REDD+ CAFÉ APUÍ AGROFLORESTAL

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Project Title	REDD+ Café Apuí Agroflorestal (CAA)
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Project Location	Country, sub-national jurisdiction(s)
Project Proponent(s)	Amazônia Agroflorestal Comercialização de Produtos Agroflorestais Ltda Contact: Sarah Sampaio Address: Barão de Solimões, 12 – room 1 – Flores. Manaus / Amazonas, Brazil.
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Validation Body	Organization and contact name with email address and phone number
Project Lifetime	01 March 2022 – 28 February 2052; 30-year lifetime
GHG Accounting Period	01 March 2022 – 28 February 2052; 30-year total period
History of CCB Status	Not submitted yet.
Gold Level Criteria	Exceptional Community Benefits (GL2) – smallholders have managements rights and will have long-term net positive well-being benefits via supporting income generation and women and youth entrepreneurship via sustainable supply chains, agroecological systems. Exceptional Benefits to Biodiversity (GL3) Trigger Species - the project area hosts 15 Vulnerable species and 7 Endangered species, and besides of forest protection and monitoring of terrestrial species, the project will also plant trees of the endangered rosewood (*Aniba roseaodora*) in leakage management areas.
Expected Verification Schedule	June-September 2023

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1 SUMMARY OF PROJECT BENEFITS

1.1 Unique Project Benefits

Table 1. Unique Project Benefits

Outcome or Impact Estimated by the End of Project Lifetime	Section Reference
1) Leveraging coffee agroforestry supply chain in the geographic region	4
2) 300 ha of agroforestry coffee substituting degraded pastures	4
3) Securing land ownership and environmental compliance via landholding registrations	4
4) Improving sustainable livelihoods and quality of life for at least 150 family farmers	4

1.2 Standardized Benefit Metrics

Table 2. Standardized Benefit Metrics

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
GHG emission reductions or removals	Net estimated emission removals in the project area, measured against the without-project scenario	Not applicable	3
	Net estimated emission reductions in the project area, measured against the without-project scenario	1,739,069 tCO2e	3
Forest[1] cover	For REDD[2] projects: Estimated number of hectares of reduced forest loss in the project area measured against the without-project scenario	3,695.8	3
	For ARR[3] projects: Estimated number of hectares of forest cover increased in the project area measured against the without-project scenario	Not applicable	3
Improved land management	Number of hectares of existing production forest land in which IFM[4] practices are expected to occurred as a result of project activities, measured against the without-project scenario	Not applicable	N/A
	Number of hectares of non-forest land in which improved land management practices are expected to be occurred as a result of project activities, measured against the without-project scenario	300	5
Training	Total number of community members who are expected to have improved skills and/or knowledge resulting from training provided as part of project activities	486 – (150 families of 3.24 individuals in average)	2
	Number of female community members who are expected to have improved skills and/or knowledge resulting from training as part of project activities	214 (44% of members)	2

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

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
Employment	Total number of people expected to be employed in project activities,[5] expressed as number of full-time employees[6]	20	2
	Number of women expected to be employed as a result of project activities, expressed as number of full-time employees	10	2
Livelihoods	Total number of people expected to have improved livelihoods[7] or income generated as a result of project activities	486	4
	Number of women expected to have improved livelihoods or income generated as a result of project activities	214	4
Health	Total number of people for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	Data not available	N/A
	Number of women for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	Data not available	N/A
Education	Total number of people for whom access to, or quality of, education is expected to improve as result of project activities, measured against the without-project scenario	Not applicable	N/A
	Number of women and girls for whom access to, or quality of, education is expected to improve as result of project activities, measured against the without-project scenario	Not applicable	N/A
Water	Total number of people who are expected to experience increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	Data not available	N/A
	Number of women who are expected to experience increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	Data not available	N/A

[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
Well-being	Total number of community members whose well-being[8] is expected to improve as a result of project activities	486	4
	Number of women whose well-being is expected to improve as a result of project activities	213	4
Biodiversity conservation	Expected change in the number of hectares managed significantly better by the project for biodiversity conservation,[9] measured against the without-project scenario	300ha	5
	Expected number of globally Critically Endangered or Endangered species[10] benefiting from reduced threats as a result of project activities,[11] measured against the without-project scenario	4	5

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

2 GENERAL

2.1 Project Goals, Design and Long-Term Viability

2.1.1 Summary Description of the Project (G1.2)

The REDD+ Café Apuí Agroforestry (CAA) project aims to expand the production chain of agroforestry coffee in southeastern Amazonas and avoid deforestation of native forests on rural properties in the municipalities of Apuí, Manicoré and Novo Aripuanã, in the state of Amazonas, Brazil. In the absence of the project, forests on the participating properties would be cleared for agricultural activities, especially pastures, for income generation. CAA is a 30-year grouped project, with new participants joining periodically over the first ten years.

The initial project's participants are 42 family farmers (Project Activity Instances – PAI) in the region who develop agricultural activities. The project participants can be divided into two profiles. The first are family farmers dedicated to agriculture, including perennial (coffee, cocoa, guaraná) and annual crops (corn, beans, rice), also engaged in cattle ranching and dairy farming. Most of the participants has landholding smaller than 400ha, and lives on the rural property. The second profile comprises landowners with landholdings larger than 400ha and/or who only engage in cattle raising activities, and who have more extensive native forest areas.

