	-	3,362	-	93,314
2038	-	3,362	-	93,314
2039	-	3,362	-	93,314
2040	-	3,362	-	93,314
2041	-	3,362	-	93,314
2042	-	3,362	-	93,314
2043	-	3,362	-	93,314
2044	-	3,362	-	93,314
2045	-	3,362	-	93,314
2046	-	3,362	-	93,314
2047	-	3,362	-	93,314
2048	-	3,362	-	93,314
2049	-	3,362	-	93,314
2050	-	3,362	-	93,314
2051	-	3,362	-	93,314

3.2.2 PROJECT EMISSIONS

There are no project emissions to report, as the only project activity is to promote conservation. The Project Area currently does not carry out any activities.

3.2.3 LEAKAGE

GHG emissions due to leakage are based on the change of activity and the market leakage effects over the entire life of the project, and leakage emissions are determined according to VM0007 v1.6, VMD0009 (LK-ASP) v1.3, and VMD0010 (LK-ASU) v1.2.

Considering the scope of the project, the market leakage effect is zero, since the process of deforestation in the project area does not involves timber harvesting for commercial markets, and the baseline is not calculated using BL-DFW, therefore, VMD0011-LK-ME is not applicable.

The greenhouse gas emissions due to the change of activity to avoid planned deforestation are assumed to be to zero ex-ante and for the ex-post estimates, monitoring of the deforestation by the baseline agent of the planned deforestation will be made, by considering other private areas of the same landowners as Carbonflor REDD, following the methodology of the VMD0009 (LK-ASP) module. Maps and geographic coordinates will be produced for the monitored areas as part of the leakage management plan. where applicable, mitigation measures will be related to the deduction of the carbon credits generated from the volume equivalent to the greenhouse gas emissions caused by monitored deforestation in the leakage management areas in each monitoring period, and articulation with landowners.

3.2.3.1 ESTIMATION OF UNPLANNED DEFORESTATION DISPLACED FROM THE PROJECT AREA TO THE LEAKAGE BELT

According to VMD0007, the annual area of unplanned baseline deforestation in the leakage belt is estimated by the formula:

$$A_{BSL,LB,unplanned,t} = A_{BSL,RRD,unplanned,t} * P_{LK}$$

Where:

$A_{BSL,LB,unplanned,t}$	Projected area of unplanned baseline deforestation in the leakage belt area in year t; ha
$A_{BSL,RRD,unplanned,t}$	Projected area of unplanned baseline deforestation in RRD in year t; ha
P_{LK}	Ratio of the area of the leakage belt to the total area of RRD; dimensionless
t	years elapsed since the projected start of the project activity

The baseline carbon stock change in the leakage belt for unplanned deforestation was calculated using Equation (23) of VMD0007.

According to VMD0010 (5.1.4 Step 3), to estimate the carbon stock changes and greenhouse gas emissions in the leakage belt that are expected to occur due to the implementation of the REDD project activity, a factor must be defined to multiply the estimated baseline carbon stock changes and greenhouse gas emissions. Therefore, for the difference in emissions from unplanned deforestation within the Leakage Belt in the baseline and project case, a factor of 10% was considered. It is assumed that this factor is valid for the Carbonflor REDD Project, considering the adoption of a series of activities for leakage mitigation, as mentioned earlier in this PD.

The annual projected area of unplanned deforestation in the leakage belt, along with the estimated baseline carbon stock change in the leakage belt and the estimated leakage due to displacement of unplanned deforestation from the project area to the leakage belt are shown below for each PAI.

3.2.3.1.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

Table 91. Estimation of leakage (unplanned deforestation) – PAI01

Year	$A_{BSL,LB,unplanned,t}$ (ha/year)	Wooded Savanna (ha/year)	Baseline carbon stock change in the leakage belt (ΔCBSL,LK,unplanned)		Estimated leakage due to displacement of unplanned deforestation from the project area to the leakage belt (ΔCLK-ASU-LB)	
			tCO2/year	tCO2 (cumulative)	tCO2/year	tCO2 (cumulative)
2021	5	5	135	135	4,4	4,4
2022	22	22	617	753	19.9	24.3
2023	22	22	824	1,577	26.6	50.8
2024	22	22	1.030	2,607	33.2	84.1
2025	21	21	1.235	3,842	39.8	123.9
2026	21	21	1.438	5,281	46.4	170.2
2027	21	21	1.641	6,921	52.9	223.1
2028	21	21	1.842	8,764	59.4	282.5
2029	21	21	2.043	10,806	65.9	348.4
2030	21	21	2.242	13,048	72.3	420.7
2031	21	21	2.390	15,438	77.0	497.7
2032	21	21	2.377	17,814	76.6	574.3
2033	21	21	2.364	20,178	76.2	650.5
2034	20	20	2.351	22,529	75.8	726.3
2035	20	20	2.338	24,867	75.4	801.7
2036	20	20	2.325	27,192	75.0	876.7
2037	20	20	2.313	29,505	74.6	951.2
2038	20	20	2.300	31,805	74.2	1,025.4
2039	20	20	2.288	34,093	73.8	1,099.2
2040	20	20	2.275	36,368	73.4	1,172.5
2041	20	20	2.263	38,631	73.0	1,245.5
2042	20	20	2.250	40,881	72.6	1,318.0
2043	19	19	2.238	43,119	72.2	1,390.2
2044	19	19	2.226	45,345	71.8	1,461.9
2045	19	19	2.214	47,559	71.4	1,533.3
2046	19	19	2.202	49,761	71.0	1,604.3
2047	19	19	2.190	51,951	70.6	1,674.9

2048	19	19	2.178	54,129	70.2	1,745.1
2049	19	19	2.166	56,295	69.8	1,815.0
2050	19	19	2.154	58,449	69.5	1,884.4
2051	14	14	2.027	60,476	65.4	1,949.8

3.2.3.1.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

Table 92. Estimation of leakage (unplanned deforestation) – PAI02

Year	$A_{BSL,LB,unplanned,t}$ (ha/year)	Alluvial Open Ombrophilous Forest (ha/year)	Lowland Open Ombrophilous Forest (ha/year)	Baseline carbon stock change in the leakage belt (ΔCBSL,LK,unplanned)		Estimated leakage due to displacement of unplanned deforestation from the project area to the leakage belt (ΔCLK-ASU-LB)	
				tCO2/year	tCO2 (cumulative)	tCO2/year	tCO2 (cumulative)
2022	14	14	-	5,446	5,446	426	426
2023	76	76	-	30,639	36,084	2,397	2,823
2024	75	75	-	30,968	67,053	2,423	5,245
2025	75	75	-	31,295	98,348	2,448	7,694
2026	74	74	-	31,619	129,968	2,474	10,167
2027	74	74	-	31,941	161,908	2,499	12,666
2028	73	73	-	32,259	194,168	2,524	15,189
2029	72	72	-	32,575	226,743	2,548	17,738
2030	72	72	-	32,889	259,632	2,573	20,311
2031	71	71	-	33,199	292,831	2,667	22,978
2032	70	70	-	33,401	326,232	2,956	25,934
2033	70	70	-	33,115	359,347	2,937	28,870
2034	69	69	-	32,831	392,178	2,918	31,788
2035	69	69	-	32,550	424,728	2,899	34,687
2036	68	68	-	32,270	456,998	2,881	37,568
2037	67	67	-	31,994	488,992	2,862	40,430
2038	67	37	30	33,587	522,578	2,844	43,274
2039	66	-	66	35,593	558,171	2,826	46,100
2040	66	-	66	35,364	593,535	2,808	48,907
2041	65	-	65	35,136	628,671	2,789	51,696
2042	65	-	65	34,910	663,581	2,765	54,461

2043	64	-	64	34,687	698,268	2,741	57,202
2044	64	-	64	34,465	732,733	2,718	59,919
2045	63	-	63	34,245	766,978	2,694	62,614
2046	62	-	62	34,027	801,005	2,671	65,285
2047	62	-	62	33,811	834,817	2,648	67,933
2048	61	-	61	33,563	868,379	2,626	70,559
2049	61	-	61	33,275	901,654	2,603	73,162
2050	60	-	60	32,990	934,644	2,581	75,742
2051	60	-	60	32,707	967,350	2,559	78,301
2052	49	-	49	27,611	994,961	2,155	80,456

3.2.3.1.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

Table 93. Estimation of leakage (unplanned deforestation) – PAI03

Year	$A_{BSL,LB,unplanned,t}$ (ha/year)	Wooded Savanna (ha/year)	Submontane Seasonal Deciduous Forest (ha/year)	Seasonal Semi-deciduous Alluvial Forest (ha/year)	Forested Savanna (ha/year)	Baseline carbon stock change in the leakage belt (ΔCBSL,LK,unplanned)		Estimated leakage due to displacement of unplanned deforestation from the project area to the leakage belt (ΔCLK-ASU-LB)	
						tCO2/year	tCO2 (cumulative)	tCO2/year	tCO2 (cumulative)
2021	3	3	-	-	-	65	65	4	4
2022	21	21	-	-	-	564	630	39	43
2023	21	21	-	-	-	763	1,393	65	108
2024	21	21	-	-	-	962	2,354	218	326
2025	21	21	-	-	-	1,159	3,514	228	554
2026	21	21	-	-	-	1,357	4,871	239	794
2027	21	21	-	-	-	1,554	6,424	250	1,043
2028	21	21	-	-	-	1,750	8,174	261	1,304
2029	20	20	-	-	-	1,946	10,121	271	1,575
2030	20	20	-	-	-	2,142	12,262	282	1,857
2031	20	20	-	-	-	2,313	14,575	291	2,148
2032	20	20	-	-	-	2,307	16,883	288	2,435
2033	20	20	-	-	-	2,302	19,184	285	2,720
2034	20	20	-	-	-	2,297	21,481	284	3,004
2035	20	20	-	-	-	2,291	23,772	283	3,287

2036	20	20	-	-	-	2,286	26,058	282	3,569
2037	20	20	-	-	-	2,281	28,339	282	3,851
2038	20	20	-	-	-	2,275	30,614	281	4,132
2039	20	20	-	-	-	2,270	32,884	280	4,412
2040	20	20	-	-	-	2,265	35,149	279	4,691
2041	20	20	-	-	-	2,259	37,408	279	4,970
2042	20	20	-	-	-	2,254	39,662	278	5,248
2043	20	20	-	-	-	2,249	41,911	277	5,525
2044	20	20	-	-	-	2,244	44,154	277	5,802
2045	20	20	-	-	-	2,238	46,393	276	6,078
2046	20	20	-	-	-	2,233	48,626	275	6,353
2047	20	20	-	-	-	2,228	50,854	274	6,627
2048	20	20	-	-	-	2,223	53,076	274	6,901
2049	20	20	-	-	-	2,217	55,294	273	7,174
2050	19	19	-	-	-	2,212	57,506	272	7,446
2051	17	17	-	-	-	2,146	59,652	250	7,697

3.2.3.2 LEAKAGE OUTSIDE THE LEAKAGE BELT (STEP 4 - LK-ASU)

Migrants prevented from migrating to and deforesting the project area are conservatively assumed to migrate to an alternative forest area and to cause deforestation in the alternative area. The proportion of migration to the Escape Belt is calculated as the area of the Escape Belt as a proportion of the total nationally available forest area (AVFOR). The AVFOR was estimated as follows:

$$AVFOR = TOTFOR - PROTFOR - MANFOR$$

Where:

AVFOR	Total available national forest area for unplanned deforestation; ha
TOTFOR	Total available national forest area; ha
PROTFOR	Total area of fully protected forests nationally; ha
MANFOR	Total area of forests under active management nationally; ha

Since the country has a wide variety of forest biomes throughout its length, TOTFOR considered only the Cerrado and Amazon biomes. This is a conservative approach. Thus, as a representation of the total forest area in these biomes, TOTFOR consisted of adding the extent of area preserved with native forest vegetation in the Cerrado (74,775,88.,98 ha, 36.73% of the biome's territorial extension)[144] and Amazon

[144] https://antigo.mma.gov.br/biomas/cerrado/mapa-de-cobertura-vegetal.html

(339,900,992.04 ha, 80.76% of the biome's territorial extension)[145]. As a result, TOTFOR represents 414,676,881.02 ha

According to Embrapa[146], PROTFOR is equivalent to 206,000,000 ha. MANFOR is estimated at 1,400,000, according to IBAMA[147]. In this context, the AVFOR is estimated at 324,710,481.02 ha.

The proportion of the area of the Leakage Belt related to the total national forest area available (PROPLB) is calculated by dividing the area of the Leakage Belt by the AVFOR. The values of PROPLB are shown in the subitems below for each PAI.

Based on similarity analysis, data from the Project Area was applied to Leakage Belt area to calculate the carbon stock across the Leakage Belt (CLB), with values shown for each PAI below. The average carbon stock for all available forest area outside the Leakage Belt (COLB; 349.90 tCO2/ha) were taken for calculation of the proportional difference in carbon stocks between areas of forest available for unplanned deforestation both inside and outside the Leakage Belt (PROPCS). PROPCS is calculated by dividing the stock outside the Leakage Belt (COLB) by the stock inside the Leakage Belt (CLB), with results shown for each PAI below.

The proportion of baseline deforestation caused by immigrating population (PROPIMM) was estimated for a period from 2010 to 2021. For calculating PROPIMM, local data for births, deaths, and population were used. It was then assumed that the total annual population growth in 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. According to the number of immigrants, we have inferred the proportion of deforestation attributed to immigrant agents (PROPIMM), shown below for each PAI.

The proportional leakage for areas with immigrating populations (LKPROP) was then equal to the immigrating proportion multiplied by the proportion of available national forest area outside theLeakage Belt multiplied by the proportional difference in stocks between forests inside and outside the Leakage Belt.

$$LK_{PROP} = PROP_{IMM} * (1 - PROP_{LB}) * PROP_{CS}$$

Where:

LK_{PROP}	Proportional leakage for areas with immigrating populations;
$PROP_{IMM}$	Estimated proportion of baseline deforestation caused by immigrating population;
$PROP_{LB}$	Area of forest available for unplanned deforestation as a proportion of the total national forest area available for unplanned deforestation;
$PROP_{CS}$	Proportional difference in stocks between areas of forest available for unplanned deforestation both inside and outside the Leakage Belt;

The values for $LKPROP$ are shown below for each PAI.

LK_{PROP} was estimated in 0.032789873

[145] https://antigo.mma.gov.br/biomas/amaz%C3%B4nia/mapa-de-cobertura-vegetal.html
[146] Síntese - Portal Embrapa
[147] Manejo sustentável autorizado pelo Ibama em 2019 totalizou 39 mil hectares

Leakage due to the proportion of the baseline deforestation actors who are displaced to areas outside the Leakage Belt was therefore equal to the change in stocks in the baseline scenario minus the change in stocks in the project scenario multiplied by the proportional leakage factor for areas with immigrating populations:

$$\Delta C_{LK-ASU,OLB} = (\Delta C_{BSL,LK,unplanned} - \Delta C_{P,LB,}) * LK_{PROP}$$

Where:

$\Delta C_{LK-ASU,OLB}$	Net CO2 emissions due to unplanned deforestation displaced outsidethe Leakage Belt; t CO2-e
$\Delta C_{BSL,LK,unplanned}$	Net CO2 equivalent emissions in the baseline from unplanneddeforestation in the leakage belt; t CO2-e
$\Delta C_{P,LB,}$	Net CO2 equivalent emissions within the leakage belt in the projectcase; t CO2-e
LK_{PROP}	Proportional leakage for areas with immigrating populations; proportion

For the difference in emissions from unplanned deforestation within the Leakage Belt in the baseline and project case, a factor of 10% was considered. It is assumed that this factor is valid for the Carbonflor REDD Project, considering the adoption a series of activities for leakage mitigation, as mentioned earlier in this PD.

3.2.3.2.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

PROPLB: 0.00194%

CLB: 44.11 tCO2/ha

PROPCS: 7.93

PROPIMM: 0.41%

LKPROP: 3.28%

The table below summarizes the results obtained for the calculation of leakage outside the Leakage Belt.

Table 94. Estimation results for leakage outside the Leakage Belt – PAI01

Sum of Strata				
Year	ΔCLK-ASU,OLB tCO2/year	ΔCP,LB tCO2/year	ΔCLK-AS,unplanned	
			tCO2/year	tCO2 (cumulative)
2021	-0.14	140	4	4
2022	-0.65	637	19	23
2023	-0.87	851	26	49
2024	-1.09	1,063	32	81
2025	-1.31	1,275	39	120
2026	-1.52	1,485	45	165
2027	-1.73	1,694	51	216
2028	-1.95	1,902	57	273
2029	-2.16	2,108	64	337
2030	-2.37	2,314	70	407
2031	-2.53	2,467	75	481
2032	-2.51	2,453	74	556
2033	-2.50	2,440	74	629
2034	-2.49	2,427	73	703
2035	-2.47	2,413	73	775
2036	-2.46	2,400	73	848
2037	-2.44	2,387	72	920
2038	-2.43	2,374	72	992
2039	-2.42	2,361	71	1,063
2040	-2.41	2,348	71	1,134
2041	-2.39	2,336	71	1,205
2042	-2.38	2,323	70	1,275
2043	-2.37	2,310	70	1,345
2044	-2.35	2,298	69	1,414
2045	-2.34	2,285	69	1,483
2046	-2.33	2,273	69	1,552
2047	-2.32	2,260	68	1,620
2048	-2.30	2,248	68	1,688
2049	-2.29	2,236	68	1,755
2050	-2.28	2,224	67	1,823
2051	-2.14	2,093	63	1,886

3.2.3.2.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

PROPLB: 0.00429%

CLB: 483.26 tCO_2/ha

PROPCS: 0.72

PROPIMM: 1.06%

LKPROP: 0.77%

The table below summarizes the results obtained for the calculation of leakage outside the Leakage Belt.

Table 95. Estimation results for leakage outside the Leakage Belt – PAI02

Sum of Strata				
Year	ΔCLK-ASU,OLB tCO2/year	ΔCP,LB tCO2/year	ΔCLK-AS,unplanned	
			tCO2/year	tCO2 (cumulative)
2022	-3.27	5,872	423	423
2023	-18.41	33,035	2,378	2,801
2024	-18.60	33,391	2,404	5,205
2025	-18.80	33,744	2,429	7,635
2026	-19.00	34,093	2,455	10,089
2027	-19.19	34,440	2,479	12,569
2028	-19.38	34,783	2,504	15,073
2029	-19.57	35,124	2,529	17,602
2030	-19.76	35,461	2,553	20,155
2031	-20.48	35,866	2,647	22,801
2032	-22.70	36,357	2,933	25,734
2033	-22.55	36,052	2,914	28,649
2034	-22.41	35,749	2,895	31,544
2035	-22.26	35,449	2,877	34,421
2036	-22.12	35,151	2,858	37,279
2037	-21.98	34,856	2,840	40,119
2038	-21.84	36,430	2,822	42,941
2039	-21.70	38,419	2,804	45,746
2040	-21.56	38,171	2,786	48,532
2041	-21.42	37,925	2,767	51,299
2042	-21.23	37,675	2,744	54,043
2043	-21.05	37,428	2,720	56,763
2044	-20.87	37,183	2,697	59,459
2045	-20.69	36,939	2,674	62,133
2046	-20.51	36,698	2,651	64,783
2047	-20.34	36,459	2,628	67,411
2048	-20.16	36,188	2,605	70,017
2049	-19.99	35,878	2,583	72,600
2050	-19.82	35,570	2,561	75,161
2051	-19.65	35,265	2,539	77,700
2052	-16.55	29,766	2,139	79,838

3.2.3.2.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

PROPLB: 0.00430%

CLB: 180.33 tCO2/ha

PROPCS: 1.94

PROPIMM: 0% (the calculated value was negative. so it was considered 0)

LKPROP: -0.26%

The table below summarizes the results obtained for the calculation of leakage outside the Leakage Belt.