The project is based on long-term (30-yr) agreements with these landowners to avoid deforestation in their areas in exchange for performance-based payment for avoided deforestation. In addition to monitoring, reporting, verification, and leakage mitigation activities, VCU revenues will be invested in agroforestry implementation, technical assistance, organic certification processes, administration, and marketing of coffee and other agroforestry products. The project aims to expand agroforestry coffee production using agroecological techniques and trained personnel in organic production promoted since 2012 in the region (Carrero and Figueiredo, 2015; Figueiredo et al. 2015).

In the scenario without the project, the forest areas of these owners would be converted into pastureland to expand livestock activity, by themselves or by others after selling their holdings (e.g., Carrero et al. 2020, Yanai et al., 2020, 2022). The increasing demand for calves for beef production in the region has intensified over the last decade. Deforestation rates have skyrocketed in the last five years and encourages family farmers to deforest and invest in cattle ranching or to sell their landholdings for capitalized farmers who would convert forest into pastures. In this scenario, income comes from ranching and from the land price increasing value. This consists of the most favorable land use change scenario in this geographic region where land speculation has been flourishing with policy changes and lowering environmental surveillance (Carrero 2022, Carrero et al. 2022a).

In the scenario with the project, payment for avoided deforestation, investment in the agroforestry coffee chain, and support for the structuring of new agroforestry product chains offer an alternative sustainable income to producers while maintaining conserved forests. The project will also support social organization and other activities that will bring positive net benefits, improved community well-being, and increased conservation of ecosystem resources and biodiversity.

Climate benefits

Average annual emission reduction estimates from avoided deforestation 57,969 tCO2e, totaling 1739,069 tCO2e in 30 years of the project.

In addition to reducing emissions, the project foresees climate benefits related to monitoring forest coverage, monitoring fire outbreaks, monitoring forest carbon stocks, strengthening partnerships for firefighting plans, creating and supporting the maintenance of firebreaks, and implementing agroforestry systems. These mitigation actions would reduce risks of non-permanence and income losses.

Community benefits

The main benefits for communities involved and impacted by the project are related to increased well-being and income. Socioeconomic and work conditions, exposure to pesticides, as well as better nourishment, environmental awareness and social recognition, are part of the theory of change for developing an economy based on sustainable rural production and land security for family farmers in the project's geographic region.

The project implements a system for sharing benefits and payment for environmental services with payment for avoided deforestation and the fostering of sustainable supply chains in the region. It supports the coordination and implementation of agroforestry and organic systems, organic certification, and related technical assistance, capacity building and training on fire control, land use management, agroecological transition, and manipulation, processing and quality control of production. It also coordinates the sale of agroforestry products to maximize income generation for participants. The CAA project will also empower women and young youth to play a leading role in income-generating productive activities.

Lastly, the project will contribute to land security by supporting land and environmental regularization for participant landholdings, including pursuing cooperation agreements with government and non-government institutions.

Biodiversity benefits

The project benefits biodiversity by maintaining biodiversity in native forest areas, reducing the habitat loss of four endangered species and dozens of Vulnerable species, as well as increasing local biodiversity by restoring degraded areas with productive coffee agroforestry systems.

The project foresees the monitoring of biodiversity via environmental DNA and camera traps, monitoring of environmental parameters of the project's properties, besides actions to reduce illegal hunting and fishing such as implementing of warning signs of fauna and flora protection in the project's forests.

2.1.2 Project Scale

Table 3. Project Scale

Project Scale	
Project	X
Large project	

2.1.3 Project Proponent (G1.1)

Table 4. Project Proponent

Organization name	Amazônia Agroflorestal Comercialização de Produtos Agroflorestais Ltda
Contact person	Sarah Sophia Perina Sampaio

Title	CEO Amazônia Agroflorestal
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2.1.4 Other Entities Involved in the Project

Table 5. Other Entities Involved in the Project

Organization name	IDESAM
Contact person	Victoria Bastos
Title	Leader at the Environmental Services Program
Address	Barão de Solimões street, number 12 – Room 1 - Flores, Manaus – Amazonas – Brazil. Zip Code: 69058-250
Telephone	+55 92 3347 7350
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Contact person	Gabriel Cardoso Carrero
Title	PDD Technical Coordinator
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2.1.5 Physical Parameters (G1.3)

The REDD+ CAA project is a grouped project located in the south of the State of Amazonas, Brazil, in its southeastern portion, along the Transamazônica Highway (BR-230). The project will take place on rural properties within and around three land reform settlement projects, PA Rio Juma in Apuí, PA Acari in Novo Aripuanã, and PA Matupi in Manicoré. The current and future project areas are composed of private rural properties.

For describing physical parameters that occur in the project region, we use the Reference Region (RR), which is also the geographic region of this grouped project where new project activity instances will be located. The RR excludes other types of land tenure that are public lands allocated for conservation, such as Conservation Units and Indigenous Lands. The RR comprises an area of approximately 1.99 million hectares (Figure 1). The portion of the RR to the west is centered on the Matupi village (or Km180) and is surrounded by Indigenous Lands and Conservation Units (UCs). The eastern portion of the RR has the townof Apuí as its center, 220km away from Matupi village, encompasses the PA Rio Juma and PA Acari

Settlements, also surrounded by UCs. In both regions, deforestation has been growing rapidly in recent years for conversion into pastures for livestock activity.

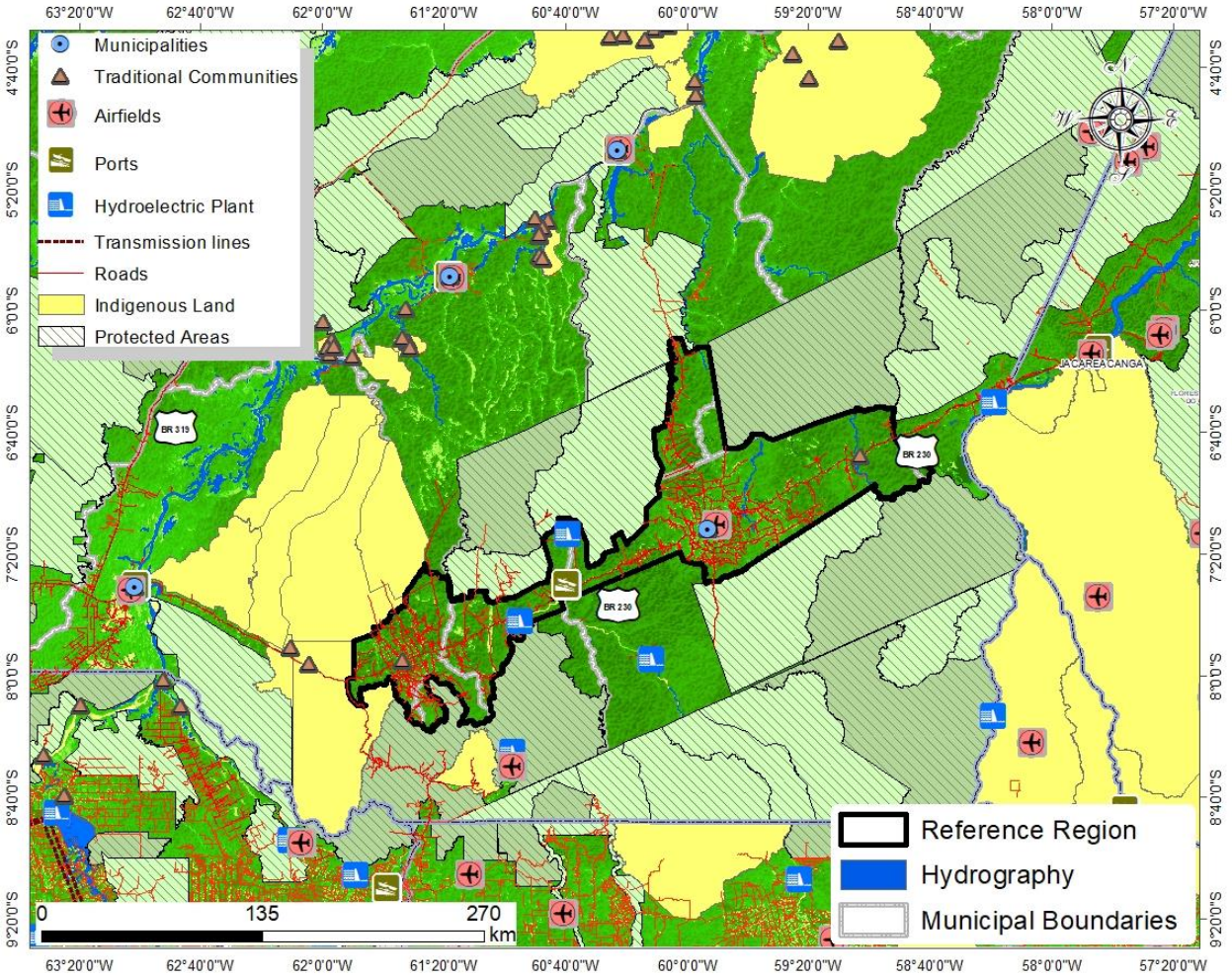

Figure 1. Region of the project, land tenure and infrastructure.

The main land access route is the Transamazon Highway (BR-230), which extends over 4,223 km passing through seven states: Paraíba, Ceará, Piauí, Maranhão, Tocantins, Pará and Amazonas. It was built in the 1970s to promote settlements along the road and connect the Amazon region to the Northeast. The closest commercial centers to the AP are the town of Apuí and the district of Matupi, part of Manicoré municipality.

The region has navigable rivers for transporting people and mainly agricultural production to Manaus, capital of Amazonas State. The main rivers used for transport are the Aripuanã River (where the port of Prainha is located) and the Juma River (where cattle are shipped during the flood season), but there are also other navigable rivers such as the Acari River, Sucunduri River, Camaiú River and Manicoré River. Proximity to water courses has historically determined the locations of settlements for the extraction of non-timber forest products (NTFPs) and timber. Waterways continue to be the predominant means of transporting forest products.

Topography

The reference region has an altimetric variation between 12 and 280 meters (Figure 2). The relief and topography in the AP are plateaus characterized by erosion and material deposition. The relief can assume different forms, such as escarpment, mountain range, or plateau. 57% of the Reference Region has slope characterized as undulating (8%-20%) and 29% as gently undulating (3%-8%) (Figure 3).