Table 96. Estimation results for leakage outside the Leakage Belt – PAI03

Sum of Strata				
Year	ΔCLK-ASU,OLB tCO2/year	ΔCP,LB tCO2/year	ΔCLK-AS,unplanned	
			tCO2/year	tCO2 (cumulative)
2021	-	70	4	4
2022	-	603	39	43
2023	-	828	65	108
2024	-	1,179	218	326
2025	-	1,388	228	554
2026	-	1,596	239	794
2027	-	1,804	250	1,043
2028	-	2,011	261	1,304
2029	-	2,217	271	1,575
2030	-	2,424	282	1,857
2031	-	2,604	291	2,148
2032	-	2,595	288	2,435
2033	-	2,587	285	2,720
2034	-	2,580	284	3,004
2035	-	2,574	283	3,287
2036	-	2,568	282	3,569
2037	-	2,562	282	3,851
2038	-	2,556	281	4,132
2039	-	2,550	280	4,412
2040	-	2,544	279	4,691
2041	-	2,538	279	4,970
2042	-	2,532	278	5,248
2043	-	2,526	277	5,525
2044	-	2,520	277	5,802
2045	-	2,514	276	6,078
2046	-	2,508	275	6,353
2047	-	2,502	274	6,627
2048	-	2,496	274	6,901
2049	-	2,490	273	7,174
2050	-	2,485	272	7,446
2051	-	2,397	250	7,697

3.2.4 NET GHG EMISSION REDUCTIONS AND REMOVALS

Net GHG Emission Reductions and Removals can be summarized as the "Estimated baseline emissions" minus the "Estimated project emissions" minus the "Estimated leakage emissions", whose components are presented below.

The estimative Uncertainty for REDD+ project activities (VMD0017 - X-UNC module[148]) focuses on the following sources of uncertainty applicable to this project:

i. Determination of deforestation and degradation rates: It is assumed that there is zero uncertainty in baseline rate of deforestation, as numbers are equal to a long-term average (BL-UP; which is the case in this project, where deforestation rate was taken as the average of the reference period) and are based on feasible plans and commonly applied for deforestation (BL-PL; which is the case of this project, as any deforestation plan approved in national territory for conversion of planned native forests will be conditioned to the maximum conversion rate of 20% of the area in the case of forests in the Legal Amazon, 65% in the case of Cerrado in the Legal Amazon, and 80% elsewhere, as specified by the Brazilian Forest Code). REDD Carbonflor assumes these conversion rates of the areas for ex-ante estimates in APD activity.

ii. Uncertainty associated with the estimation of stocks in carbon pools and changes in carbon stocks: In relation to initial and post-deforestation carbon stocks, initial forest biomass data were derived from peer-reviewed literature in the same geographic region, biome, and climate regime as in the project area, and the values (See Table 70) adopted by the authority responsible for the National GHG Inventory were used in calculations; thus, uncertainty was considered within the confidence interval and was not calculated. This uncertainty will be calculated later when primary data is obtained via the estimations of the carbon stocks on site, as according to VMD0017 (X-UNC).

3.2.4.1.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

Table 97. Net GHG emissions reductions and removals in REDD Carbonflor – PAI01

Year	Estimated baseline emissions or removals (tCO_2e/year) (ΔCBSL-REDD)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e) (ΔCLK-REDD)	Estimated net GHG emission reductions or removals (tCO_2e) (NER.REDD)	Buffer (15%)	Verified Carbon Units (VCUs)
2021	9,911	-	4	9,907	1,486	8,421
2022	41,505	-	19	41,486	6,223	35,263
2023	24,453	-	26	24,427	3,664	20,763
2024	20,367	-	32	20,335	3,050	17,284
2025	20,433	-	39	20,394	3,059	17,335
2026	20,498	-	45	20,454	3,068	17,386
2027	20,564	-	51	20,513	3,077	17,436

148 https://verra.org/wp-content/uploads/2020/09/VMD0017-X-UNC_v2.2.pdf

2028	20,629	-	57	20,571	3,086	17,485
2029	20,693	-	64	20,629	3,094	17,535
2030	20,757	-	70	20,687	3,103	17,584
2031	17,152	-	75	17,077	2,562	14,516
2032	3,207	-	74	3,133	470	2,663
2033	762	-	74	688	103	585
2034	758	-	73	685	103	582
2035	754	-	73	681	102	579
2036	750	-	73	677	102	576
2037	746	-	72	673	101	572
2038	742	-	72	670	100	569
2039	738	-	71	666	100	566
2040	734	-	71	663	99	563
2041	730	-	71	659	99	560
2042	726	-	70	655	98	557
2043	722	-	70	652	98	554
2044	718	-	69	648	97	551
2045	714	-	69	645	97	548
2046	710	-	69	641	96	545
2047	706	-	68	638	96	542
2048	702	-	68	634	95	539
2049	698	-	68	631	95	536
2050	695	-	67	627	94	533
2051	654	-	63	590	89	502
Total	253,923	-	1,886	252,037	37,806	214,232

3.2.4.1.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

Table 98. Net GHG emissions reductions and removals in REDD Carbonflor – PAI02

Year	Estimated baseline emissions or removals (tCO_2e/year) (ΔCBSL-REDD)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e) (ΔCLK-REDD)	Estimated net GHG emission reductions or removals (tCO_2e) (NER.REDD)	Buffer (15%)	Verified Carbon Units (VCUs)
2022	23,329	-	423	22,906	3,436	19,470
2023	131,413	-	2,378	129,034	19,355	109,679

2024	133,736	-	2,404	131,332	19,700	111,632
2025	136,056	-	2,429	133,627	20,044	113,583
2026	138,375	-	2,455	135,920	20,388	115,532
2027	140,691	-	2,479	138,212	20,732	117,480
2028	143,005	-	2,504	140,501	21,075	119,426
2029	145,318	-	2,529	142,789	21,418	121,370
2030	128,559	-	2,553	126,006	18,901	107,105
2031	43,192	-	2,647	40,545	6,082	34,463
2032	45,710	-	2,933	42,777	6,417	36,360
2033	43,454	-	2,914	40,540	6,081	34,459
2034	41,200	-	2,895	38,305	5,746	32,559
2035	38,948	-	2,877	36,071	5,411	30,661
2036	36,697	-	2,858	33,839	5,076	28,763
2037	34,448	-	2,840	31,608	4,741	26,867
2038	32,200	-	2,822	29,378	4,407	24,972
2039	29,954	-	2,804	27,150	4,073	23,078
2040	28,078	-	2,786	25,291	3,794	21,498
2041	27,887	-	2,767	25,120	3,768	21,352
2042	27,648	-	2,744	24,904	3,736	21,169
2043	27,411	-	2,720	24,691	3,704	20,987
2044	27,176	-	2,697	24,479	3,672	20,807
2045	26,943	-	2,674	24,269	3,640	20,629
2046	26,712	-	2,651	24,061	3,609	20,452
2047	26,483	-	2,628	23,855	3,578	20,276
2048	26,256	-	2,605	23,650	3,548	20,103
2049	26,030	-	2,583	23,447	3,517	19,930
2050	25,807	-	2,561	23,246	3,487	19,759
2051	25,586	-	2,539	23,047	3,457	19,590
2052	21,551	-	2,139	19,413	2,912	16,501
Total	1,809,853	-	79,838	1,730,015	259,502	1,470,512

3.2.4.1.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

Table 99. Net GHG emissions reductions and removals in REDD Carbonflor – PAI03

Year	Estimated baseline emissions or	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e) (ΔCLK-REDD)	Estimated net GHG emission reductions or removals (tCO_2e)	Buffer (15%)	Verified Carbon Units (VCUs)

	removals (tCO_2e/year) (ΔCBSL-REDD)			(NER.REDD)		
2021	9,136	-	4	9,131	1,370	7,762
2022	76,164	-	39	76,125	11,419	64,706
2023	79,430	-	65	79,365	11,905	67,460
2024	83,961	-	218	83,743	12,562	71,182
2025	87,074	-	228	86,846	13,027	73,819
2026	90,187	-	239	89,948	13,492	76,456
2027	93,300	-	250	93,050	13,958	79,093
2028	96,413	-	261	96,152	14,423	81,729
2029	99,525	-	271	99,254	14,888	84,366
2030	102,637	-	282	102,355	15,353	87,002
2031	49,686	-	291	49,395	7,409	41,986
2032	27,707	-	288	27,419	4,113	23,306
2033	24,671	-	285	24,386	3,658	20,728
2034	21,658	-	284	21,374	3,206	18,168
2035	18,645	-	283	18,362	2,754	15,608
2036	15,632	-	282	15,350	2,302	13,047
2037	12,619	-	282	12,338	1,851	10,487
2038	9,606	-	281	9,325	1,399	7,927
2039	6,594	-	280	6,313	947	5,366
2040	3,581	-	279	3,301	495	2,806
2041	2,787	-	279	2,508	376	2,132
2042	2,780	-	278	2,502	375	2,127
2043	2,773	-	277	2,495	374	2,121
2044	2,766	-	277	2,489	373	2,116
2045	2,758	-	276	2,483	372	2,110
2046	2,751	-	275	2,476	371	2,105
2047	2,744	-	274	2,470	370	2,099
2048	2,737	-	274	2,463	369	2,094
2049	2,730	-	273	2,457	369	2,088
2050	2,723	-	272	2,451	368	2,083
2051	2,504	-	250	2,253	338	1,915
Total	1,038,278	-	7,697	1,030,582	154,587	875,994

3.3 MONITORING

3.3.1 DATA AND PARAMETERS AVAILABLE AT VALIDATION

Data / Parameter	44/12
Data unit	Dimensionless
Description	Carbon mass tCO_2e mass conversion factor
Source of data	From scientific literature: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 AFOLU
Value applied	44/12
Justification of choice of data or description of measurement methods and procedures applied	Conversion from C to CO_2 based on molecular weights
Purpose of data	Determination of baseline scenario Calculation of baseline emissions Calculation of project emissions Calculation of leakage
Comments	IPCC standard value

Data / Parameter	C_{ab_tree}
Data unit	t CO_2-e ha-1
Description	Mean aboveground biomass carbon stock in stratum i
Source of data	The value is the result of the division of the total aboveground carbon pool per stratum by the area, as indicated in Table 71 (PD)
Value applied	Wooded Savannah = 44.11 Alluvial Open Ombrophilous Forest = 430.10 Lowland Open Ombrophilous Forest = 490.97 Submontane Seasonal Deciduous Forest = 151.80 Seasonal Semi-deciduous Alluvial Forest = 208.60 Forested Savanna = 253.73
Justification of choice of data or description of measurement methods and procedures applied	As indicated in module CP-AB. According to the values adopted by the authority responsible for the officially published by Brazil in the Fourth National Communication on Brazil's Biennial Update Report to the United Nations Framework Convention on Climate Change - Reference Report: Land Use Sector, Land Use Change and Forests, 2020.
Purpose of data	Calculation of baseline emissions

Comments	N/A

Data / Parameter	C_{bb_tree}
Data unit	t CO2-e ha-1
Description	Mean belowground biomass carbon stock in stratum i
Source of data	The value is the result of the division of the total aboveground carbon pool per stratum by the area, as indicated in Table 71 (PD)
Value applied	Wooded Savannah = 89.98 Alluvial Open Ombrophilous Forest = 42.90 Lowland Open Ombrophilous Forest = 49.13 Submontane Seasonal Deciduous Forest = 56.10 Seasonal Semi-deciduous Alluvial Forest = 41.73 Forested Savanna = 55.81
Justification of choice of data or description of measurement methods and procedures applied	As indicated in module CP-AB. According to the values adopted by the authority responsible for the officially published by Brazil in the Fourth National Communication on Brazil's Biennial Update Report to the United Nations Framework Convention on Climate Change - Reference Report: Land Use Sector, Land Use Change and Forests, 2020.
Purpose of data	Calculation of baseline emissions
Comments	N/A

Data / Parameter	$C_{dw,i}$
Data unit	t CO2-e ha-1
Description	Carbon stock in dead wood in stratum i
Source of data	The value is the result of the division of the total aboveground carbon pool per stratum by the area, as indicated in Table 71 (PD)
Value applied	Wooded Savannah = 6.16 Alluvial Open Ombrophilous Forest = 34.83 Lowland Open Ombrophilous Forest = 39.97 Submontane Seasonal Deciduous Forest = 22.77 Seasonal Semi-deciduous Alluvial Forest = 22.95 Forested Savanna = 27.90
Justification of choice of data or description of measurement methods and procedures applied	As indicated in module CP-D. According to the values adopted by the authority responsible for the officially published by Brazil in the Fourth National Communication on Brazil's Biennial Update Report to the United Nations Framework Convention on Climate Change -

	Reference Report: Land Use Sector, Land Use Change and Forests, 2020.
Purpose of data	Calculation of baseline emissions
Comments	N/A

Data / Parameter	Pasture carbon pool
Data unit	t CO2-e ha-1
Description	Pasture carbon pool in the baseline scenario
Source of data	Indicated in Table 82 (PD). According to the values adopted by the authority responsible for the officially published by Brazil in the Fourth National Communication on Brazil's Biennial Update Report to the United Nations Framework Convention on Climate Change - Reference Report: Land Use Sector, Land Use Change and Forests, 2020. Deforestation measured through data from Mapbiomas project.
Value applied	Pasture in Cerrado = 27.76 Pasture in Amazon = 36.67
Justification of choice of data or description of measurement methods and procedures applied	The post-deforestation biomass (pasture) according to the National GHG Inventory has been multiplied by the deforestation measured through data from Mapbiomas.
Purpose of data	Calculation of baseline emissions
Comments	Calculation based on country-specific values.

Data / Parameter	Deforestation
Data unit	ha
Description	Maps of forest cover areas converted into non-forest areas
Source of data	Measured through data from Mapbiomas project
Value applied	Yearly variable: deforestation values are presented for the Reference Region, Leakage Belt and Project Area (projections) in this VCS/CCB-PD

Justification of choice of data or description of measurement methods and procedures applied	The Mapbiomas project contributes to understand the land use dynamics 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 covers 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 conversion of forest land to non-forest land. iv) Monitoring occurred during the entire fixed baseline period. In case of unavailability of Mapbiomas data for the monitoring period, other sources will be consulted such as PRODES, or a classification of imagery (Landsat) will becarried out to measure deforested area: Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. For analysis of areas with cloud cover, visual interpretation of radar image would be performed. Evaluation of classification accuracy is performed by analyzing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be over than 90%, considered very high.
Purpose of data	Calculation of baseline emissions
Comments	N/A

Data / Parameter	C_{LB}
Data unit	t CO_2e ha^{-1}
Description	Area-weighted average aboveground tree carbon stock for forests available for unplanned deforestation inside the leakage belt
Source of data	Calculated by using the Project Area data and data from the Fourth National Communication on Brazil's Biennial Update Report to the United Nations Framework Convention on Climate Change - Reference Report: Land Use Sector, Land Use Change and Forests, 2020.
Value applied	PAI01 = 44.11 PAI02 = 483.26 PAI03 = 180.33
Justification of choice of data or description of measurement methods and procedures applied	Based on similarity analysis, data from the Project Area was applied to Leakage Belt area. A weighted average was taken of aboveground biomass inside the Project Area.
Purpose of data	Calculation of leakage emissions
Comments	N/A.

Data / Parameter	COLB
Data unit	t CO_2e ha^{-1}
Description	Area-weighted average aboveground tree carbon stock for forests available for unplanned deforestation outside the leakage belt
Source of data	Calculated by using data from the Fourth National Communication on Brazil's Biennial Update Report to the United Nations Framework Convention on Climate Change - Reference Report: Land Use Sector, Land Use Change and Forests, 2020.
Value applied	349,90
Justification of choice of data or description of measurement methods and procedures applied	As indicated in module CP-AB. According to the values adopted by the authority responsible for the officially published by Brazil in the Fourth National Communication on Brazil's Biennial Update Report to the United Nations Framework Convention on Climate Change - Reference Report: Land Use Sector, Land Use Change and Forests, 2020.
Purpose of data	Calculation of leakage emissions
Comments	N/A.

Data / Parameter	DLF
Data unit	%
Description	Displacement Leakage Factor
Source of data	Local assessment
Value applied	10
Justification of choice of data or description of measurement methods and procedures applied	If deforestation agents do not participate in leakage prevention activities and project activities, the Displacement Factor shall be 100%. Where leakage prevention activities are implemented, the factor shall be equal to the proportion of the baseline agents estimated to be given the opportunity to participate in leakage prevention activities and project activities. The project design team estimates that 100% of potential deforestation agents in the Reference Region will be given 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 stated that most of neighbors are being given opportunity to participate in leakage prevention activities. Thus, the “Displacement Leakage Factor” (DLF) was conservatively defined as 10%.
Purpose of data	Calculation of leakage
Comments	This value is an ex-ante estimate. Accurate and actual values will be monitored and reported in verification periods

3.3.2 DATA AND PARAMETERS MONITORED

Data / Parameter	ADistPA
Data unit	ha
Description	Area impacted by natural disturbance in the project stratum i converted to natural disturbance stratum q in year t; ha
Source of data	Remote Sensing imagery combined with ground verification orGPS coordinates
Description of measurement methods and procedures to be applied	Minimum monitoring unit shall be equal to a minimum of 11Landsat pixels or one hectare.
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurson a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	This value varies annually, as a function of deforested area.
Monitoring equipment	Remote sensing and GIS tools
QA/QC procedures to be applied	The Mapbiomas project contributes to understand the land use dynamics 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 covers 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 conversion of forest land to non-forest land. iv) Monitoring occurred during the entire fixed baseline period. In case of unavailability of Mapbiomas data for monitoring period, other sources will be consulted such as PRODES or a classification of imagery (Landsat) will be carried out to measure deforested area: Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. For analysis of areas with cloud cover, visual interpretation of radar image would be performed. Evaluation of classification accuracy is performed by analyzing the overall accuracy and kappa index obtainedfrom a confusion matrix. The minimum accuracy of the mapping classification should be over 90%, considered very high.

Purpose of data	Calculation of project emissions
Calculation method	Ex ante, estimations of emissions from natural disturbances shall be based on historic incidence of such event in the Projectregion
Comments	N/A

Data / Parameter	ABSLPAt
Data unit	ha
Description	Annual area of baseline deforestation in the project area at yeart
Source of data	Remote sensing data and GIS
Description of measurement methods and procedures to be applied	Forest cover change due to deforestation is monitored through periodic assessment of classified satellite imagery covering the project area provided by Mapbiomas project.
Frequency of monitoring/recording	Annually
Value applied	The value will be calculated ex-post, before every verification period.
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	The Mapbiomas project contributes to understand the land use dynamics 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 covers 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 conversion of forest land to non-forest land. iv) Monitoring occurred during the entire fixed baseline period. In case of unavailability of Mapbiomas data for monitoring period, other souces will be consulted such as PRODES or a classification of imagery (Landsat8) will be carried out to measure deforested area: Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. For analysis of areas with cloud cover, visual interpretation of radar image would be performed. Evaluation of classification accuracy is performed by analyzing the overall accuracy and kappa index obtained from a confusionmatrix.