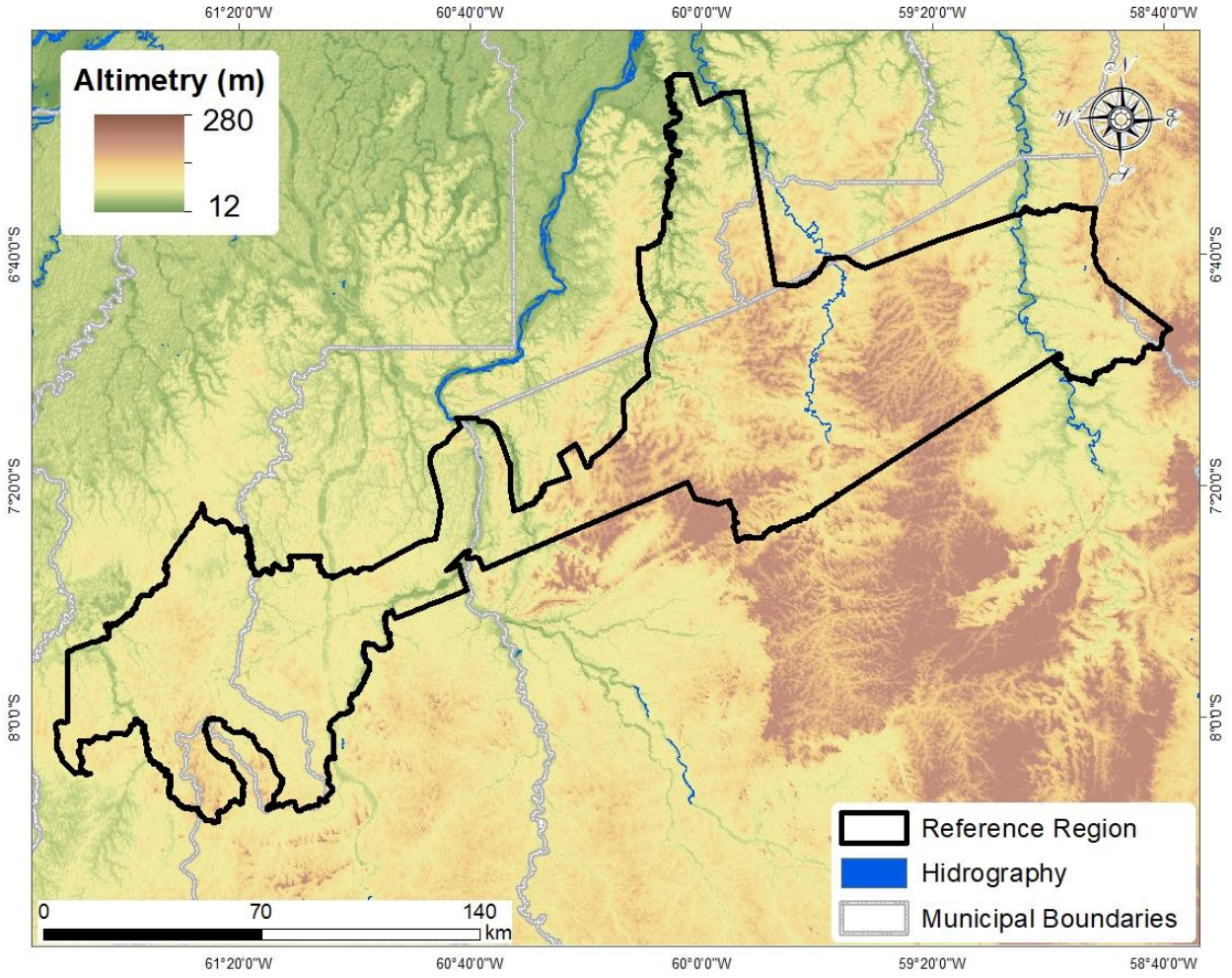

Figure 2. Altitude variation within the Reference Region

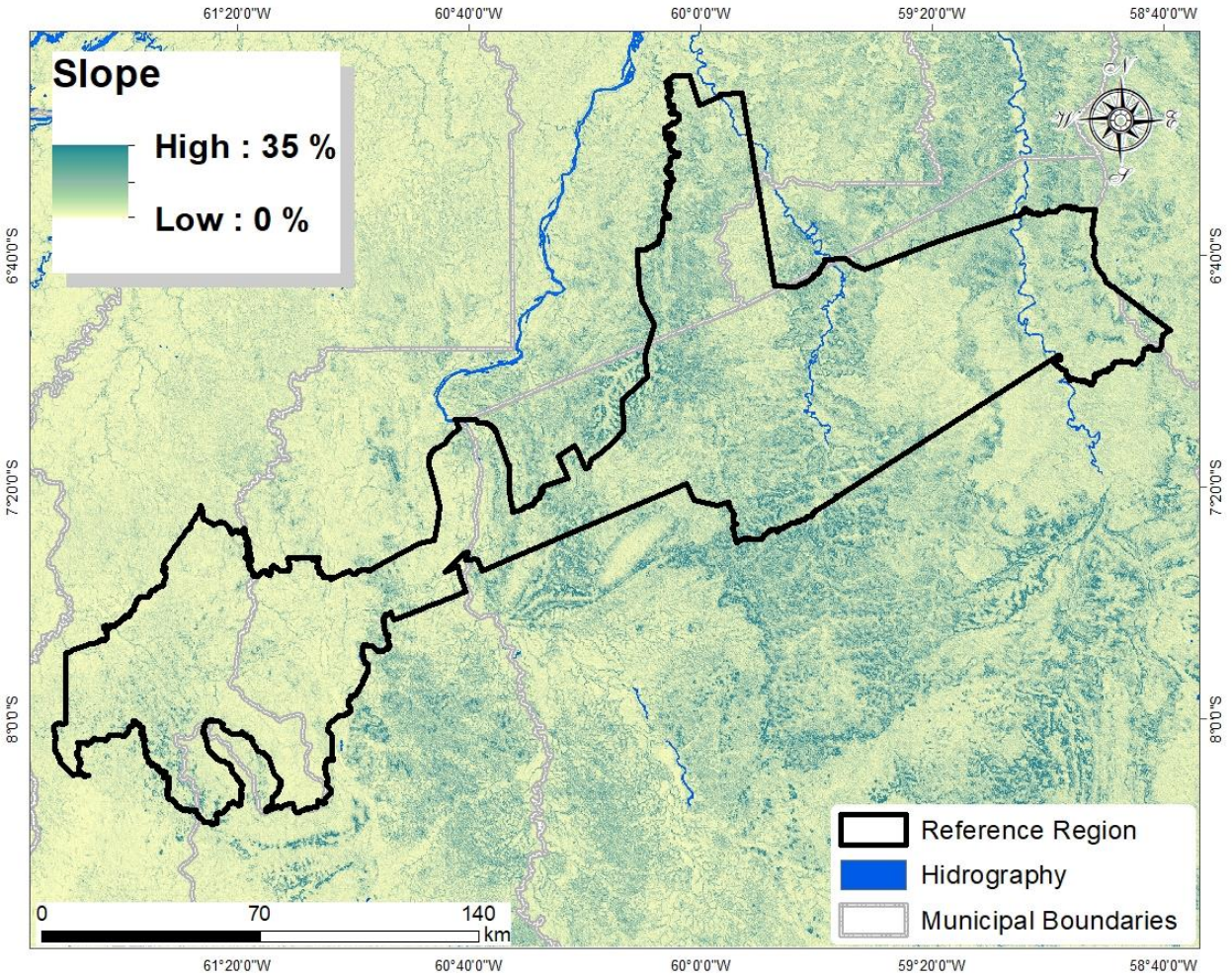

Figure 3. Slope in the Reference Region

Geodiversity

Alto Tapajós (63%), Içá (15%), Colíder (9%) and Serra da Providência (5.5%) formations represent 92.3% of the RR's geodiversity (Figure 4).

Alto Tapajos: sedimentary basin occupies 135,000 km² of the southern portion of the Amazon Craton, which articulates the SW and SE of the basins of the Amazon and Solimões Rivers (Maia & Marmos, 2010). The occurrence of a sedimentary succession with marine characteristics dominated by normal faults and with a Siluro-Devonian record in the lowest unit is observed along the northern flank of the Alto Tapajós Basin (Santiago, Santos & Maia, 1980). The region has a wide occurrence of sedimentary rocks of the Jatuarana Group, with tectonic breccias that configure possible zones of reactivation of the basin (Reis, 2006). To the northwest is clastic rocks and Neo-Silurian and Neo-Devonian neritic carbonates from the Jutaí Formation (Araujo; Lima; Santos, 2015).

Içá Formation- comprises products of fluvial origin from the Alter do Chão and Solimões formations. It is sedimentary and adheres to the uplift and paroxysm of the Andean chain, does not go beyond the limits of the Purus Arch. Within the range of the Amazon Basin, a Pleistocene sedimentation has been identified, occurring on the east flank of the arc and extends north along the NS lineament, which controls the lower

course of the Branco river, in the state of Roraima. This sedimentation registers temporal equivalence to the Solimões Unit of the Solimões Basin and, possibly, maintains correlation with the Novo formations of the middle Amazon, and Praia Vermelha (Reis, 2006), of the lower region.