	The minimum accuracy of the classification mapping should be over than 90%, considered very high.
Purpose of data	Calculation of project emissions Calculation of baseline emissions
Calculation method	Analysis of satellite images and maps
Comments	N/A

Data / Parameter	MANFOR
Data unit	ha
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	As per LK-ASU, a demonstration is required that areas will be protected against deforestation. Such a demonstration must include the existence of forest guards in sufficient numbers toprevent illegal colonization and an active management plan detailing harvest plans and return intervals, and/or evidence that the concession owner has previously evicted illegal colonists/squatters from the forest areas. Ex-ante it can be assumed that MANFOR must remain constant.
Frequency of monitoring/recording	Annually
Value applied	1,400,000.00
Monitoring equipment	N/A
QA/QC procedures to be applied	As per Section 9.3 of REDD+ MF or other VCS methodology that uses this module.
Purpose of data	Calculation of leakage emissions
Calculation method	N/A
Comments	N/A.

Data / Parameter	PROTFOR
Data unit	ha
Description	Total area of fully protected forests nationally
Source of data	Official country-specific data from ISA. According to Embrapa, PROTFOR is equivalent to 206 million hectares in Brazil.

Description of measurement methods and procedures to be applied	As per LK-ASU, a demonstration is required that areas will be protected against deforestation. Such a demonstration is madeby government mechanisms and national polices. Ex-ante it can be assumed that PROTFOR must remain constant.
Frequency of monitoring/recording	Annually
Value applied	206,000,000.00
Monitoring equipment	N/A.
QA/QC procedures to be applied	As per Section 9.3 of REDD+ MF or other VCS methodology that uses this module.
Purpose of data	Calculation of leakage emissions
Calculation method	N/A.
Comments	N/A.

Data / Parameter	TOTFOR
Data unit	ha
Description	Total available national forest area
Source of data	Official country-specific data from MMA. Thus, as a representation of the total forest area in these biomes, TOTFOR consisted of adding the extent of area preserved with native forest vegetation in the Cerrado (74.775.888,98 ha, 36.73% of the biome's territorial extension) and Amazon (339.900.992,04 ha, 80.76% of the biome's territorial extension).
Description of measurement methods and procedures to be applied	As per LK-ASU, forest areas suitable for conversion to livestock. Ex ante it can be conservatively assumed that TOTFOR must remain constant for the baseline period.
Frequency of monitoring/recording	Annually
Value applied	414,676,881.02
Monitoring equipment	N/A.
QA/QC procedures to be applied	As per Section 9.3 of REDD+ MF or other VCS methodology that uses this module.
Purpose of data	Calculation of leakage emissions
Calculation method	N/A.

Comments	N/A.

Data / Parameter	$\Delta C_{P,LB}$
Data unit	tCO2e
Description	Net greenhouse gas emissions within the leakage belt in theproject case
Source of data	As per Module M-REDD
Description of measurement methods and procedures to be applied	As per Module M-REDD.
Frequency of monitoring/recording	Annually
Value applied	To be measured ex-post.
Monitoring equipment	N/A.
QA/QC procedures to be applied	As per Section 9.3 of REDD+ MF or other VCS methodology that uses this module.
Purpose of data	Calculation of leakage emissions
Calculation method	N/A.
Comments	N/A.

Data / Parameter	$PROP_{IMM}$
Data unit	Proportion
Description	Estimated proportion of baseline deforestation caused by immigrating population
Source of data	Official country-specific (government) data. The proportion of baseline deforestation caused by immigrating population (PROPIMM) was estimated for a period from 2010 to 2021. For calculating PROPIMM, it was used local data for births, deaths, and population. It is then assumed that the total annual population growth in 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 proportion of the area deforested in the past 5years by population that migrated into the leakage belt and project area in the past 5 years (all areas within 2 km of the boundaries of the project area and the leakage belt must beconsidered here).

Frequency of monitoring/recording	Annually
Value applied	PAI01 = 0.41% PAI02 = 1.06% PAI03 = 0% (calculated value was negative, so “0” was considered)
Monitoring equipment	N/A.
QA/QC procedures to be applied	As per Section 9.3 of REDD+ MF or other VCS methodology that uses this module.
Purpose of data	Calculation of leakage emissions
Calculation method	N/A.
Comments	N/A.

Data / Parameter	ADefLB,i,t
Data unit	ha
Description	Area of recorded deforestation in the leakage belt in the projectcase in stratum i in year t
Source of data	As per Module M-REDD. Satellite imagery.
Description of measurement methods and procedures to be applied	As per Module M-REDD. Satellite imagery analysis.
Frequency of monitoring/recording	Annually
Value applied	To be measured ex-post.
Monitoring equipment	N/A.
QA/QC procedures to be applied	As per Section 9.3 of REDD+ MF or other VCS methodology that uses this module.
Purpose of data	Calculation of leakage emissions
Calculation method	N/A.
Comments	N/A.

Data / Parameter	ADefPA,I,u,t
Data unit	ha
Description	Area of recorded deforestation in the project area in the projectcase in stratum i converted to land use *u* in year *t*

Source of data	As per Module M-REDD. Satellite imagery.
Description of measurement methods and procedures to be applied	As per Module M-REDD. Satellite imagery analysis.
Frequency of monitoring/recording	Annually
Value applied	To be measured ex-post.
Monitoring equipment	N/A.
QA/QC procedures to be applied	As per Section 9.3 of REDD+ MF or other VCS methodology that uses this module.
Purpose of data	Calculation of leakage emissions
Calculation method	N/A.
Comments	N/A.

Data / Parameter	RFt
Data unit	%
Description	Risk factor used to calculate VCS buffer credits
Source of data	VCS Non-Permanence Risk Report (v3.1), Remote sensing data and GIS, Supervisor report. Literature data.
Description of measurement methods and procedures to be applied	All sources of data from the VCS Non-Permanence Risk Report will be used to measure the various risk factors.
Frequency of monitoring/recording	Annually
Value applied	20
Monitoring equipment	VCS-approved AFOLU Non-Permanence Risk Tool
QA/QC procedures to be applied	Literature data from reputed 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 the risk factors described in the VCS Risk Report were assessed.

Comments	N/A

Data / Parameter	Project Forest Cover Monitoring Map
Data unit	ha
Description	Map showing the location of forest land within the project area at the beginning of each monitoring period. If within the Project Area some forest land is cleared, the benchmark map must showthe deforested areas at each monitoring event
Source of data	Remote sensing in combination with GPS data collected during ground truthing
Description of measurement methods and procedures to be applied	The minimum map accuracy must be 90% for the classificationof forest/non-forest in the remote sensing imagery. If the classification accuracy is less than 90% then the map is not acceptable for further analysis. More remote sensing data and ground truthing data will be needed to produce a product that reaches the 90% minimum mapping accuracy
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	To be calculated ex-post
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	The Mapbiomas project contributes to understand the land use dynamics 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 covers 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 conversion of forest land to non-forest land. iv) Monitoring occurred during the entire fixed baseline period. In case of unavailability of Mapbiomas data for monitoring period, other souces will be consulted such as PRODES or a classification of imagery (Landsat8) will be carried out to measure deforested area: Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. For analysis of areas with cloud cover, visual interpretation of radar image would be performed. Evaluation of classification accuracy is performed by analyzing the overall accuracy and kappa index obtained from a confusion

	matrix. The minimum accuracy of the classification mapping should be over than 90%, considered very good.
Purpose of data	Project Emission
Calculation method	Remote sensing and GIS
Comments	N/A

Data / Parameter	Leakage Belt Forest Cover Monitoring Map
Data unit	ha
Description	Map showing the location of forest land within the leakage belt area at the beginning of each monitoring period. Only applicable where leakage is to be monitored in a leakage belt
Source of data	Remote sensing in combination with GPS data collected during ground truthing
Description of measurement methods and procedures to be applied	The minimum map accuracy must be 90% for the classificationof forest/non-forest in the remote sensing imagery. If the classification accuracy is less than 90% then the map is not acceptable for further analysis. More remote sensing data and ground truthing data will be needed to produce a product that reaches the 90% minimum mapping accuracy.
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	To be calculated ex-post
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	The Mapbiomas project contributes to understand the land use dynamics 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 covers 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 conversion of forest land to non-forest land. iv) Monitoring occurred during the entire fixed baseline period. In case of unavailability of Mapbiomas data for monitoring period, other souces will be consulted such as PRODES or a classification of imagery (Landsat8) will be carried out to measure deforested area: Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters..

	Evaluation of classification accuracy is performed by analyzing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be over than 90%, considered very good.
Purpose of data	Leakage emissions
Calculation method	Remote sensing and GIS
Comments	N/A

Data / Parameter	$ADefLB_{i,u,t}$
Data unit	ha
Description	Area of recorded deforestation in the leakage belt in stratum i converted to land use u in year t
Source of data	As per Module M-REDD v2.2. Remote sensing imagery.
Description of measurement methods and procedures to be applied	As per Module M-REDD. Satellite imagery analysis.
Frequency of monitoring/recording	Annually
Value applied	To be measured ex-post.
Monitoring equipment	N/A
QA/QC procedures to be applied	As per Section 9.3 of REDD+ MF or other VCS methodology that uses this module.
Purpose of data	Calculation of leakage emissions
Calculation method	N/A.
Comments	N/A.

3.3.3 MONITORING PLAN

The monitoring plan of the REDD Carbonflor combines three main components: Climate, Community and Biodiversity. As the Project Proponent, ECCON will be responsible for the coordination and execution of the monitoring plan activities and processes for climate, community, and biodiversity aspects.

In this section, the parameters to be monitored in the Climate aspect will be described, including AUDD and APD scopes. The monitoring plan for the parameters evaluated in the aspects of Community and Biodiversity will be addressed in the following sections, 4.4 and 5.3, respectively.

In general, according to VM0007, the monitoring plan provides four tasks: (1) Monitoring of project implementation; (2) Monitoring of actual carbon stock changes and greenhouse gas emissions; (3)

Monitoring of leakage carbon stock changes and greenhouse gas emissions; and (4) Estimation of ex-post net carbon stock changes and greenhouse gas emissions.

For each of these tasks, the monitoring plan must include the following information:

a) Technical description of the monitoring task
b) Data to be collected (the list of data and parameters to be collected must be given in PD)
c) Overview of data collection procedures
d) Quality control and quality assurance procedure
e) Data archiving
f) Organization and responsibilities of the parties involved in all of the above

3.3.3.1 MONITORING OF PROJECT IMPLEMENTATION

a) Technical description of the monitoring task

The project implementation includes: (1) delimitation of the project's accounting areas for each instance by analyzing the historical period and excluding consolidated areas, as described in section 3.1.3; (2) the stratification of the eligible area for measuring the carbon stock by vegetation classes, in order to reduce uncertainties and increase the accuracy of the results; (3) carbon stock estimates from secondary data available in the Brazilian Fourth Communication. These three tasks are performed for both the APD and AUDD scopes; (4) determination of deforestation rates for the APD and AUDD scopes, through proxy areas and reference region, respectively, (5) delimitation of the leakage area.

b) Data to be collected

Parameters	Source
Deforestation	PRODES (Inpe)
Land use multitemporal	MapBiomas
Vegetation classes	IBGE - BDiA
Default values (Above-ground Carbon Stock) by vegetation class	FOURTH NATIONAL INVENTORY OF ANTHROPIC GREENHOUSE GAS EMISSIONS AND REMOVALS

c) Overview of data collection procedures

To provide the project boundaries and stratification, secondary databases of official sources and data processing and mapping software were consulted, according to described in the table above. The data were downloaded to the ECCON server and plotted in geoprocessing software, in order to overlap the layers of interest for a combined analysis. In this way, the areas (in hectare) of each phytophysiognomy were calculated and the stock was calculated using a table prepared by the ECCON team, which has all the recommended and required assumptions by VM0007 and the applicable modules, including deductions based on the deforestation rate obtained for the scopes APD and AUDD.

d) Quality control and quality assurance procedure

The collection and analysis of data on a temporal scale, as well as the production of cartographic products were carried out by professionals from the team specialized in geoprocessing. Vegetation classes and carbon stock values for each phytophysiognomy were evaluated by a specialized team composed of botanical biologists and forestry engineers. The estimation worksheets are saved in the cloud directory, by PAI, containing the date of the analyzes, and a double check is made to ensure possible errors. A careful database was prepared with the phytophysiognomies present in the Cerrado and Amazonia biomes (Project Zone) in the spreadsheet, in order to automate data entry and reduce the chance of typing errors in the values. All files will be shared with the auditors.

e) Data archiving

Data archiving is carried out in accordance with the SOP called "data management" available as an appendix to the PD (Appendix 9: Standard operating procedures).

f) Organization and responsibilities of the parties involved in all of the above

ECCON has a multidisciplinary team, and as the only proponent of the REDD Carbonflor project, it works with the following teams:

- ✓ *Legal team: made up of lawyers, responsible for all document analysis of the areas included in Carbonflor REDD, as well as support in jurisdictional issues and any other front that the project may need.*
- ✓ *Geoprocessing team: has experience with various software and databases. All mapping of areas, consultation of deforestation data, degradation and production of cartographic products are carried out by this team.*
- ✓ *Field technical team made up of specialists in fauna and flora, responsible for collecting regional secondary data for each PAI, developing fauna and flora monitoring and designing forest inventories to be carried out to measure the carbon stock, as well as the statistical analyzes and calculations foreseen in the modules for carrying out the project.*
- ✓ *Community team: has experience with traditional communities and field work, working on the front of identification, characterization, and consultation with stakeholders, as well as with the development of social co-benefits.*
- ✓ *Carbon Management: responsible for contacting potential clients that will make up the project and validating and reviewing all data produced by the technical team. It will also be responsible for the dynamics of selling the credits as the project issues its VCUs.*

3.3.3.2 MONITORING OF ACTUAL CARBON STOCK CHANGES AND GREENHOUSE GAS EMISSIONS

a) Technical description of monitoring tasks

Changes in carbon stock and GHG emissions within the project area will be assessed at each monitoring period. For this, the following core activities will be carried out: analysis of vegetation cover, identification of disturbances and carbon stock measurements. ECCON is responsible for coordinating and executing activities.

b) Data to be collected:

Records of forest fires, anthropic degradation, undue alteration of land use will be mapped for analysis of forest cover and identification of disturbances that may cause damage to carbon stocks. To measure the carbon stock changes in the project area, data will be collected at least every five years regarding the forest inventory, such as taxonomic identification, height, and diameter of tree individuals.

c) Overview of data collection procedures

Monitoring of changes of use and land coverage:

To verify the vegetation cover and possible changes in land cover and use, high resolution spatial data will be used, using Landsat and CBERS sensors. The data collected by these sensors are made available and processed by institutions (such as the US Geological Service - USGS, and INPE with the appropriate geometric corrections and removal of clouds and shadows. The same sources should be used for the next monitoring periods unless satellites with higher resolution are available.

If any change is detected in the vegetation cover of the project area, these changes will be monitored and new estimates of carbon stocks will be carried out. At each monitoring period, the areas of each category within the project and leakage areas will be calculated and the reference maps of the vegetation cover will be updated. When the project baseline is renewed (every 6 years), these procedures will be performed again, adding an estimate of the total deforested area during the reference historical period in the reference region, with an update of the vegetation cover map.

Monitoring of carbon stock and emission on non-CO_2:

For measuring the carbon stock, forest inventories will be carried out in the project areas, to calculate the carbon stock in the monitoring period using primary data. The pools analyzed for measuring the carbon stock in the monitoring of REDD Carbonflor are: a) aboveground biomass; b) belowground biomass; and c) dead wood. By analyzing the sample sufficiency of each PA, considering a confidence interval of 95%, permanent plots will be allocated in each phytophysiognomy (stratified sample) to obtain tree biomass data. In each plot, trees will be identified to the lowest possible taxonomic degree and numbered. Diameter measurements will be taken at breast height (DBH) measured at 1.30m from the ground in forest formations and base diameter (DB30), measured at 30cm from the ground in savanna formations, using a tape measure. The height of individual trees will be estimated with the aid of a clinometer. From the collection of this information, the volume of the tree layer will be calculated, and then, conversion factors will be used to estimate carbon stocks. Measurements from the permanent plots were selected to indicate changes due to natural processes such as vegetation growth and mortality as well as changes due to human activities. Additional plots will be used in case of disturbance events, in order to verify if there were significant changes in the stock. Belowground biomass and dead wood will be accounted for by conversion factors available in the literature.

Fieldwork expeditions will also be associated with the use of drone images to estimate carbon stock, with the use of LiDAR, multispectral sensors, and RGB cameras, align with aerial photogrammetry techniques. The inventory will be carried out before each verification event and with a minimum frequency of 05 years.

d) Quality control and assurance procedures

The measures and oversight for quality control and accuracy will be documented with a standard operating procedure (SOP), for maintenance of quality control, accuracy and defining data archiving procedures. The SOP should be including procedures applied, including the training, all pre-processing steps and corrections and detailed explanation about data used in accuracy assessment related to ground-truth points (including GPS coordinates, identified land-use class, and supporting photographic evidence) and/or sample points of high-resolution imagery.

The ECCON technical team will be responsible for carrying out all quality control measures on remote sensing, carbon stock estimates, and GHG quantification. If a systemic deviation is found in the measurement and re- measurement of the parameter, the deviation is to be investigated, informed and resolved. When updating data stored electronically, the file should be versioned.

The field teams and the technical teams minimize error by working to check the identification of tree species and diameter measurements, and to review the data collected and input. If drones are used to measure carbon stock, all images will be stored electronically and backed-up.

To reduce and eliminate transcriptional errors, a subset of spreadsheets is proofed by re-reading the field notebooks and comparing it to the data that has been entered. Checks are also made for any values or variables that are outliers against the recorded data and corrected if deemed to be transcription errors. All publicly available satellite data used in monitoring, validation, verification and certification will be archived and made available to auditors.

Accuracy of the images will be assessed by comparing them with ground-truthing as well as drone imagery. Any data collected from ground-truth points will be recorded (including GPS coordinates, land-use classification, and supporting photographic evidence) and archived. All high-resolution drone imagery used to assess accuracy will also be archived.

e) Data filing

Data archiving is carried out in accordance with the SOP called "data management" available as an appendix to the PD (See Appendix 9: Standard operating procedures).

f) Organization and responsibilities of the parties involved in all of the above

The teams responsible for carrying out monitoring activities and the roles within each team are as follows:

Technical Team

- *Technical Manager – responsible for overseeing technical work to methodological and standard requirements, conducting quality control checks.*
- *Technical Analyst – responsible for conducting technical analyses related to remote sensing and project/baseline emissions calculations.*

Field Team:

- *Field Coordinator – responsible for training team members, conducting quality control checks, data recording, and transcription, and conducting ground-truthing of any identified areas with disturbances.*
- *Forest Engineers and/or Biologists – responsible for taking carbon stock measurements in the field and support the Technical manager in data collection and transcription.*

3.3.3.3 MONITORING OF LEAKAGE CARBON STOCK CHANGES AND GREENHOUSE GAS EMISSIONS

All significant sources of leakage will be monitored, following the same procedures described above in section 3.3.3.2.