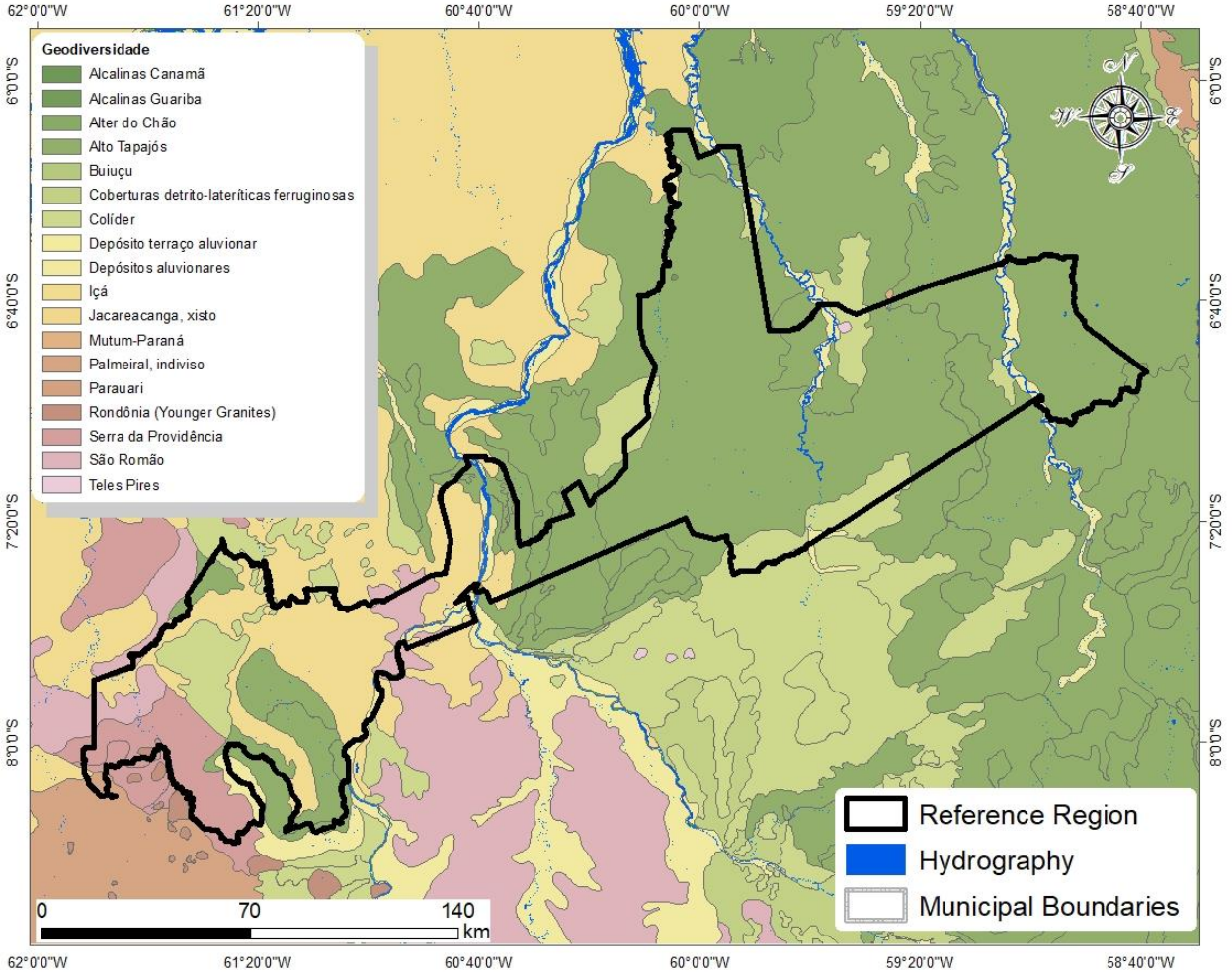

Figure 4. Geodiversity in the Reference Region.

Colíder – Different formations group clastic sedimentary rocks that rest discontinuously on the volcanic ones that in turn form the Colíder formation to the south and southwest of the Apuí region, corresponding to the lower lithofacies established by Almeida and Nogueira Filho (1959). The rocky substrate that emerges in this domain is quite varied and comprises meta igneous rocks (Iza, Costa & Costa e Castro, 2015) and effusive igneous rocks, all of Paleoproterozoic age; sedimentary rocks of platform cover and intrusive igneous rocks of Meso- to Neoproterozoic age; and slightly younger sedimentary rocks of Siluro-Devonian age. The great lithological diversity is reflected in the landscape by the expressive occurrence of residual relief features, many associated with outcrops of granitic rocks or rhyodacites of the Colíder Group (Iza, Costa & Costa e Castro, 2015)

Serra da Providência- is inserted in the geotectonic context of the Amazon Craton in the central-eastern portion of the State of Rondônia, and covers an area of about 3,000 km² (Iza, Costa & Costa e Castro, 2015). The lithostratigraphic unit of this sheet integrates the south/southwest portion of the Rondônia-Juruena Geochronological Province, with predominantly Precambrian units formed from the

Paleoproterozoic, and Paleozoic units linked to the sedimentation of the Parecis Basin (Godoy et al., 2019). In general, Paleo/Mesoproterozoic igneous and metamorphic rocks are predominant in the region, composing polydeformed terrain affected by different intensities of metamorphism with a significant decrease in the degree of deformation and metamorphism from west to east along the geological profile (Iza, Costa & Costa e Castro, 2015).

Soils

85% of the RR has Dystrophic Latosols (Ferralsols in WRB-IUSS Class). Dystrophic Red-Yellow Argisols (Acrisols) make up another 14%, and Dystrophic Haplic Plinthosols less than 1% (Figure 5).

Dystrophic red-yellow latosols (LVAd1)- covers non-hydromorphic mineral soils with latosolic B horizons and Fe_2O_3 content between 7% and 11%, with clayey or very clayey texture (Oliveira, Jacomine & Camargo, 1992). The LVAd are soils that occur throughout the Brazilian territory, associated with flat, gently undulating, or undulating reliefs; they present high depth and uniformity in color, texture and structure along the vertical profile (Oliveira, Jacomine & Camargo, 1992). They have low fertility (V% < 50%) with low micronutrient and phosphorus contents (EMBRAPA, 2018) and are considered chemically poor soils, with base contents concentrated only on the surface, due to the recycling of nutrients. They are usually highly acidic soils, with pH values in water close to between 4 and 5.

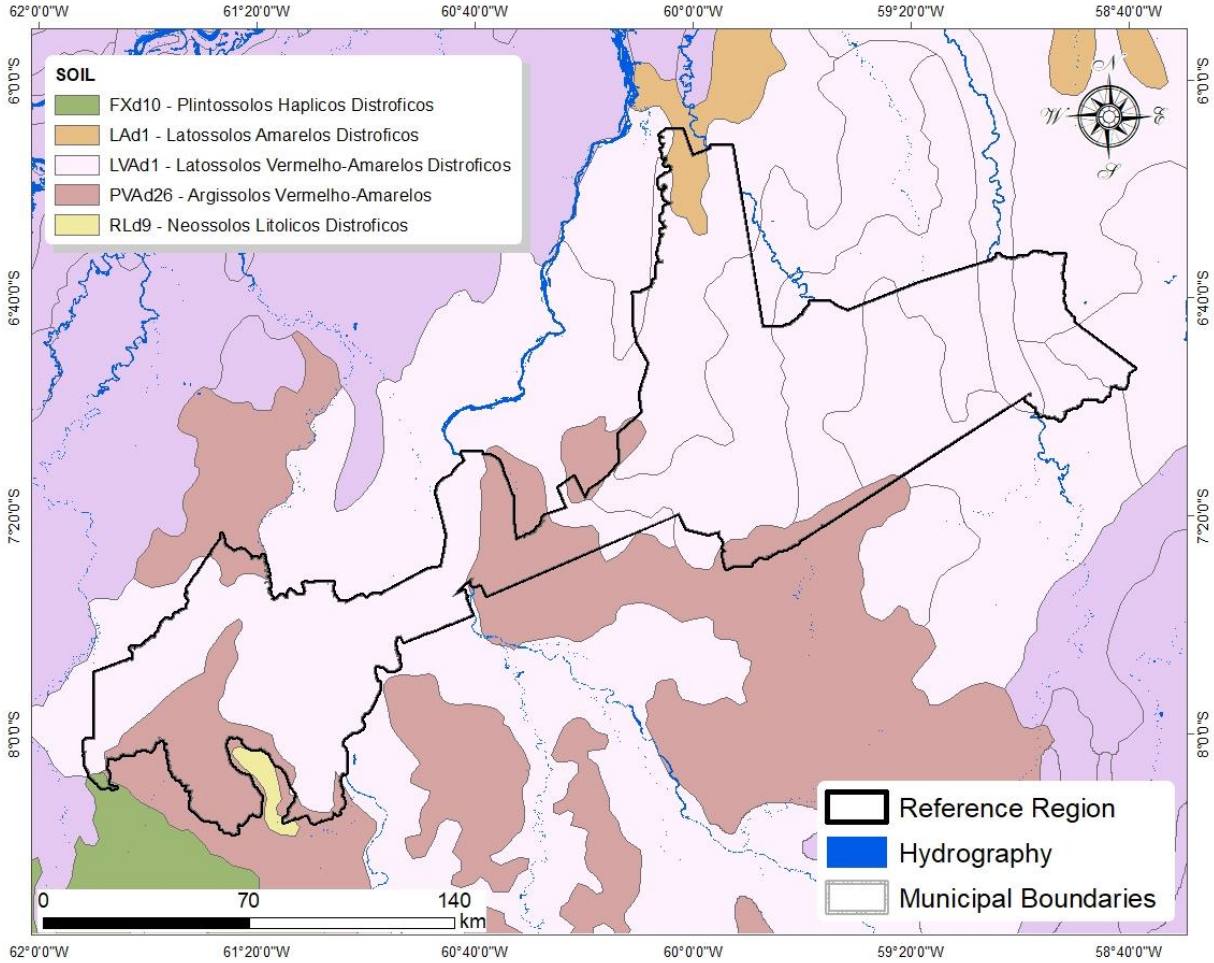

Figure 5. Soil types in the Reference Region

Dystrophic yellow latosols (LAd1) - are soils consisting of mineral material, presenting latosol diagnostic B horizon preceded by any type of A horizon within 200 cm of the soil surface or within 300 cm if the A horizon is thicker than 150 cm (EMBRAPA, 2018). Its occurrence occurs in relief environments, normally flat and smooth wavy and, less frequently, wavy. They are uniformly yellowish in color, or more yellow in most of the first 100 cm of the B horizon (including BA). Likewise, the clay content occurs homogeneously throughout the profile, with a texture that tends to vary, generally, from clayey to very clayey (EMBRAPA, 2018). The structure is normally weak, with physical conditions favorable to moisture retention and good permeability. Because they are dystrophic, that is, with base saturation (V%) below 50%, considered of low fertility. They are deep soils, with good drainage, but with limitations related to somewhat restricted permeability and somewhat slow infiltration (Oliveira; Jacomine & Camargo, 1992; EMBRAPA, 2018).

Dystrophic red-yellow argisols (PVAd) - comprise soils constituted by mineral material that has as differential characteristics the presence of low activity clay textural B horizon, or high activity provided that it is combined with low V% or with aluminum character. Ultisols show a substantial increase in clay from the A to B horizon, with the transition between these horizons usually clear, abrupt or gradual. Argisols have a high occurrence throughout the Brazilian territory, being surpassed only by the class of Oxisols (Resende et al., 2019). In the case of Dystrophic Red-Yellow Argisols (PVAd) the V% is less than 50% with high activity clay in most of the first 100 cm of the B horizon (including BA); they are non-hydromorphic and susceptible to erosion (EMBRAPA, 2018).

Climate and Hydrology

The project region is located in the south of the state of Amazonas, in the interfluve of two major tributary rivers of the Amazon River, the Tapajós River to the east and the Madeira River to the west. The climate, according to the Koppen classification, is Humid Tropical Climate (Am), with total annual precipitation ranging from 2400 to 2800mm and average between 2013 and 2021 of 2,513 mm per year (Figure 6), with an average temperature of 26º Celsius. The region has a dry period of 0 to 3 months, generally between August and October.