3.3.3.4 ESTIMATION OF *EX POST* NET CARBON STOCK CHANGES AND GREENHOUSE GAS EMISSIONS

Ex-post estimates will be performed following the parameters described in section 3.2.4. The methodological procedures for data collection are the same as those described in section 3.3.3.2, looking at the project area and the leakage area. The procedures for quality and accuracy control and file archiving will also follow the standards described in section 3.3.3.2, as well as the organization of the team and responsibilities.

3.3.3.5 REVISING THE BASELINE FOR FUTURE PROJECT CREDITING PERIODS

The project baseline will be updated every 06 years, considering the applicable methodological procedures.

3.3.4 DISSEMINATION OF MONITORING PLAN AND RESULTS (CL4.2)

The results arising from the monitoring of REDD Carbonflor will be published on the ECCON website and on the VERRA platform through the monitoring report. Also, synthetized versions will be provided, in Portuguese, and in accessible language, to be sent to all interested parties and partners of the project. Such versions may be requested through the communication channel open to the Project (email carbonflor@ecconsa.com.br). In addition, the monitoring results will be presented to the communities during workshops and training offered by the project proponent in the subsequent monitoring period.

4 COMMUNITY

4.1 WITHOUT-PROJECT COMMUNITY SCENARIO

4.1.1 DESCRIPTIONS OF COMMUNITIES AT PROJECT START (CM1.1)

According to the CCB Standards and the 'Social and Biodiversity Impact Assessment (SBIA) Manual for REDD+ Projects: Part 1 – Core Guidance for Project Proponents', the process of identification of communities must consider that a community is a group of people that derive income, livelihood or cultural values and other contributions to well-being from the project area at the start of the project and/or under the project scenario. In cases where there are many small communities that have homogenous patterns of organization and livelihoods, they may be listed as one community.

The Project proponent and the landowners are private business. The landowners have been protecting the area. Consequently, communities living nearby have benefited by non-deforestation measures practiced so far.

4.1.1.1.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil) - Community Acaba Vida

For PAI 01, in Niquelândia, the process to identify communities was mapping, using the MapBiomas platform, and research in government databases. In INCRA's (National Institute of Colonization and Agrarian Reform - Instituto Nacional de Colonização e Reforma Agrária in Portuguese) database, it is possible to identify the rural settlements in municipalities.

In Niquelândia, there are 10 (ten) rural settlements, known as (from largest to smallest): PA Acaba Vida (Figure 106), PA Rio Vermelho, PA Julião Ribeiro, PA Conceição, PA Salto para o Futuro, PA José Martí, PA Água Limpa, PA Aranha, PA Engenho do Bom Sucesso, and PA Santa Rita do Broeiro.

Figure 106. Acaba Vida settlement.

In the Project influence zone, only the PA Acaba Vida is included, according to Figure 107.

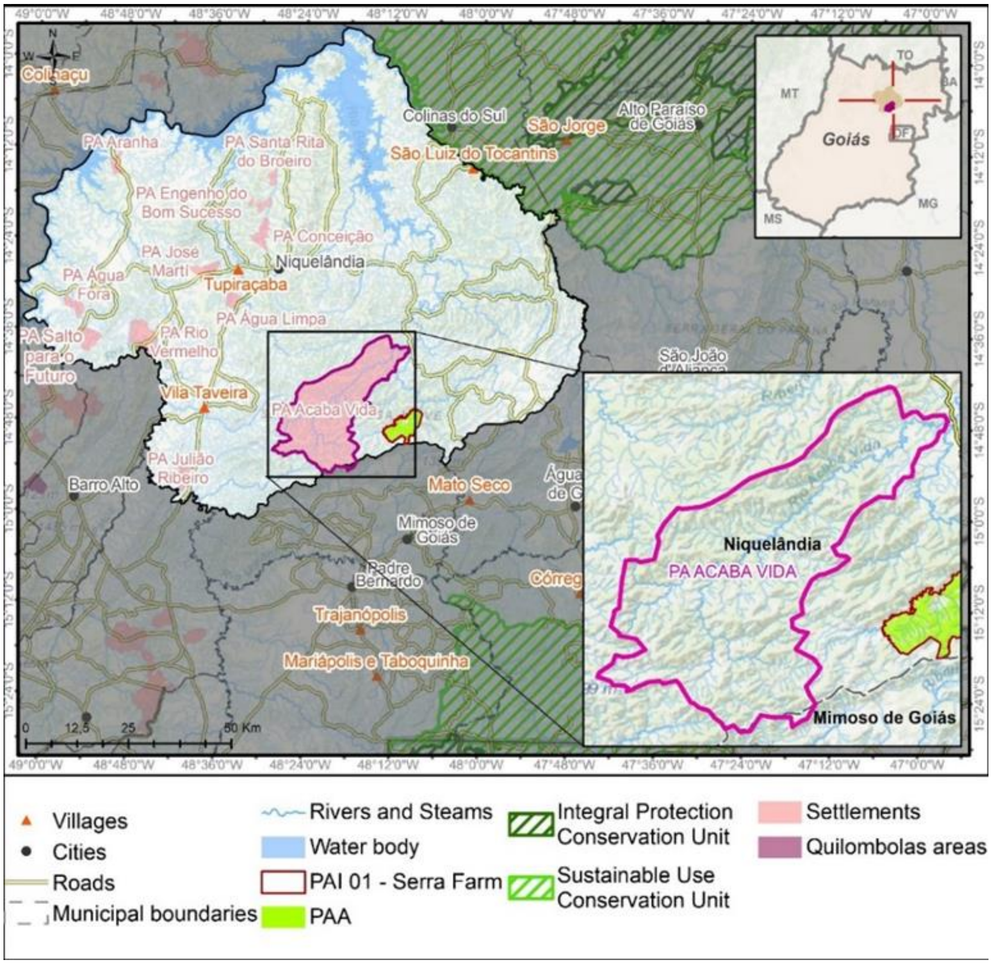

Figure 107. Acaba Vida settlement location relative to the PAI 01. Source: ECCON Team, 2022.

A settlement is a former rural property that is divided into many small rural lands for families or rural workers that cannot afford to purchase a rural property. The INCRA, a government agency, give the rural property under specific conditions, mostly based on the economical utilization of the area.

PA Acaba Vida was created by the Federal Decree No 93,556/1986, it was called "Acaba Vida Farm" and in the priority zone of agrarian reform. The area of the settlement is 46,742.10 hectares, in Niquelândia/GO. According to INCRA's data from 2019, the settlement was established on April 01, 1987, and has 59 families inside the area.

The Rural Environmental Sanitation and Health agency of the State of Goiás conducted a participatory technical diagnosis, in 2018, with the Acaba Vida settlement[89]. The land use of the region, according to the diagnosis, is 79.78% of the area covered by native vegetation, and 20.14% by pasture.

The settlement income from the families is basically distributed as: (i) livestock; (ii) community projects, in infrastructure; (iii) retirement and pensions; and (iv) government aid. The average amount received by the families in the community is R$1,220.47 per month. The access conditions and dirt roads are in bad conditions and it´s very difficult even for children to reach school. The local health unit has fallen apart due to lack of maintenance and is not currently operative. There are no doctors or nurses attending the community, making them marginalized from health emergencies and proper health care support.

History

The history of agrarian issues in Brazil makes clear the relationship of family farmers149 already marginalized by the similar work to enslaved in the farms, to be settled on deceitan lands with the lack of the state's ability to serve them appropriately in their needs and rights guaranteed by law, such as access to basic transportation, education, health and housing infrastructures, in addition to the look of that same State in favor of large landowners and to the detriment of the family farmers communities. (FERRETTI, 2021)[150].

The period frame about those conflicts is settled during the military regime in Brazil and according to Jelineck[151] (2006, p.18) two main goals were aimed, but only one of them were achieved:

> It is worth noting that the Earth Statute was created by Law 4,504 of November 30, 1964, and therefore, a work of the military regime that had just been installed in Brazil through the military coup of 31. Its creation will be closely linked to the climate of prevailing dissatisfaction in the rural environment and the fear of the government and the conservative elite for the outbreak of a farmers' revolution. With the spectres of the implementation of land reforms in several Latin American countries, farmers in Brazil began to organize since the 1950s, with the emergence of trade unions and acting in the progressive wing of the Catholic Church and the Brazilian Communist Party. The movement for greater social justice in the rural areas and agrarian reform was generalized in the country and took on large proportions in the early 1960s. However, this movement was virtually annihilated by the military regime installed in 1964. The creation of the Earth Statute in 1964[152] and the promise of agrarian reform was the strategy used by the rulers to appease the family farmers and reassure the large landowners. The goals set by the Earth Statute were basically two: the implementation of an agrarian reform and the development of agriculture. Decades then, the first goal was only on paper, while the second received great attention, especially regarding the capitalist or business development of agriculture in Brazil.

Both historical evidences provide the record of marginalization and consequent vulnerability of the family farmers communities since the beginning of the first settled families during the 1950s and 1960s, besides the great conflicts with the landowners that still remain present to nowadays.

The Community Acaba Vida is a standard example of this history matching its important dates with the agrarian issues and movements in Brazil. From 1964, when the first families arrived at the farm to claim that the social function was not being respected, until 1987 when INCRA decides for the families settlement, an intense process marked by legal conflicts extended for decades.

During visits to Acaba Vida community for the first meetings held in January/2023, it was possible to collect information directly from the first residents of the settlement, people who arrived with their families still small, under 10 years old and who today are over 60 years old. Some of them no longer live within the area of the

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[149] In Brazil, the "use of the term peasant will have as a time frame the 1950s, period in which the great economic and social transformations gave rise to debate the agrarian issue" (PEREIRA, 2009, p. 291), as a result of the "Peasant Leagues." Pereira (2009) and Altafin (2007) dialogue that in the 1970s is marked the concept of small production and the transition from the 1980s to 1990s, comes the term *family farming* and which is consolidated as it "would have a generic character, including different productive situations performed by rural family centers" (PEREIRA, 2009, p. 293)

[150] FERRETTI, K. D. Cadeia dominial e processo de desapropriação da fazenda Acaba Vida, Niquelândia-GO (1765-2021). Goiânia: UFG, 2021, p.31.

[151] JELINECK, R. O princípio da função social da propriedade e sua repercussão sobre o sistema do Código Civil. Porto Alegre: PUCRS, 2006, p.18.

[152] https://www.planalto.gov.br/ccivil_03/leis/l4504.htm

community of Acaba Vida but have spent much of their lives living on the site and today live in the surroundings.

According to the interviews with this community, their families arrived in 1964 and joined a few other families who had been there since the 1950s, who were from the same State of Goiás. Their families came from Minas Gerais State in horses, in search of better working conditions and ownership of devotional land or that did not properly fulfill the social function of the land, sufficient argument for entry into the process of settlement of families.

Those family farmers used to plant rice, beans, corn and coffee. They explain that during the 1970s until the 1990s, the period of the legal settlement (1987), Acaba Vida had many more family farms running than now. Due to the soil depletion and the decay in the price of coffee, they started to change their main economic activity to livestock breeding, which is still the main income of the Acaba Vida families, so agriculture (corn, manioc, coffee and beans mostly) is more of a subsuistence activity.

As the largest settlement of the State of Goiás, the distribution of Acaba Vida families in its more than 46,000 hectares occurs remotely (Figure 108). Each family nucleus has a small farm and therefore is configured in a scattered way in the area. The sub-groups of the community are divided by the schools of São Jorge (which serves the families of the locality of Machadinho, around 8 families), José Mariano (in the locality known as Acaba Vidão, with 44 families) and Dom Bosco, the locality called Acaba Vida with more than 60 families. Although the legal numbers of the settlement account for only 59 families, during the visit it was possible to identify more than 200 families living in Acaba Vida.

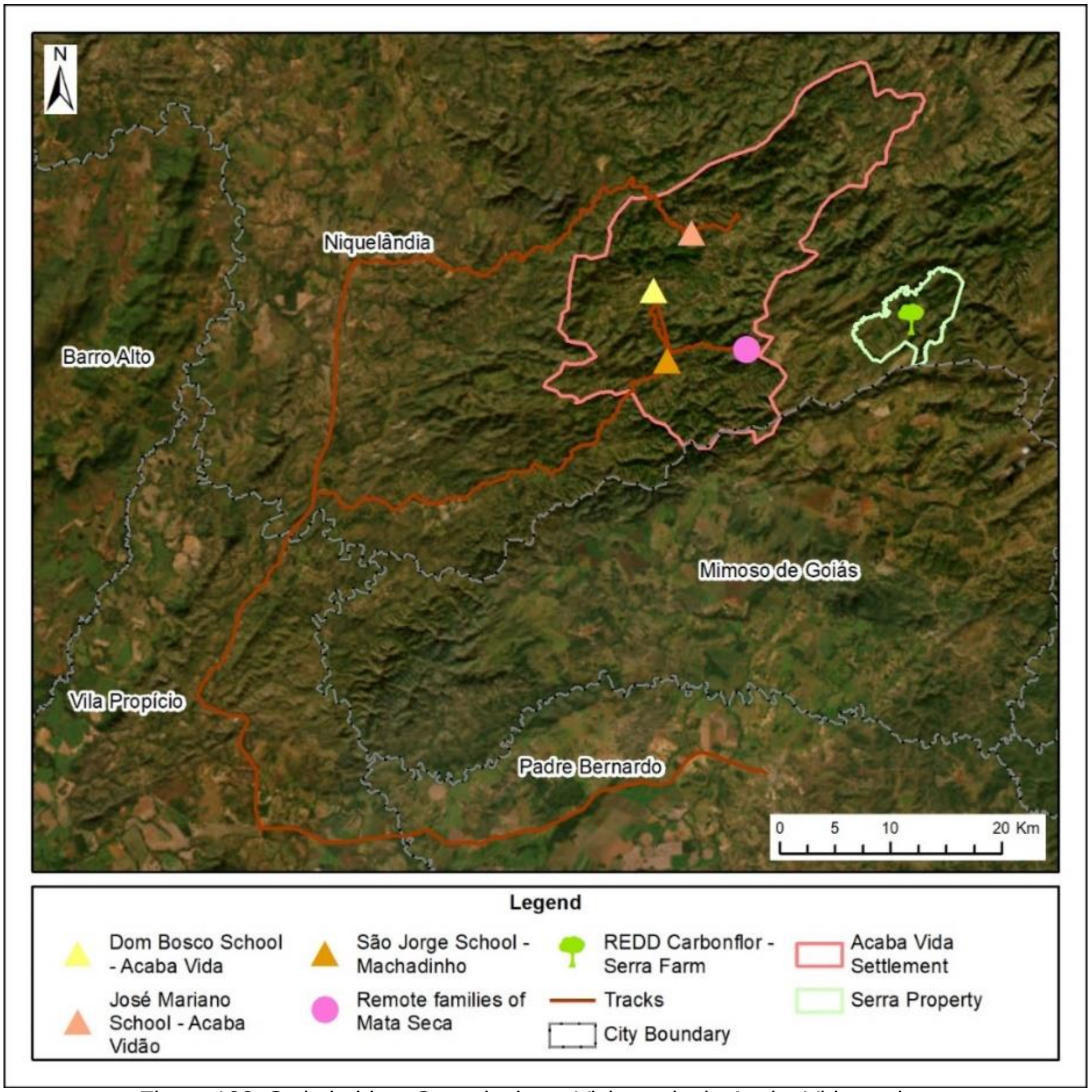

Figure 108. Stakeholders Consultation – Visit on site in Acaba Vida settlement.

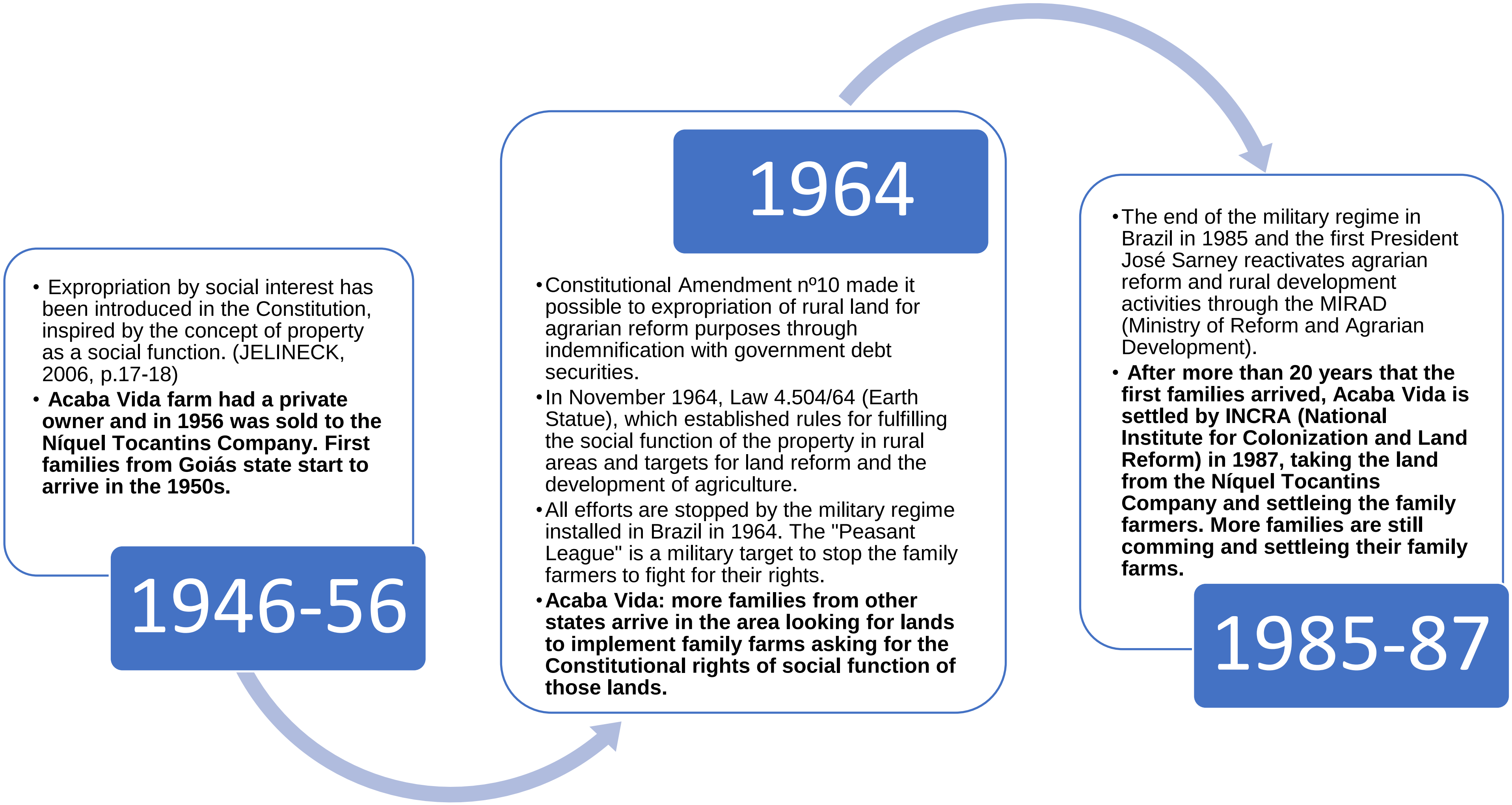

Figure 109. Historic context in Brazil comparing with Acaba Vida settlement´s timeline.

Transport & Access

The greatest infrastructure difficulty faced by the community of Acaba Vida, in all its localities, is the access. The dirt roads have a lot of stones and large erosions, the wooden bridges are in a precarious state of conservation. The distances are long between the families´ farms and the places they need to reach in order to send their products for selling. There are life risks to those who transit these roads and maintenance is carried out by the residents themselves, with few resources to make improvements.

The most important impacts of the precariousness of access, reported by residents, are related to the limitation in the economic development of their agricultural and livestock activities, such as:

1) The conditions for the agricultural production to be delivered are precarious, so that the production cannot be sold easily and ends up been spoiled, especially in the case of fruit and milk;

2) The carriers refuse to serve the community of Acaba Vida to carry out the transport of cargo (agricultural and livestock), due to the risks of accessing the dirt roads;

3) The long transport walking from the farms to the point where the cattle can be shipped, makes the cattle to lose weight and devalues its price, which is sold per kilo.

Besides the limitation in economic activities, the hard logistics also impacts their lives when health situations occur. A mother in labor or transporting an elderly can be huge challenges for the families to overcome and sometimes impossible under heavy rain. Emergencies are even worse situations, once there is no phone signal throughout the dirt roads.

Improvements in the road access and the bridges structures are a key issue for the Community of Acaba Vida, making this topic their first concern.

To access the Community, ECCON's team had to use a 4x4 vehicle and horses to reach the schools for the meetings. One of the entrances of the Community is located at the Quebra-Linha, in Vila Taveira / Niquelândia, which is 200km away from Brasília (Brazil´s Capital) and 240km from the State Capital, Goiânia. The road is paved and well maintained until the Quebra-Linha, but from there, when the dirt roads start to go inside Acaba Vida Community, the precariousness can be seen.

Figure 110. The dirt road and bridges conditions in Acaba Vida settlement.

From the Quebra-Linha, ECCON team reached the Machadinho locality, 44km in dirt road with 4x4 vehicle, for the first meeting at São Jorge School. On the second day, also by 4x4 vehicle, we had to come back all the way to the Quebra-Linha to reach another entrance to Acaba Vidão locality, for the second meeting at José Mariano School. By 4x4 vehicle we drove the 44km from the Machadinho to Quebra-Linha and another 40km to Acaba Vidão on dirt roads.

Figure 111. The dirt road conditions in Acaba Vida settlement.

On the third day we left from Quebra-Linha back to Machadinho (44km in dirt road), took the horses and continued for another 8km to reach the remote families of Mata Seca locality, where not even the 4x4 vehicles can access. On the fourth day we left Machadinho locality to reach the Dom Bosco School locality also by horses (7km each way).

Health

Of the 3 localities visited and by the report of the residents, the health issues in Acaba Vida are a major concern of the Community. Only one building was found as the health center at the locality of Machadinho, where there´s a Community Health Agent (Agente Comunitário de Saúde - ACS in Portuguese), however, it´s closed since 2014 due to the building´s lack of maintenance. The residents themselves carried out a refurbishing in the building in 2017, but it was used as a classroom for the nearby school São Jorge until it was closed again completely and is now inoperative.

Acaba Vida doesn´t have health centers to attend the Community, not even a proper ambulance to be used in dirt roads for emergencies and more Community Health Agents to attend each locality.

Many problems come with this lack of access to health facilities, especially regarding the elderly, the children and the women needs. When a family member is sick, they need to move to nearby cities to be able to reach health assistance, many times living behind their plantation or having to sell their animals, that require intensive work and care, and which are the family’s main source of income.

Figure 112. Inoperative Health Center of Machadinho at Acaba Vida Community.

Education

Through interviews and local visits, the history of education in Acaba Vida starts in the living room of a few houses in 1968, when teachers themselves had only until the 4th grade. Nowadays, there are 3 schools in Acaba Vida Community distributed in different localities, attending from 1st grade to high school. All schools give classes during the morning and evenings for the high school students that work during the day.

None of them offer small children's education, from 2 to 5 years old. Residents pointed out that not having the infant education is harmful for the children´s literacy process, once during this period they should already learn the basic information for their alphabetization that takes place on the first regular year. Without it, the children have difficulties in learning during the first years of elementary school, reflecting on their ability to write and read in the long term.

At the schools that the teachers do not live in the Community, there are innadequate accommodation conditions for them to stay during the week, having to sleep on a mattress on the floor and not having a proper place for shower and kitchen.

1) São Jorge School: located in Machadinho, with 2 buildings, one dedicated to the first elementary years (1st to 5th) and high school (Figure 113), and another building (newer) dedicated to elementary years from 6th to 9th (Figure 114). The school has around 20 students.

Figure 113. The first building of São Jorge School (1st to 5th grade and high school) in Machadinho locality.

Figure 114. Second building of São Jorge School (6th to 9th grade) in Machadinho locality.

2) José Mariano School: located in Acaba Vidão locality, is the least structured building of all the schools. Elementary (1st to 9th year) and high school education (Figure 115). The school has around 40 students.

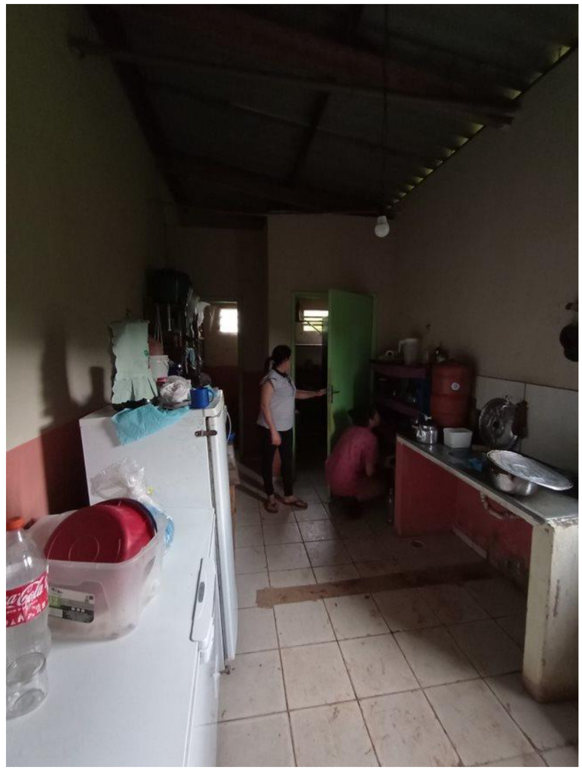

Figure 115. José Mariano School in Acaba Vidão locality.

3) Dom Bosco School located in Acaba Vida, the largest and best structured school of the Community. Elementary (1st to 9th year) and high school education (Figure 116). The school has around 24 students.

Figure 116. Dom Bosco School in Acaba Vida locality.

Economic Activities

The Rural Environmental Sanitation and Health agency of the State of Goiás conducted a participatory technical diagnosis, in 2018, with the Acaba Vida settlement. The study was very important to map out some data of the Project. The land use of the region, according to the diagnosis, is 79.78% of the area covered by native vegetation, and 20.14% by pasture (Figure 117).

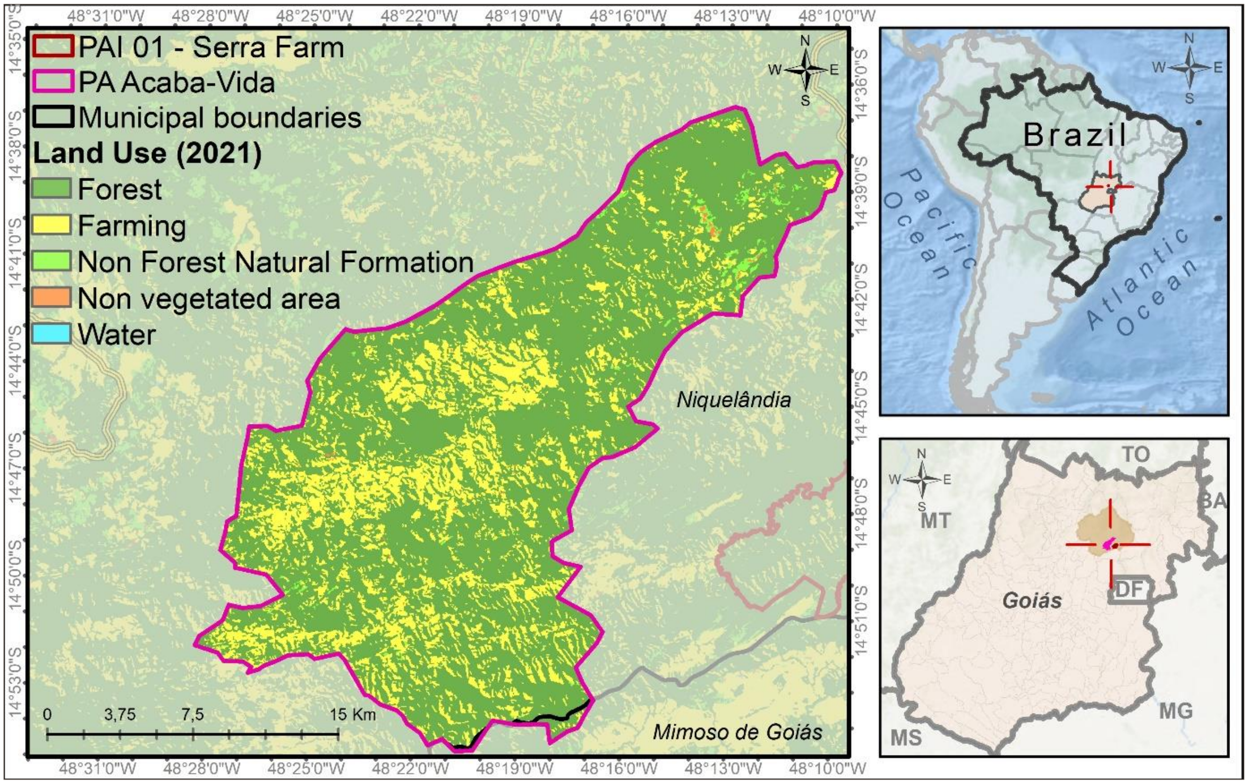

Figure 117. Acaba Vida settlement

The main income from the families is basically distributed as: (i) livestock; (ii) community projects, in infrastructure; (iii) retirement and pensions; and (iv) government aid. The average amount received by the families in the community is R$1,220.47 per month.

During the visit it was possible to verify that livestock is the main income for the families and plantation plays an important role as food security part, but much less as an income. The livestock is raised in each family´s small farm, sometimes in steep valleys of Acaba Vida mountains. Young boys by the age of 13 years old are already working with their parents helping to take care of the cattle and usually attending high school during the evenings.

The milk also plays an important role for the food security of the families, as the women produce cheese and other sub-products from it. The community expressed their wish to develop this handmade production to a more organized level, capable to become a source of income, especially for the women.

During the visit it was possible to identify an old project of the Ministry of Environment implemented in the year 2000 that still has a building (which is in precarious condition in 2023) dedicated to the babaçu coconut beneficiation. The residents described that the small factory was made to offer an income through the products that can be made with babaçu coconut. However, the coconut is very hard to break, and the machine broke in the early stages of the project. Not being able to work in the factory and without any further assistance, the building and the project were abandoned for over 20 years.

Figure 118. Babaçu coconut factory (abandoned). Source: ECCON Team, site visit, 2023.

Livelihood

The Community is distributed in three main localities: Acaba Vida / Acaba Vidão / Machadinho. Each family household is distant from each other, due to the size of the family farms. The families don´t struggle with food insecurity because they plant and consume most of their food needs, but many items are bought by the families in the closest market in the nearby cities of Vila Propício and Padre Bernardo, making them dependent on vehicles and struggling with the hard access.

During the visit we could also identify remote families and their households are classified as having less comfortable conditions (such as no bathrooms and wooden ceilings) than the ones closer to the main dirt roads accessible by 4x4 vehicles. Those remote families are more dependent on natural resources for their self-sustainability, such as using pork´s fat to produce their own soap and planting almost 100% of their food needs.

Figure 119. Remote family households in Acaba Vida. Source: ECCON team, site visit, 2023.

The remote families doesn´t have access to energy supply and few have a solar panel for emergency needs, such as being able to charge a cellphone and take it all the way to a neighbor that has internet or on top of a mountain to find a bit of signal. Internet access is very expensive in comparison to the families average salary, so few families can have internet connection. There´s no phone signal easily accessible and families, that can´t afford to have internet connection, are completely isolated from communications.

Often there´s lack of energy supply or problems in the network that can take days to be fixed by the municipality. When this occurs, the schools can´t have the night classes and the families become completely vulnerable without internet connection and energy for their living and farming needs, such as to turn on water pumps and other machinery.

Regarding the garbage management and disposal, residents declared they need to burn their waste due to lack of the municipality´s management about this matter, providing evidence that the community is marginalized from public services.

Major development constraints

The education system in Acaba Vida is one of the major development constraints of the Community. Since the buildings structure, facing the lack of proper water and energy supply, accommodations for the teachers and kitchen, until the basic level of instruction of teachers, lack of courseware support, library and ludic learning tools. The schools doesn´t provide young children education (from 2 to 5 years old) which has a direct impact in the first years of learning, by decreasing the children´s capacity of being literate in the first two years of elementary school and making it harder for them to develop properly in the disciplines understanding, because they still illiterate or with few ability to understand what they write and read until the late years of elementary school. Furthermore, the lack of education in general makes the Community vulnerable in not being able to organize themselves in associations or cooperatives to strengthen their own governance system.

The access by the dirt roads in precarious conditions is also one of the major development constraints of the community´s development. The residents indicate that if they had a better access to take their products for selling, they would be able to make larger and more diversified plantation. As mentioned in Transport & Access item, their cattle lose weight during the trip to reach the shipping point and consequently loses value per kilo and carriers refuse to take their production, making it more expensive for them to transport their cargo.

4.1.1.1.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

Information about the communities in PAI 02 are under development. Site visits are scheduled to happen in the first semester of 2023.

4.1.1.1.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

Information about the communities in PAI 03 are under development. Site visits are scheduled to happen in the first semester of 2023.

4.1.2 INTERACTIONS BETWEEN COMMUNITIES AND COMMUNITY GROUPS (CM1.1)

4.1.2.1.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

In the context of PAI 01, the manager of Serra Farm, Márcio, sells cattle to Mario Augusto, one of the residents of the Acaba Vida settlement, a key point for the project's contact with the community.

Between the community´s sub-groups, they showed a good relationship among the families, although many of them live very distant from each other, due to the settlements´ size. For this reason, they asked for the different meeting´s location and to have representatives from each sub-group, representing the needs and supporting communication in each locality.

The community´s interactions with other stakeholders, such as the municipality offices of Niquelândia was point out by the residents as distant. The lack of resources sent to their basic needs, such as access, health, education, electricity, and communications coverage, shows evidence of how much the community of Acaba Vida is marginalized by the public sector of Niquelândia. Acaba Vida is also far away in geographic distance, over 50km from the urban area of Niquelândia, which contributes to its marginalized condition.

4.1.2.1.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

Information about the communities in PAI 02 are under development. Site visits are scheduled to happen in the first semester of 2023.

4.1.2.1.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

Information about the communities in PAI 03 are under development. Site visits are scheduled to happen in the first semester of 2023.

4.1.3 HIGH CONSERVATION VALUES (CM1.2)

4.1.3.1.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

Connected to the project´s area it´s possible to identify that the Acaba Vida river receives direct influence from the conservation Project to deliver good quality water supply for the Community. Residents consume water straight from their sink (coming from the river) and use the water for their plantation and cattle. Both activities are directly connected to their food security and main economic activity.

This relationship with the water supply between the project's area and the Community are highly important for the benefits delivered to the Community by the project´s existence in assuring that the water quality will be kept and improved by the conservation of nature around it.

Table 100. High Conservation Values Niquelândia

High Conservation Value	Acaba Vida and Bagagem Rivers
Qualifying Attribute	HCV 4: Ecosystem service in critical situation – protection of water catchments and maintaining water quality characteristics.[153]
Focal Area	Confluence of the two rivers, where the settlement area begins. The Acaba Vida River, based on historical data[154], had 50% of water appearance between 1985 and 1995. From 1995 to the present day, its presence has been dropping to close to 0%, with no further data on the map since 2010. There is also no data in the state water resources systems of Goiás (SECIMA), only available for the Bagagem River.

4.1.3.1.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

Information about the HCV in communities in PAI 02 are under development. Site visits are scheduled to happen in the first semester of 2023.

[153] BROWN, Ellen et al. Common guidance for the identification of High Conservation Values. HCV Resource Network, p. 1-74, 2013.

[154] Information provided by Water Map from MapBiomas. Available at: https://plataforma.brasil.mapbiomas.org/agua.

4.1.3.1.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

Information about the HCV in communities in PAI 03 are under development. Site visits are scheduled to happen in the first semester of 2023.

4.1.4 WITHOUT-PROJECT SCENARIO: COMMUNITY (CM1.3)

4.1.4.1.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil) - Acaba Vida Community

The agency for Rural Environmental Sanitation and Health of the State of Goiás, with the participatory technical diagnosis already mentioned, gives a description of the households in the region of Niquelândia/GO and the information was validated by ECCON´s team during the first visit in January/23.

In the without-project scenario it is expected that the community of Acaba Vida to continue having difficult access by dirt road, poor formal education (structure and teacher´s support), little access to health care, lack of proper basic sanitation and garbage management, lack of electricity to all households, among other difficulties such as access to cell phone coverage and internet.

Many people from rural areas sell their land to new occupants and move to the cities due to the marginalized situation. This happens, for example, when an elderly needs access to health care and the whole family needs to move where they can access better health facilities. This way, many areas in the vicinity of the land, that used to be from the community´s settlement, are occupied by squatters and/or invaded by cattle raisers, miners, and land grabbers, causing great social disturbances.

Therefore, the expected changes in welfare conditions and other characteristics of communities and community groups in the without-project land use scenario are negative. This project aims to encourage forest conservation and maintain the community´s culture, with improvements in their living conditions and empowerment of their governance systems.

4.1.4.1.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

Information about the communities in PAI 02 is under development. Site visits are scheduled to happen in the first semester of 2023.

4.1.4.1.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

Information about the communities in PAI 03 is under development. Site visits are scheduled to happen in the first semester of 2023.

4.2 NET POSITIVE COMMUNITY IMPACTS

4.2.1 EXPECTED COMMUNITY IMPACTS (CM2.1)

Negative impacts are understood as risks and costs for the communities and positive impacts as benefits. The project design and participatory tools for decision-making processes aim to increase potential benefits and mitigate identified risks. No costs will be under the communities' responsibility. All expected community impacts were mapped in a participatory way, during the face-to-face meetings.

4.2.1.1.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

Table 101. Expected positive impacts for the community of Acaba Vida.

Community Group	Acaba Vida
Impact(s)	Fire
Type of Benefit/Cost/Risk	Risk: wildfires are common in Cerrado biome, but also illegal fires intentionally caused by human activities, both inside the PAI 01 and the settlement.
Change in Well-being	Negative change in the community´s well-being can be caused by the loss of vegetation cover, biodiversity and possible loss in their agriculture production and cattle. It´s a high relevance risk with possible critical consequences for their well-being and the families' loss of income.
Mitigation Measures	The landowners have the responsibility to attend a Fire Prevention and Emergency Plan, which will be supported technically by ECCON team. Participatory tools will be used to engage the possible affected stakeholders to participate in the actions.

Community Group	Acaba Vida
Impact(s)	Diversify income sources for the families
Type of Benefit/Cost/Risk	Actual benefits: cheese making courses, direct benefit for women. Predict benefits: by qualifying the cheese production, handmade by the community´s women, they can improve and generate another source of income for the families.
Change in Well-being	Empowering women to be able to improve their family´s income, they can work from home while taking care of the small children, improve their household conditions and achieve financial independence.

Community Group	Acaba Vida
Impact(s)	Governance system strengthen
Type of Benefit/Cost/Risk	Actual benefits: training and support for the community to organize their governance system has indirect benefit for all the activities they plan in the future. Predict benefits: by supporting the community to organize themselves as associations or cooperatives, they will achieve proper conditions to search for partnerships to improve their livelihood.
Change in Well-being	Strengthening the community´s governance system will provide better conditions for them to articulate their needs with the public sector and other partnerships to reach their own collective goals in a long-term change possibilities in their well-being.

Community Group	Acaba Vida
Impact(s)	Agronomic Engineer Consultancy
Type of Benefit/Cost/Risk	Actual benefits: research and training for the community to improve their plantation systems, has a direct impact in their agriculture production and soil management. Predict benefits: by testing the soil and training the community, they will be able to make better investments and get better results from their agriculture production while taking care of the soil.
Change in Well-being	By fixing the best investments for the soil and improving their agriculture production, family income will improve and consequently their livelihood.

Community Group	Acaba Vida
Impact(s)	Training in genetics improvement for livestock
Type of Benefit/Cost/Risk	Actual benefits: training for the community to improve their livestock breeding, has a direct impact in their sales income. Predict benefits: by improving the cattle genetics, they will have best prices in their sales, which is the main income for the families.
Change in Well-being	By increasing their cattle prices, family income will improve and consequently their livelihood conditions.

Community Group	Acaba Vida
Impact(s)	Dirt roads and bridges improvements
Type of Benefit/Cost/Risk	Actual benefits: strengthening relations with the responsible public sector that must take care of the dirt roads and bridges of the community has a direct impact in their livelihood conditions. Predict benefits: by articulating and supporting the community to demand their rights for better access conditions, the dirt roads and bridges will be improved. Predicted risks: improving access may open the community to invasion and disorganized visitation impacts.
Change in Well-being	Having better bridges and dirt roads may bring negative impacts for the community, that must be mitigated. On the other hand, their production can be taken more easily to the market and increase their income, improving their livelihood. Also, emergencies and services (such as doctors caravans) can be done more easily and provide better assistance for the community´s needs in health, education, and other services.

4.2.1.1.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

Information about the communities in PAI 02 is under development. Participatory decision-making meetings about the projects are scheduled to happen in the first semester of 2023.

4.2.1.1.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

Information about the communities in PAI 02 is under development. Participatory decision-making meetings about the projects are scheduled to happen in the first semester of 2023.

4.2.2 NEGATIVE COMMUNITY IMPACT MITIGATION (CM2.2)

Possible community impacts are related to the identified risks and their fears. A participatory tool through the communication channels to listen to the communities' fears and questions will be available during the whole project´s lifetime and the identified risks can be considered for mitigation measures before they happen, in a precautionary way.

During the monitoring reports and site visits, ECCON's team will be attentive to all opportunities to enhance positive impacts regarding HCV to the community's livelihood. In case any disturbance in HCV is identified or the communities report possible risks, mitigation measures will be promptly implemented for each specific situation and according to the communities' decisions about which are their priorities.

Mitigation procedure:

- *To stimulate the participatory analysis by the communities about possible risks.*
- *To create an effective communication channel to listen to the communities.*
- *To bring the fears and questions from the communities to the mitigation measures planning with a precautionary principle.*
- *To be attentive to HCV behavior, implement mitigation measures as soon as any disturbance is identified.*
- *To report all identified risks during monitoring report and plan mitigation measures to be promptly implemented.*

4.2.3 NET POSITIVE COMMUNITY WELL-BEING (CM2.3, GL1.4)

Through participatory tools of decision-making, the communities´ well-being benefits will be addressed to strengthen their governance systems, improve their family´s income and income sources opportunities, and the articulation connections with public sector and other partnerships to bring solutions in the long-term to the community´s collective goals. All those activities that wouldn´t happen in a without the project scenario and that would bring the populations to a more vulnerable and marginalized condition with the climate change scenario.

To achieve gold level in the projects planning, women empowerment and focus in livelihood improvements for the most vulnerable and marginalized populations will be the first concern for the social projects implementation. By supporting the communities to diversify their sources of income, improve their livelihoods and strengthening their ability to self-sustainability, they will be better prepared for climate changes demands in the future, being able to provide food security for the families and to protect the HCV that provides important ecosystems services for their agriculture and livestock activities.

4.2.4 HIGH CONSERVATION VALUES PROTECTED (CM2.4)

The HCV are a focal point for the project´s concern in a way that all the identified relationship between communities and the project area will be mapped and analyzed. For those communities that have indirect and limited connection with their livelihoods depending on the project´s area, nonnegative impacts were identified for the communities that could be linked to the project´s implementation. For those communities living inside or very close to the project´s area and having relevant connections for their livelihoods, such as water supply and wood source for construction and firewood, protection measures will be taken to improve the HCV access for them, bringing positive impacts by ensuring that the communities benefit from the project´s implementation.

4.3 OTHER STAKEHOLDER IMPACTS

4.3.1 IMPACTS ON OTHER STAKEHOLDERS (CM3.1)

The benefits of ecosystem services will impact all people living in a nearby area, not just the communities expressed in the project. Climate regulation is important to both people living in remote and rural areas and to people in the cities, therefore the benefits of the project will reach a wide range of people and other stakeholders.

Also, by strengthening the communities´ governance system and articulating with the public sector, other stakeholders are benefited from these connections by being supported to achieve their political goals in better attending marginalized populations. Those connections are made possible by the social project´s implementation and will benefit the whole economic system locally.

4.3.2 MITIGATION OF NEGATIVE IMPACTS ON OTHER STAKEHOLDERS (CM3.2)

There are no negative impacts expected to affect other stakeholders. For any cases, a grievance redress process will be available during the whole project´s duration, to identify any possible claims as a measure of mitigation of negative impacts.

4.3.3 NET IMPACTS ON OTHER STAKEHOLDERS (CM3.3)

The project´s design analyzes possible risks for the stakeholders and all decisions are made to not to generate negative impacts. Through continuous stakeholders' meetings and communication channels, all possible impacts perceived by other stakeholders will be mapped and brought to the project´s design not to generate negative impacts. In case any negative impact is pointed out by the stakeholders as possible to happen, participatory decision-making tools will be used to create mitigation measures during monitoring reports.

4.4 COMMUNITY IMPACT MONITORING

4.4.1 COMMUNITY MONITORING PLAN (CM4.1, CM4.2, GL1.4, GL2.2, GL2.3, GL2.5)

The community monitoring plan aims to identify the communities and other interested parties that will be monitored, the variables and monitoring methods, as well as the frequency and how the monitoring results will be assessed. The communities to be monitored are presented in section 4.1.1.

The table below brings together the indicators and impacts that will be monitored in the Project. The activities developed in the communities and the results of the actions will be reported in the monitoring reports.

Table 102. Summary of activities planned for monitoring community impacts

Stakeholder Type	Project Objectives	Monitoring variable	Measurements / Indicators	Method	Impact assessment	Frequency
Communities Types: A / B / C / D	Empowerment: Strengthening in the community's capacity to manage and confront their own needs	Governance system strengthen	- Which governance system was implemented? - What is the working plan for the governance system? - How is the governance system working and achieving its goals?	Participatory assessment during face-to-face meetings.	• Did the governance system bring benefits for the community? • Were there any negative impacts? • What are the next steps to bring more benefits? • What could change in the working plan?	With monitoring report
Communities Types: A / B / C / D	Security: The benefits are fairly distributed and both parts benefit from the development of the social projects	Social projects	- Number of projects implemented. - Number of families benefited. - Percentage changes in family´s income.	Participatory assessment during face-to-face meetings.	• Were the families benefited by the project? • Were there any negative impacts? • What other projects are the community´s priorities? • What could change in the working plan? • Do the community feel that the benefit sharing process is fair?	With monitoring report
Community Sub-groups in Acaba Vida Type: B	Opportunity: Increase in the capability of the Project to generate jobs and income in short and long	Cheese production	- Number of women that participated in the training. - Number of families selling cheese. - Cheese quality and price.	- Evaluation questionary to the families. - Cheese quality and price comparation in the market.	• Were the women benefited by the cheese making courses? • Were there any negative impacts? • What are the next steps to bring more benefits?	Biannually

	term for the community		- Percentage increase in family´s income.	- Impact assessment during online meetings with community´s representatives.	• What could change in the working plan?	
Community Sub-groups in Acaba Vida **Type: B**	Opportunity: Increase in the capability of the Project to generate jobs and income in short and long term for the community	Agriculture production and soil management	- Number of people that participated in the training. - Number of families reached. - Agriculture production measurements.	- Evaluation questionary to the families. - Agriculture production numbers. - Impact assessment during online meetings with community´s representatives.	• Were the families benefited by the agronomic consultancy? • Were there any negative impacts? • What are the next steps to bring more benefits? • What could change in the working plan?	Biannually
Community Sub-groups in Acaba Vida **Type: B**	Opportunity: Increase in the capability of the Project to generate jobs and income in short and long term for the community	Livestock genetics improvement	- Number of people that participated in the training. - Number of families reached. - Number of inseminated semen. - Cattle quality and price. - Percentage increase in family´s income.	- Evaluation questionary to the families. - Cattle quality and price comparation in the market. - Impact assessment during online meetings with community´s representatives.	• Were the families benefited by the cattle genetics improvement? • Were there any negative impacts? • What are the next steps to bring more benefits? • What could change in the working plan?	Biannually
Community Sub-groups in Acaba Vida **Type: B**	Empowerment: Strengthening in the community's capacity to manage and		-Number of agreements and articulations with public sector.	Impact assessment during online meetings with community´s representatives.	• Were the families benefited by the dirt roads and bridges improvement? • Were there any negative impacts?	Biannually

	confront their own needs	Dirt roads and bridges improvements	- Number of bridges improved. - Length of dirt roads improved.		• What are the next steps to bring more benefits? • What could change in the working plan?	
Other stakeholders **Types:** **E / F / G**	Empowerment: Strengthening in the community's capacity to manage and confront their own needs	Partnerships	- Number of agreements and articulations done. - Number of families reached. - Results and status of implemented projects. - Community´s assessment about each project implemented.	Online meetings and e-mails to share information.	• Is the institution satisfied with the partnership? • Were there any negative impacts? • What are the next steps to bring more benefits? • What could change in the working plan for the current projects? • Are you interested in new partnership agreements?	Biannually

4.4.2 MONITORING PLAN DISSEMINATION (CM4.3)

The results arising from the monitoring of REDD Carbonflor will be published on the ECCON website and on the VERRA platform through the monitoring report. Also, synthetized versions will be provided, in Portuguese, and in accessible language, to be sent to all interested parties and partners of the project. Such versions may be requested through the communication channel open to the Project (email **carbonflor@ecconsa.com.br contato@ecconsa.com.br**). In addition, the monitoring results will be presented to the communities during workshops, sent via WhatsApp group and training offered by the project proponent in the subsequent monitoring period.

5 BIODIVERSITY

5.1 WITHOUT PROJECT BIODIVERSITY SCENARIO

5.1.1 EXISTING CONDITION (B1.1)

5.1.1.1.1 PAI 01 – Fazenda Serra (Niquelândia, GO, Brazil)

The Cerrado is considered the richest savanna in the world, with more than 12,000 plant species[155]. It has a very diverse fauna, with approximately 199 species of mammals, 864 of birds, 180 of reptiles, 210 of amphibians, and 1,200 of fish, a total of 2,653 species of vertebrate animals[156].

Despite the Cerrado's diversity, and its importance in keeping ecosystems services, the increasing deforestation rates threaten their fauna and flora, affecting the ecosystems balance, and, consequently, the provision of water, and food security in Brazil and worldwide.

PAI01 is located in Cerrado biome. Below, we point out specific characteristics of the region, demonstrating the local biodiversity, with a list of endemic, rare, and/or endangered species. The list of species was made based on secondary data, taken from inventories and scientific research that were made inside the municipality of Niquelândia, Thus, the biodiversity research is related to the species found in the limits of Niquelândia.

Niquelândia municipality is inside the Cerrado biome with its vegetation comprising of different phytophysiognomies of savannas (wooded savanna and savanna park), and a forest type savanna (forested savanna). The main characteristic of the savannas phytophysiognomies is the ground layer covered by herbaceous species differing in the density of wooded species in the upper layer. For the forested savanna, the canopy cover is denser, and the wood species diversity higher, with few herbaceous species on the ground layer (See details in 2.1.5.8).

Niquelândia region presents over 60 species of trees and shrubs, belonging to 44 genera and 26 families. The abundant species includes *Byrsonima coccolobifolia*, *Byrsonima pachyphylla*, *Callisthene molissima*, *Qualea parviflora*, *Tachigali subvelutina* and *Vellozia squamata* [157]. Other species can be cited as *Pterodon emarginatus* (sucupira branca), *Lafoensia pacari* (dedaleiro), *Dimorphandra mollis* (faveiro), *Anacardium humile* (caju do Cerrado), *Solanum licocarpum* (lobeira), all that common to wooded savannas ecosystems [158].

The region has a high richness of mammals, encompassing threatened species like *Lonchophylla dekeyseri* (morcego-beija-flor), *Myrmecophaga tridactyla* (tamanduá-bandeira), and *Priodontes maximus* (tatu canastra). It also harbors representative species of the Cerrado Biome as *Chrysocyon brachyurus* (lobo grará), and *Speothos venaticus* (cachorro-vinagre), a species which little is known about its autoecology [159]. The avifauna presents around 120 species, with seven endemic species, corresponding to 19.4% (36

[155] https://ispn.org.br/biomas/cerrado/fauna-e-flora-do-cerrado/
[156] https://www.wwf.org.br/natureza_brasileira/areas_prioritarias/cerrado/biodiversidade/
[157] Ribeiro, 2015. Florística e estrutura da vegetação de áreas de cerrado sentido restrito, em diferentes substratos, parque nacional da chapada dos veadeiros – GO. Capstone project, University of Brasília.
[158] Brasil, 2009. Plano de Manejo Parque Nacional Chapada dos Veadeiros
[159] Brasil, 2009. Plano de Manejo Parque Nacional Chapada dos Veadeiros

species) of the existing endemics species in the Cerrado. At the region, it was also found the first record of *Cyanoloxia moesta* for the Goiás State [160].

For the amphibians, the region harbours around 29 species, and the families Bufonidae, Cyclorhamphidae, Dendrobatidae, Hylidae, Leiuperidae, Leptodactylidae, Microhylidae and Strabomantidae are present [161]. The region was also considered home to the endemic species, *Alobates goianus*, only found in two more places at Cerrado, both in Goiás State [162]. It is an endangered species according to the Brazilian list of threatened species of ICMBio (2014), due to habitat loss and fragmentation, and because of your restricted area of occurrence. Among the species of lizards, it is recorded *Hoplocercus spinosus* (calango-roseta), *Norops meridionalis*, *Tropidurus oreadicus* (calango), *Tropidurus itambere* (calango), *Bachia bresslaui* and *Micrablepharus atticolus* (lagartinho)[163].

For the icthyofauna, the following species are recorded for the region: *Prochilodus nigricans* (curimatá), *Leporinus friderici* (piau), *Hypostomus emarginatu*, Geophagus cf. surinamensis, Pseudodoras niger (abotoado) and *Pimelodus blochii* (mandí)[164].

Table 103. List of species recorded in the region of PAI01, in some level, endangered according to the IUCN Red List of Threatened Species (2021).

Class	**Scientific name**	**IUCN Threat Category**
Mammalia	Lonchophylla dekeyseri	Endangered
	Myrmecophaga tridactyla	Vulnerable
	Priodontes maximus	Vulnerable
	Ozotocerus bezoarticus	Near threatened
	Chrysocyon brachyurus	Near threatened
	Oncifelis colocolo	Near threatened
	Panthera onca	Near threatened
	Speothos venaticus	Near threatened
Birds	Alipiopsitta xanthops	Near threatened
	Neothraupis fasciata	Near threatened

5.1.1.1.2 PAI 02 – Fazenda Bom Destino (Rio Branco, AC, Brazil)

The Bom Destino farm is in the state of Acre, municipality of Rio Branco, located in the western of Brazil. PAI02 is in the Amazon biome, a humid tropical forest characterized by a dominant hot and humid climate,

[160] Curcino, 2011. Avifauna em áreas de mineração: diversidade e conservação em Niquelândia e Barro Alto – GO. PhD. Thesis – Federal University of Goiás.

[161] Oda et al., 2009. Taxocenose de anfíbios anuros no Cerrado do Alto Tocantins, Niquelândia, Estado de Goiás: diversidade, distribuição local e sazonalidade. Biota Neotrop., vol. 9, no. 4.

[162] Carvalho et al., 2016. A new account for the endangered Cerrado Rocket Frog Allobates goianus (Bokermann, 1975) (Anura: Aromobatidae), with comments on taxonomy and conservation. Acta Herpetologica., vol. 11, no 1: 21-30.

[163] Brasil, 2009. Plano de Manejo Parque Nacional Chapada dos Veadeiros

[164] Brasil, 2009. Plano de Manejo Parque Nacional Chapada dos Veadeiros

predominance of forest physiognomies and the largest hydrographic system in the world, the Amazon River hydrographic basin.

The biome is home to exceptional biodiversity, where species have been described year after year. Until now, science has cataloged around 40,000 species of flora, 427 mammals, 1,294 birds, 378 reptiles, 427 amphibians and around 3,000 fish in the Amazon[165].

The secondary data survey carried out at PAI02 considered the Management Plan developed for FLONA Macauã[166] and other scientific work carried out in the region that contemplate the same vegetation classes that make up the Bom Destino farm.

In the Floristic, Physionomic and Structural Characterization of the Vegetation of the National Forest of Macauã, 506 plant species were found, belonging to 65 different families. Of this total, 96.2% represent species of woody trees or shrubs, 1.9%, species of palm trees, 1.8%, species of vines and lianas, and 0.1%, of herbaceous plants. The four most representative families in number of species were Fabaceae, Caesalpinaceae, Mimosaceae and Moraceae. Together they represented about 27% of the diversity of the area, with more than 30 species each.

In general, four strata of vegetation were defined. The lower stratum (up to 2m high) is mostly herbaceous from the families Acanthaceae, Theophrastaceae, Heliconiaceae. The medium stratum (up to 5m high) predominates species such as *Rinorea guianensis*, *Aptandra tubicina*, *Trichilia* sp, *Miconia affunis*, *Neea* cf. *oppositifolia*, *Lunaria parviflora*, *Faramea* sp., *Theobroma cacao*, *Theobroma speciosum*, *Hirtella* sp., *Pausandra macropetala*, among others. The upper stratum, also called the canopy (between 10 and 12 m) is composed mainly of the species *Guadua sarcocarpa*. In the emergent stratum (between 25 and 35m) predominate species such as *Anartia flavicans*, *Buchenavia* sp., *Sapium marmieri*, *Pouteria* sp., *Hevea brasiliensis*, *Pachira insignis*, *Protium heptaphyllum*, *Torresia* sp., *Inga* cf. *alba*, *Ficus* cf. *insipida*, *Brosimum* sp., *Ceiba pentandra*, *Torresia* sp. and *Apulea leocarpa*. [167]

Regarding the ichthyofauna, 38 species were recorded in the Macauã river and the Paneiro creek (insert ref) which is located about 70km from PAI03. Regarding the Iaco River, which is about 30km from the area, the species mentioned by residents as the most found are: Bico-de-Pato (*Sorubim lima*); Jeju (*Hoplerythrinus unitaeniatus*); Pacu (various genres); Caparari (*Pseudoplatystoma tigrinum*); Cangati (*Parauchenipterus galeatus*); Mapará (*Hypophthalmus* spp.); Sarapó (*Gymnotus carapo*); Stingray (*Potamotrygon* sp); Pirarucu (*Arapaima gigas*); Cascudo (various genera); Yam (Geophagus sp.); Cachorra (*Rhaphiodon gibbus* and *Cynodon* sp); Piranha (*Serrasalmus nattereri* and other genera); Jundiá (*Learius marmoratus*); Candiru (*Vandellia cirrhosa*); Traíra (*Hoplias malabaricus*); Surubim (*Pseudoplatystoma fasciatum*); Piaba (various species); Curimatã (*Prochilodus* sp.); Poraquê (*Electrophorus electricus*); Bodó (*Pterygoplichthys* sp.); Branquinha (various genres); Mandi (*Pimelodus* spp. and *Pimelodella* spp.), the latter mentioned being the most abundant.[168]

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[165] Available in: https://www.wwf.org.br/natureza_brasileira/areas_prioritarias/amazonia1/bioma_amazonia/

[166] Available in: https://www.gov.br/icmbio/pt-br/assuntos/biodiversidade/unidade-de-conservacao/unidades-de-biomas/amazonia/lista-de-ucs/flona-do-macaua/arquivos/dcom_plano_de_manejo_flonas_macaua_e_sao_francisco.pdf

[167] Available in: https://www.gov.br/icmbio/pt-br/assuntos/biodiversidade/unidade-de-conservacao/unidades-de-biomas/amazonia/lista-de-ucs/flona-do-macaua/arquivos/dcom_plano_de_manejo_flonas_macaua_e_sao_francisco.pdf

[168] Available in: https://www.gov.br/icmbio/pt-br/assuntos/biodiversidade/unidade-de-conservacao/unidades-de-biomas/amazonia/lista-de-ucs/flona-do-macaua/arquivos/dcom_plano_de_manejo_flonas_macaua_e_sao_francisco.pdf

The studies cited by the Management Plan of FLONA Macauã point to a high diversity of herpetofauna for the region. Among the mentioned species, 27 species of anurans, 13 species of snakes and 8 species of lizards were recorded for the municipality of Sena Madureira, bordering the municipality of Rio Branco. Amphibians represent 8 families of anurans, with characteristic species of the Amazon rainforest. Among the reptiles, snakes from 4 different families were found, among them, two families of venomous snakes – Viperidae (*Bothrops atrox*) and Elapidae (*Micrurus lemniscatus*). The lizards are represented by 5 families, with species restricted to forest environments, such as *Anolis nitens* and more generalist species, which inhabit more anthropized environments, such as *Ameiva amoiva* and *Kentropyx calcarata*. The study also cites the presence of alligators and chelonians in the area, such as tortoises (*Geochelone denticulate*) and tracajás (*Podocnemis unifilis*), the latter two species being appreciated by the population as a source of food. [169]

Considered one of the areas with the greatest ornithological diversity[170], the National Forests of Macauã and São Francisco have 166 registered bird species, belonging to 136 genera of 49 families. The great extension of the forest continuum of the FLONAs favors the occurrence of the great hawks, curassows, jacamins and macaws, among them the Gavião-real *Harpia harpyja*, the Gavião-de-penacho *Spizaetus ornatus*, the Gavião-pombo-da-amazônia *Leucopternis albicollis*. However, the greatest richness was found among the small tyrannids (family Tyrannidae), with 18 species, followed by the families Psittacidae and Thamnophilidae, both with 13 species. Fourteen records appear among the list of Amazonian species with restricted distribution (Oren, 2001): *Aratinga weddellii*, *Brotogeris cyanoptera*, *B. sanctithomae*, *Pionopsitta barrabandi*, *Phaethornis philippi*, *Galbacyrhynchus purusianus*, *Galbula tombacea*, *Galbula cyanescens*, *Brachygalba albogularis*, *Pteroglossus bitorquatus*, *Synallaxis albigularis*, *Neoctantes niger*, *Pyriglena leuconota* and *Myrmeciza hemimelaena*. The species that present some degree of threat of extinction are shown in the table below.

For mastofauna, the survey carried out on the middle Iaco River recorded 68 species of mammals. The Soim-preto *Callimico goeldii* and the Bigodeiro *Saguinus imperator* stand out, primate species that have a large part of their distribution areas within the state of Acre. According to Silva et al (2001) *Callimico goeldi* occurs in the region with the highest known densities. Of the cataloged species, 09 are on the global list of endangered animals, as shown in the table below.

Table 104. List of species recorded in the region of PAI02, in some level, endangered according to the IUCN Red List of Threatened Species (2021).

Class	**Scientific name**	**IUCN Threat Category**
Osteichthyes	Arapaima gigas	Data Deficient
Mammalia	Myrmecophaga tridactyla	Vulnerable
	Priodontes maximus	Vulnerable
	Speothos venaticus	Near threatened
	Pteronura brasiliensis	Endangered

[169] Available in: https://www.gov.br/icmbio/pt-br/assuntos/biodiversidade/unidade-de-conservacao/unidades-de-biomas/amazonia/lista-de-ucs/flona-do-macaua/arquivos/dcom_plano_de_manejo_flonas_macaua_e_sao_francisco.pdf
[170] Available in: https://repositorio.museu-goeldi.br/bitstream/mgoeldi/347/1/B%20MPEG%20C%20Nat%205%283%292010%20Aleixo.pdf

	Callimico goeldi	Vulnerable
	Leopardus wiedii	Near threatened
	Panthera onca	Near threatened
	Inia geoffrensis	Endangered
	Sotalia fluviatilis	Endangered
Aves	Harpia harpyja	Vulnerable
	Spizaetus ornatus	Near threatened

5.1.1.1.3 PAI 03 – Fazenda Bodoquena (Miranda, MS, Brazil)

The Bodoquena farm is in the Cerrado biome, in a contact area with the Pantanal biome. The Cerrado, as described in section 5.1.1.1.1, is considered the richest savanna in the world. The Pantanal, in turn, constitutes the largest floodplain in the world. According to the Management Plan consulted, the PAI03 area is considered a Cerrado-Pantanal biodiversity corridor, made up of public conservation units, private reserves, and productive areas. These corridors, located in the transition zone between the two biomes, comprise fauna and flora species from both biomes, which contributes to the conservation of local biodiversity.

In the diagnostic carried out to describe the flora of the PEPRN, both characteristic phytophysiognomies of the Pantanal biome and the Cerrado biome were identified, such as wooded savannah, forested savannah and seasonal alluvial semideciduous forest, among others. The extensive plant list covers 772 species of flora. The most numerous family is Fabaceae (Leguminosae) with 128 species. Common species were recorded in several biomes, including for the cerrado: *Annona cornifolia, Caryocar brasiliense, Cissus campestris, Couepia grandiflora, Diospyrus hispida, Dipteryx alata, Evolvulus pterygophyllus, Himatanthus obovatus, Jacaranda cuspidifolia, Kielmeyera coriacea, K. rubriflora, Lippia lupulina, Magonia pubescens, Paepalanthus giganteus, Pouteria ramiflora, Pseudobombax longiflorum, Qualea grandiflora, Q. parviflora, Rhodocalyx rotundifolia, Vochysia cinammomea* and *V. haenkeana*.

The results obtained in the PEPRN Management Plan recorded 117 species of fish, the most frequent being: *Aequidens plagiozonatus, Hoplias malabaricus, Crenicichla edithae, Triportheus paranensis* and *Loricariichthys platymetopon,* and the most abundant: *Moenkhausia dichroura, Odontostilbe* cf. *calliura* and *Aequidens plagiozonatus*.

Regarding amphibians, 15 species of frogs were recorded in the park, including terrestrial, arboreal and aquatic species. The species *Dendropsophus nanus*, *Lysapsus limellus*, *Hypsiboas raniceps*, *Pseudis paradoxa*, *Leptodactylus chaquensis*, *L. podicipinus* and *L. fuscus* are cited with wide distribution and recorded activity for the dry and rainy seasons. Among the reptiles, 27 species were found, representing 4 orders and 11 distinct families, the most common being the lizards *Ameiva Ameiva* and *Ameivulla ocellifer*. For the registered herpetofauna taxa, in general, an expected seasonality was described for the group, since reptiles and amphibians, both cold-blooded animals, depend on external climatic factors to regulate their metabolism and, consequently, their activity throughout the seasons, especially in terms of temperature and humidity.

A total of 164 species of Birds was presented, belonging to 21 orders and 52 families. Among the recorded birds, a greater number of insectivorous (34.75%) and omnivorous (32.31%) species was recorded, which is expected for regions with seasonal environments, that is, with well-defined seasons, a characteristic shared between both the biomes, Cerrado and Pantanal.

The mammals sampled represent 26 species, three species of rodents, two species of marsupials, and 21 species of medium and large mammals. Among the large species, two introduced species stand out: the feral pig (Sus scrofa) and the cattle (Bos taurus).

The species cited by the study described above represent taxa occurring in the Cerrado and Pantanal biomes. Although there may be differences between the specific fauna of PAI03, the proximity to the PEPRN indicates that the animals registered in the park are also distributed in the project area. All fauna species that present some degree of threat in the global list of extinction are mentioned in the table below.

Table 105. List of species recorded in the region of PAI03, in some level, endangered according to the IUCN Red List of Threatened Species (2021).

Class	Scientific name	IUCN Threat Category
Osteichthyes	Plagioscion ternetzi	Data Deficient
Amphibia	Rhinella schneideri	Data Deficient
Reptilia	Bachia bresslaui	Vulnerable
	Acanthochelys macrocephala	Near threatened
Mammalia	Myrmecophaga tridactyla	Vulnerable
	Priodontes maximus	Vulnerable
	Tolypeutes matacus	Near threatened
	Alouatta caraya	Near threatened
	Chrysocyon brachyurus	Near threatened
	Pseudalopex vetulus	Near threatened
	Speothos venaticus	Near threatened
	Lontra longicaudis	Near threatened
	Pteronura brasiliensis	Endangered
	Leopardus colocolo	Near threatened
	Leopardus tigrinus	Vulnerable
	Leopardus wiedii	Near threatened
	Panthera onca	Near threatened
	Tapirus terrestris	Vulnerable
	Tayassu pecari	Vulnerable
	Blastocerus dichotomus	Vulnerable
	Mazama americana	Data Deficient
	Ozotoceros bezoarticus	Near threatened
	Dasyprocta azarae	Data Deficient
Birds	Rhea americana	Near threatened
	Anodorhynchus hyacinthinus	Vulnerable

5.1.2 HIGH CONSERVATION VALUES (B1.2)

The “Building Forest Carbon Project – Biodiversity Impacts Guidance” was used to define de High Conservation Values of the Project[171] . The HCV was built based on secondary data, from scientific research, that studied biodiversity in the project areas.

Table 106. Identification of the high conservation value (HCV 1)

High Conservation Value	HCV 1 – Species Diversity (Concentration of biological diversity including endemic species, and rare, threatened or endangered species, that are significant at global, regional or national levels)
Qualifying Attribute	The project zone, represented by the Cerrado and Amazonia biomes, comprises a wide diversity of fauna and flora species, also contemplating species with different degrees of threat of extinction and endemic species. In this way, the project zone falls under HCV 1. The survey based on the literature points to the possible occurence of endemic and endangered species are likely to occur in the project areas.
Focal Area	PAI01 - 03

Table 107. Identification of the high conservation value (HCV 2)

High Conservation Value	HCV 2 – Landscape-level ecosystems, ecosystem mosaics and IFL
Qualifying Attribute	The PAI03 is near a protected area, the Parque Estadual do Pantanal do Rio Negro (10km), a state conservation unit. The protection of habitats close to conservation units is important since they can represent corridors or mosaics of preserved vegetation for the passage, shelter, reproduction and other activities of the local fauna, as well as the dispersion of flora species, bearing in mind that the species that occur in PEPRN probably occur in PAI03. Furthermore, this area configures a peculiar environment, a transition area between two biomes (Cerrado and Pantanal), with potential for the occurrence of species of flora and fauna from both biomes.
Focal Area	PAI03

5.1.3 WITHOUT-PROJECT SCENARIO: BIODIVERSITY (B1.3)

The Cerrado and Amazonia, which compose the Carbonflor Project Zone, are the Brazilian biomes with the highest deforestation rates in recent years (see section 2.1.1). Consequently, the Project Zone are

[171] https://www.thebiodiversityconsultancy.com/fileadmin/user_upload/Pilgrim_etal_2011.pdf

increasingly likely to be cleared and converted to pasture and cropland, or to other alternative anthropogenic land uses. Thus, there is constant pressure on biodiversity in these biomes.

A study that relates the impact of the conversion of areas of native vegetation to livestock and soybeans, in these two biomes, on biodiversity, evaluated 486 species of fauna, endemic or threatened with extinction. The overlapping of the areas of occurrence of each species with the deforested areas proves that 484 of the evaluated species were affected by the loss of distribution area. Therefore, the intrinsic relationship and the negative impact of the conversion of land use - from native vegetation to non-forest - and the loss of biodiversity due to the reduction of habitat and area of occurrence is evident[172].

In addition, due to the continuous suppression of the natural ecosystems present in the Cerrado and in the Amazon, which has intensified in recent years, the species that were already losing their habitats are concentrated in remaining areas, which, in turn, are increasingly fragmented and degraded. , which reinforces the need to conserve fragments of native vegetation in the Project Zone[173].

According to the predictions based on the current analysis of forest deforestation in Amazon biome, made by INPE, the without-project scenario will be probably the gradual loss of the forest's fragments, given the conversion in land use for pasture, agriculture, mining and logging.

In Cerrado biome, it is known that the main growth strategy for the vegetation is resprout, due to the presence of underground organs[174]. Once the soil is damaged because of the land conversion, the underground organs are destroyed, and the vegetation will hardly recover spontaneously[175]. It will be necessary the expense with restoration activities for plants reintroduction, with no guarantee of recovery success since the reintroduction of Cerrado species is still a challenge[176]. Thus, maintaining preserved areas of the savannas, will assure species conservation, and will avoid future expenses in case of savannas deforestation.

Besides, after the implementation of social programs in the project instances, the importance of biodiversity protection will be highlighted, looking for support the preservation of forest and healthy ecosystems during and after the project term.

5.1.4 EXPECTED BIODIVERSITY CHANGES (B2.1)

The Expected Biodiversity Changes were chosen guided by the "Building Forest Carbon Project – Biodiversity Impacts Guidance".

The Impact Guidance is based on the Pressure-State-Response framework. Conceptually, it relies on a causal chain whereby pressures or threats (e.g., deforestation) negatively impact the state or status/condition of biodiversity (e.g., habitat area). However, responses or project interventions are taken to reduce pressures/threats, which in turn are expected to improve the state of biodiversity.

Habitat fragmentation through deforestation involves changes such as habitat loss, reduction in habitat patch size, connectivity alteration, and increased edge effects, resulting in the loss of biodiversity. Locally, landscape fragmentation can generate biodiversity loss by changing populations dynamic through the

[172] https://wwfbr.awsassets.panda.org/downloads/wwf_notatecnica_desmate_e_perda_de_especies_2021_v7.pdf
[173] https://wwfbr.awsassets.panda.org/downloads/wwf_notatecnica_desmate_e_perda_de_especies_2021_v7.pdf
[174] Pausas et al., 2018. Unearthing belowground bud banks in fire-prone ecosystems. New Phytologist, vol. 217: 1435–1448
[175] Buisson et al.,2018. Resilience and restoration of tropical and subtropical grasslands, savannas, and grassy woodlands. Biol. Rev, vol. 94, n.2:590-609
[176] Durigan et al., 2009. Protocolo de avaliação de áreas prioritárias para a conservação da Mata Atlântica na região da Serra do Mar/Paranapiacaba*. Rev. Inst. Flor., São Paulo, vol. 21, n. 1:39-54.

number, reproduction, and survival of individuals, and in the communities, by changing species composition and richness [177]. Considering that the project region is threatened by anthropogenic activities, such as agriculture, and pasture, all of them linked to deforestation, we will consider deforestation as a pressure for the actual state condition, which is the standing ecosystems. The response for measuring the pressure will be the following biodiversity indicators: native vegetation cover, landscape connectivity, edge effects, cover of lianas in the edge, and cover of invasive and native grasses.

The indicators will be assessed by researching on government official websites, using reliable data information concerning biome deforestation, by geospatial information, and drone images that will be processed in SIG software. Field-work campaigns will be carried out to take the drone images, to assess and validate data of the satellite images, and to collect biodiversity data.

Table 108. Expected Biodiversity Changes - Flora

Biodiversity Element	Flora
Estimated Change	The expected positive impact involves the conservation of biodiversity of flora species, by preventing deforestation. The maintenance of the protected ecosystem must maintain the native vegetation cover, the connectivity of the landscape between the different phytophysiognomies, the effects of edge and ground cover by native herbaceous species.
Justification of Change	A balanced environment offers less risk of invasion by exotic species of flora and degradation of habitats, thus avoiding the loss of biodiversity. Fieldwork campaigns, capture of images by drones, validation of data from satellite images and confirmation of data referring to biodiversity will be carried out to evaluate the indicators.

Table 109. Expected Biodiversity Changes - Fauna

Biodiversity Element	Fauna
Estimated Change	The expected positive impact involves the conservation of biodiversity of fauna species, by avoiding deforestation and consequently keeping the ecosystem in balance.
Justification of Change	The conservation of the specific characteristics of the diverse phytophysiognomies provides the occurrence of wild species of birds, mammals, reps and amphibians adapted to such environments, corroborating for the organisms to develop and reproduce without the risks arising from anthropized environments. In this way, the project will act in the conservation of species with different degrees of endemism and threat. loss of biodiversity. Records obtained through project monitoring will be

[177] Fahrig, 2003. Effects of Habitat Fragmentation on Biodiversity. Annu. Rev. Ecol. Evol. Syst, vol. 34:487–515

	used to confirm data relating to biodiversity and evaluate indicators.

5.1.5 MITIGATION MEASURES (B2.3)

Deforestation causes the area to return to an initial condition in the timeline of forest succession. With deforestation, not only the forest itself is lost, but changes in landscape structure also occur. The changes include indirect degradation of remaining forests due to habitat fragmentation, besides the immediate negative effects on biodiversity, locally, at the deforested area [178][179].

On the other hand, the REDD Carbonflor goal is to reduce the emission of GHG by the maintenance of the native vegetation. With the protection of the fragments, regeneration and succession can take place, which can increase diversity with time [180]. Additionally, the Project will create revenue from this maintenance, which will make the preservation activity attractive to the rural producers supported by the project in a competitive way against the alternative uses of the soil (i.e. agricultural production or cattle ranching). The consciousness that keeping forests stands can generate income, conserve biodiversity, and promote ecosystem services for the population will be an important tool against deforestation in the project region. Besides, the revenues will finance programs in the region, which include activities aimed at benefiting the social, and natural resources, causing positive impacts on biodiversity in the region. In this way, the project goals do not involve negative impacts to be mitigated, and the social programs aligned with the monitoring of deforestation will be used to protect biodiversity.

5.1.6 NET POSITIVE BIODIVERSITY IMPACTS (B2.2, GL1.4)

The creation of protected areas helps contain deforestation, and landscape fragmentation, conserving biodiversity. Currently, for being an efficient tool to keep ecosystems conserved, legally protecting areas was chosen to be the best way of preserving biodiversity [181].

We listed some net positive impacts on biodiversity by preventing deforestation, which can be applied on the project region:

Avoid species loss: landscape fragmentation can generate species loss by decreasing available habitats and changing species dynamics, which gradually generates a reduction in species composition and richness [182].

[178] Laurance et al., 2011. The fate of Amazonian forest fragments: A 32-year investigation. Biol. Cons, vol. 144, n.1:56-67

[179] Bracalion et al. 2012. Strategies for supporting the conservation of secondary tropical forests embedded in modified landscapes. Bol. Mus. Para. Emílio Goeldi. Cienc. Nat., Belém, vol. 7, n. 3: 219-234.

[180] Lennox et al., 2018. Second rate or a second chance? Assessing biomass and biodiversity recovery in regenerating Amazonian forest. Glob. Gang. Bio, vol, 24, n.12:5680:5694.

[181] Paiva et al., 2020. Deforestation in protect areas in the Amazon: a threat to biodiversity. Biod. and Cons., vol. 29:19-38.

[182] Fahrig 2003. Effects of Habitat Fragmentation on Biodiversity. Annu. Rev. Ecol. Evol. Syst, vol. 34:487–515

Keep habitat quality: fragmentation increases the amount of habitat exposed to edge effects by the increase of solar radiation, and burning exposure, and facilitates invasion by alien species [183],[184], [185]. Additionally, in a low-quality habitat, the degradation leads to the occupation of generalist species, which can survive in harsher environments, decreasing the diversity of the species which only survive in conserved ecosystems [186].

Increase in environmental awareness: the social programs intend to implement activities that will promote the importance of biodiversity protection align with the sustainable use of the soil to reach balance between the society needs and the nature conservancy. This programs also intend to reduce illegal activities as nature resource extractivism and hunting.

Improve ecosystem services: preservation of the natural ecosystems will help to maintain hydrological cycle, and consequently the production of clean water, will improve air quality, and soil fertility [187].

5.1.7 HIGH CONSERVATION VALUES PROTECTED (B2.4)

The High Conservation Values of the Project are related to forest areas containing globally, regionally or nationally significant concentrations of biodiversity values (e.g., endemism, threatened species, refugia). The areas will be protected from deforestation, the fragments will be kept stands with no activities inside the Project Area, which leads to biodiversity protection. Besides, the revenues will finance programs aimed at promoting social benefits and sustainable activities, highlighting the importance of natural ecosystems conservation and the conscious use of natural resources. In this way, keeping the Project will cause no negative effect on HCV related to biodiversity.

5.1.8 SPECIES USED (B2.5)

The Project area will be conserved by keeping the vegetation untouched, with no other usage besides protection. Thus, no species will be used in the Protected Areas. For the social programs, there will be no direct planting, and for any activity considered, care will be taken to consider the species already cultivated by the community, with no introduction of species that could cause harm to the environment and biodiversity.

5.1.9 INVASIVE SPECIES (B2.5)

The Project will not use any kind of invasive species. However, it is important to note that degradation, and pasture by exotic species in the surrounding may be a threat in long term to facilitate the colonization by invasive species. To keep the Project Areas protected from invasive species monitoring native vegetation cover, and fieldwork, as highlighted in 5.2.1, will be important practices for conservation.

For the social programs, the proposed activities will not involve direct planting, and invasive species will not be considered for the activities. Besides, sustainable use of the soil will be part of the programs, which will

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183 Pivello et al. 1999. Alien grasses in Brazilian savannas: a threat to the biodiversity. Biod. and Cons., vol.8: 1281-1294.

184 Laurance et al., 2011. The fate of Amazonian forest fragments: A 32-year investigation. Biol. Cons, vol. 144, n.1:56-67

185 Coelho et al., 2020. Effects of anthropogenic disturbances on biodiversity and biomass stock of Cerrado, the Brazilian savanna. Biod. and Cons., vol. 29:3151-3168.

186 Coelho et al., 2020. Effects of anthropogenic disturbances on biodiversity and biomass stock of Cerrado, the Brazilian savanna. Biod. and Cons., vol. 29:3151-3168.

187 https://www.prefeitura.sp.gov.br/cidade/secretarias/meio_ambiente/pmma/index.php?p=191885

highlight the importance of controlling and/or avoiding the spread of invasive species for pastureland already present in the communities.

5.1.10 IMPACTS OF NON-NATIVE SPECIES (B2.6)

The Project does not intend to introduce non-native species to the Project Area. For the social programs, the proposed activities will consider the already cultivated species as specified in item 4. The programs will be important for the orientation of the sustainable use of the soil, with no intention to intervene directly in planting activities. It is worth noting that the programs guidance will exclude species that could cause any harm for the environment and will encourage the use of native species for agriculture and local activities.

5.1.11 GMO EXCLUSION (B2.7)

The aim of the project does not include the use of GMOs to generate GHG reductions or removals.

5.1.12 INPUTS JUSTIFICATION (B2.8)

No intervention is intended to occur in the Project Areas. The community chosen that will participate of the social programs will be encouraged to have sustainable activities with no use of fertilizers, chemical pesticides, biological control and other inputs.

5.1.13 WASTE PRODUCTS (B2.9)

No waste products are expected to be generated with the Project activities. The waste products that can be generated with the workshops will be minor, and properly disposed of for recycling.

5.2 OFFSITE BIODIVERSITY IMPACTS

5.2.1 NEGATIVE OFFSITE BIODIVERSITY IMPACTS (B3.1) AND MITIGATION MEASURES (B3.2)

We are expecting no negative impact to occur outside the project area. The activities proposed with the Project will only involve practices that highlight nature conservancy and the sustainable use of the soil. We expect to reinforce conservations values beyond the project region.

5.2.2 NET OFFSITE BIODIVERSITY BENEFITS (B3.3)

The project is designed for biodiversity conservation, with no intention to create activities inside the Project Areas besides monitoring the fragments to control deforestation. For biodiversity, we also expect to have offsite positive impacts, since the conservation of the project area will act as a source of propagules and a refuge for animals in the surrounding[188]. The vegetation area will also be a patch of connectivity between vegetation areas, helping the increase and conservation of biodiversity. Environmental education proposed for the communities will also involve the increase in consciousness of the benefits of keeping the fragments stand, as specified in item 5.2.3. The other activities proposed by the project will encourage the community for the sustainable use of the soil, sparing more deforestation in the vicinity. In this way, the project aims to broader the biodiversity benefits from beyond the project region, with no unmitigated negative.

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[188] https://royalsocietypublishing.org/doi/epdf/10.1098/rstb.2021.0075. Lewis et al., 2022. Identifying hotspots for ecosystemrestoration across heterogeneous tropicalsavannah-dominated regions. Phil. Trans. R. Soc. B, vol. 378:20210075

5.3 BIODIVERSITY IMPACT MONITORING

5.3.1 BIODIVERSITY MONITORING PLAN (B4.1, B4.2, GL1.4, GL3.4)

The biodiversity monitoring plan aims to define methods, locations, sampling frequency and presentation of monitoring results for PAI 01, PAI 02 and PAI 03. Monitoring variables are directly linked to the project's objectives for biodiversity conservation. The effectiveness of measures taken to maintain or improve all identified HCVs related to biodiversity present in the project zone will also be evaluated.

The table below brings together the indicators and impacts that will be monitored in the Project. The activities developed will be reported in the monitoring reports, annually, indicating the results of monitoring activities and the positive and negative impacts on the monitored variables.

The records with fauna specimens will be reported through photographic records made by ECCON's technical team and by residents of local communities, after guidance provided by ECCON in the workshops on the importance of maintaining biodiversity. In these workshops, participating residents will be encouraged to share knowledge about the local fauna with the technical team, invited to actively participate in monitoring.

Table 110. Summary of activities planned for monitoring biodiversity impacts.

Areas	Topic	Activities / Method	Impacts	Indicators	Frequency
PAI 01 *PAI 02* *PAI 03*	Flora conservation monitoring	Field-work campaigns to take drone images, to validate data of the satellite images, and to confirm data concerned to biodiversity	Conservation status of the Wooded savanna	Native vegetation cover landscape connectivity edge effects ground cover by herbaceous species (native and exotic)	At every verification event.
PAI 01 *PAI 02* *PAI 03*	Mammal's monitoring	Active search during field activities and participatory monitoring, through photographic records of local residents of the community	Mastofauna species richness	Number of specimens found Number of species registered Number of threatened species Number of endemic species	At every verification event.
PAI 01 *PAI 02* *PAI 03*	Birds monitoring	Active search during field activities and participatory monitoring, through photographic records of local residents of the community	Avifauna species richness	Number of specimens found. Number of species registered. Number of threatened species	At every verification event.

				Number of endemic species	
PAI 01 *PAI 02* *PAI 03*	Reptile and amphibians' monitoring	Active search during field activities and participatory monitoring, through photographic records of local residents of the community	Reptile and amphibian fauna species richness	Number of specimens found Number of species registered Number of threatened species Number of endemic species	At every verification event.

5.3.2 BIODIVERSITY MONITORING PLAN DISSEMINATION (B4.3)

The results arising from the monitoring of REDD Carbonflor will be published on the ECCON website and on the VERRA platform through the monitoring report. Also, synthetized versions will be provided, in Portuguese, and in accessible language, to be sent to all interested parties and partners of the project. Such versions may be requested through the communication channel open to the Project (email contato@ecconsa.com.br). In addition, the monitoring results will be presented to the communities during workshops and training offered by the project proponent in the subsequent monitoring period.

APPENDICES

APPENDIX 1: STAKEHOLDER IDENTIFICATION TABLE

Type	Identification	Special features	Relevance to the Project
A	Traditional Populations living within 20km from the project´s area	Recognized by federal regulation as a Traditional Population such as Indigenous and Quilombolas communities.	These stakeholders are highly relevant in the project to control and combat deforestation with activities based on sustainable practices with the forest. Has the potential to receive social and technical assistance.
B	Community groups within 20km from the project´s area, affected directly or indirectly by the project	Location, size, similar features and self-identified as a community group, but not under the Traditional Populations federal regulation classification	These stakeholders are highly relevant in the project to control and combat deforestation with activities based on sustainable practices with the forest. Has the potential to receive social and technical assistance.
C	Other stakeholders: within 20km from the project´s area, affected directly or indirectly by the project	Subgroups not self-identified as a community in its complexity, but having its own representative	These stakeholders are highly relevant in the project to control and combat deforestation with activities based on sustainable practices with the forest. Has the potential to receive social assistance.
D	Other stakeholders: marginalized and vulnerable subgroups, within 20km from the project´s area, affected directly or indirectly by the project	Subgroups identified as marginalized and/or in vulnerable conditions	These stakeholders are highly relevant in the project to control and combat deforestation with activities based on sustainable practices with the forest. Has the potential to receive social assistance.
E	Other stakeholders: Companies / Institutions / Associations / Cooperatives / NGOs	Private sector, associations and non-profitable organizations acting locally	These stakeholders are of medium importance in the project, for possible partnerships, as well as technical assistance.
F	Other stakeholders: Regional and local authorities	Community´s legal representatives and public sector	These stakeholders are of medium importance in the project for the implementation of public policies, as well as technical assistance.
G	Other stakeholders: University and educational representatives	Teachers and managers in Education area	These stakeholders are of medium importance in the project, for possible partnerships for research, as well as technical assistance.

APPENDIX 2: PROJECT ACTIVITIES AND THEORY OF CHANGE TABLE

Roles of project participants:

ECCON

- Management of REDD Carbonflor
- Inventory of carbon stocks
- Monitoring of deforestation (remote sensing and in situ visits)
- Propecting of farms, due dilligence and signing contracts
- Engagement of local authorities
- Engagement of local communities, design and implementation of activities of activities

Landowner

- Voluntaily paricipate in the project
- Sign 30-year legally binding agreement
- Halt any planned deforesttion activity
- Implement measures to avoid any unplanned deforestation (active monitoring)
- Implment measures to avoid fire and degradation (e.g. firebreaks, fences)

Local Communities

- Participate in project activities
- Identify and prioritize needs
- Participate in implementation of social projects
- Empowerment through participation in decision-making of social and community based project activities

Figure 120. Roles of project participants in REDD Carbonflor.

Impacts to the Climate, Community and Biodiversity Benefits in the Business as Usual Scenario vis a vis the REDD Carbonflor scenario.

Without and with REDD Carbonflor Scenarios

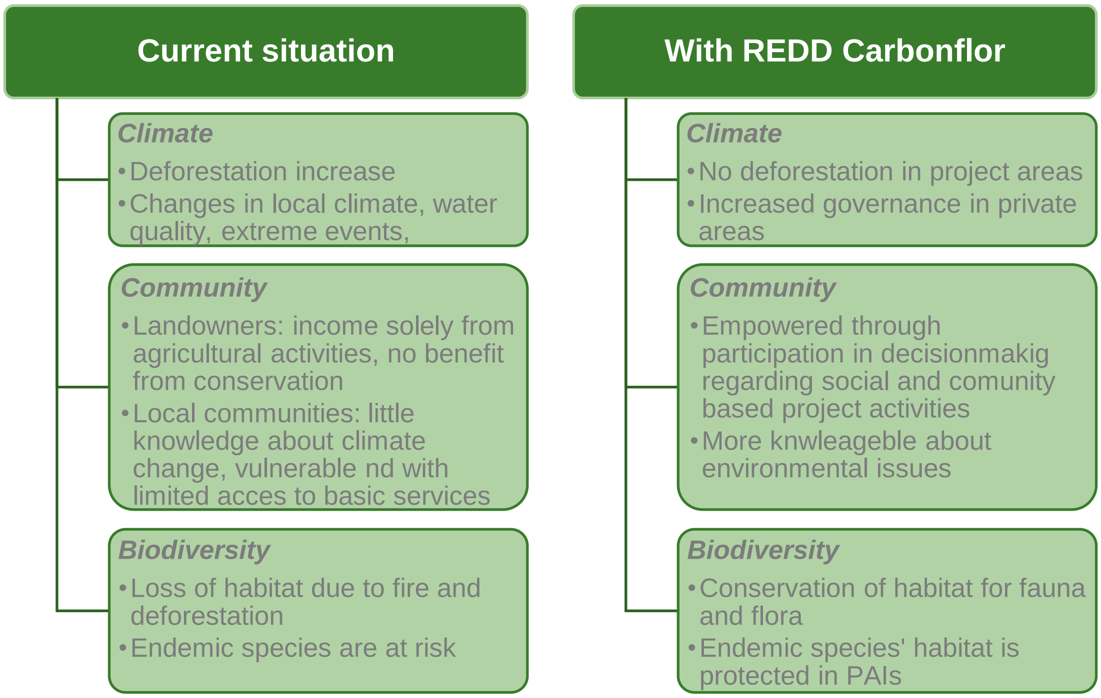

Figure 121. Diagram that summarizes impacts to Climate, Community and Biodiversity in the Current Situation and with the implementation of REDD Carbonflor.

Theory of change table:

Table 111. Theory of change of the REDD Carbonflor

<table>
<tr><th rowspan="2">Activity description</th><th colspan="3">Expected climate, community, and/or biodiversity</th><th rowspan="2">Relevance to project's objectives</th></tr>
<tr><th>Outputs
(short term)</th><th>Outcomes
(medium term)</th><th>Impacts
(long term)</th></tr>
<tr><th colspan="5">Management</th></tr>
<tr><td>Signing of 30-year conservation agreements (ECCON+ Landowners)</td><td>One 30-year contract signed for each PAI</td><td>Increased forest protection, as conservation generates returns for landowners</td><td rowspan="3">Improved carbon stocks in protected forests, contributing to climate change mitigation, habitat for biodiversity and improved water quality where PAIs include riparian forest areas.
Project enables environmental outcomes with communities</td><td rowspan="4">Very high. Project stimulates conservation through long term commitments of forest protection, generating cashflow from conservation. This improves and stimulates conservation activities, which contribute to climate change mitigation, through deforestation reduction, maintenance of habitat for fauna and flora.</td></tr>
<tr><td>Forest monitoring for degradation and deforestation (ECCON)</td><td>Annual monitoring of project areas within PAIs</td><td>Reduction of deforestation pressure and possibility of actively mitigating risks</td></tr>
<tr><td>Measurement of biomass through forest inventory (ECCON)</td><td>Inventory plot s according to methodology for each PAI</td><td>Better estimates of carbon stock in PAIs</td></tr>
<tr><td>Introduction of voluntary fire brigades</td><td>Training of local actors on the importance of firefighting and techniques</td><td>Improved interaction among local actors, and increased efficiency in firefighting. Improved and more resilient communities.</td><td>Improved control of wildfires, resulting in lower incidence of widespread and uncontrolled fires. Community participation in firefighting strengthens the community.</td></tr>
<tr><th colspan="5">Community</th></tr>
<tr><td>Workshops with the Community for design and implementation of the project</td><td>Create a participatory space, where the community feels they are considered and listened in the decision-making process</td><td>The project brings opportunities for the community to develop</td><td>Opportunity: Increase in the capability of the Project to generate jobs and income in short and long term for the community</td><td>Very high as it generates positive impacts in the community's well-being</td></tr>
<tr><td>Participatory conceptions and implementation of social projects</td><td>The Community and the team work together to design the community´s needs and what it´s possible to achieve</td><td>The community and the project build trust in each other to be able to develop and monitor the social projects</td><td>Security: The benefits are fairly distributed and both parts benefit from the development of the social projects</td><td>Very high as it provides long term benefits that wouldn´t happen without the Project scenario</td></tr>
</table>

Participatory management and decision-making tools	The training and support from the team build self-confidence in the Community. The Community is valued as the center of the decisions and the benefits for themselves.	The social projects are implemented and led by the Community with the support of the team	Empowerment: Strengthening in the community's capacity to manage and confront their own needs	Improving self-governance and management knowledge beyond the project´s duration period

APPENDIX 3: ACRE'S JURISDICTIONAL SYSTEM

The description of Acres Jurisdictional system is shared with the VVB in a cloud folder.

APPENDIX 4: PROJECT RISKS TABLE

The Non-Permanence-Risk-Report developed by ECCON for REDD Carbonflor is shared with the VVB in a cloud folder.

APPENDIX 5: STAKEHOLDER CONSULTATION

Information on the banners presented to the community and also images of the WhatsApp groups created during the stakeholder consultation are shared with the VVB through a cloud folder.

APPENDIX 6: ECCON’S FINANCIAL STATEMENT

Since ECCON’s commercial information is sensitive, it will be shared with the VVB through a cloud folder.

APPENDIX 7: ECCON'S CODE OF PRACTICE

The code of conduct of the company proposing the project and the anti-corruption law is shared with the VVB through a cloud folder.

APPENDIX 8: APD RATES

The document about APD rates is shared with the VVB through a cloud folder.

APPENDIX 9: STANDARD OPERATING PROCEDURES

A list of SOPs developed for the project will be shared with the VVB through a cloud folder.