Vegetation

The REDD+ CAA Project is located in a region that originally has more than 91% of the area of the RR in tropical forest, with 64.8% of Dense Ombrophyllous Forest and 26.3% of Open Ombrophyllous Forest, with small a portion of non-forest formations (grasslands) composed of wooded savannah or herbaceous or shrubby pioneer formations around rivers and lakes (Figure 3). These classes follow the phyto-ecological definitions established by the RADAMBRASIL Project (Veloso & Góes-Filho, 1982; Veloso, Rangel-Filho & Lima, 1991) (see item 2.1.5 – Physical Parameters).

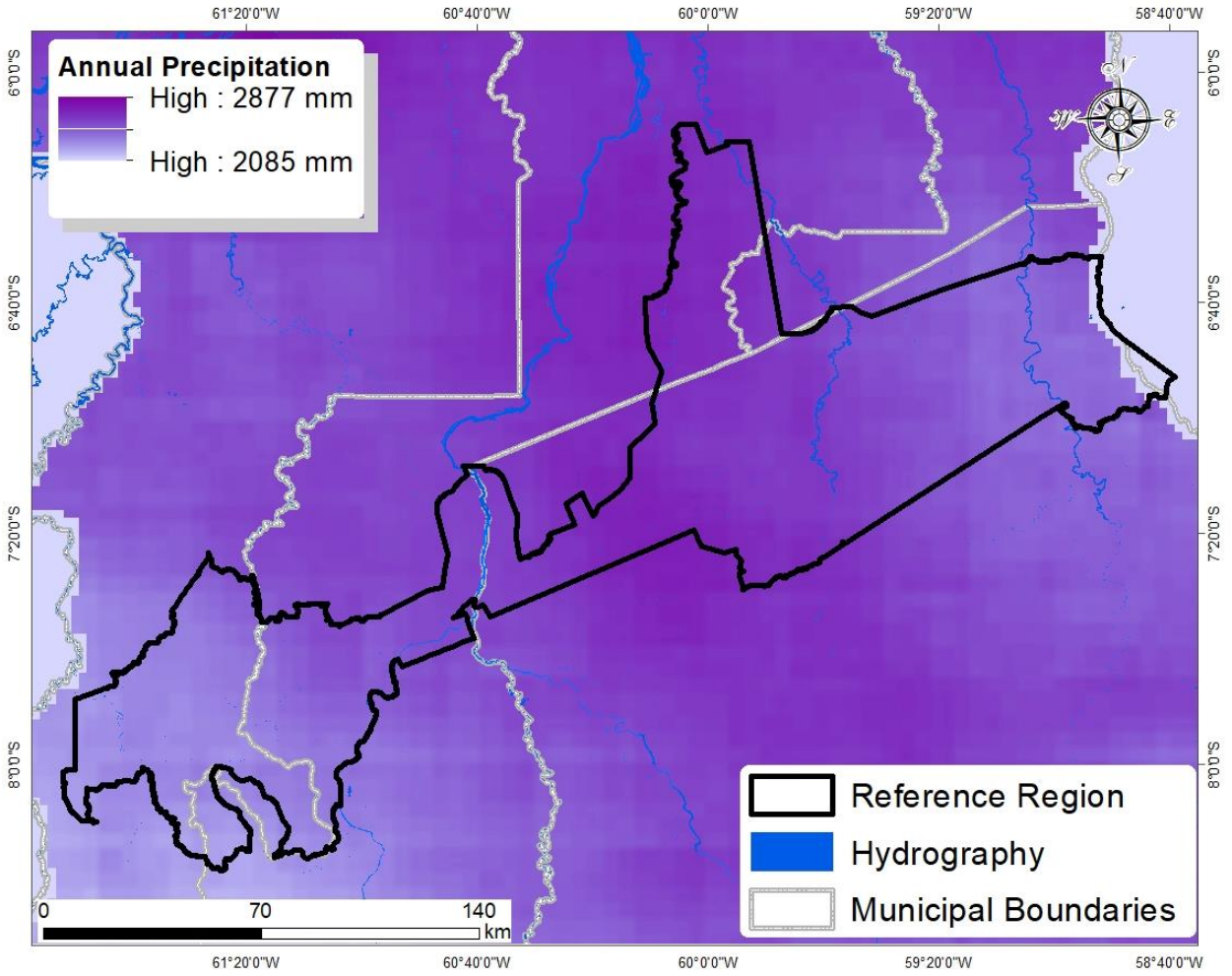

Figure 6. Average annual rainfall between 2013 and 2021. (Source: CHIRPS data).

Dense Ombrophylous Forest – This forest class spread through 68% of the Reference Region. It is composed of various sub-classes. Submontane Dense Ombrophyllous Forest represents the majority of the area, covering both the Precambrian shelf's highlands and dissecting terrain and hills. This is the dominant vegetative phytophysiognomy in the project region. In the highlands, the forests have a uniform structure, with tall and wide trees (over 40 m), with or without palm trees. Many emerging trees also characterize it. This forest does not have an herbaceous layer but an intense secondary regeneration of tree species. In hills, the structure of the forest varies with the degree of dissection of the terrain. The presence of emerging trees decreases proportionally to the slope of the terrain. Lowland Dense Ombrophyllous Forest (Db) is the dominant type found in the northern area of RR, replacing Submontane Dense Ombrophyllous Forests as it moves north. These forests have clusters of emergent trees at the highest interfluvial elevations. Significant palm densities are found, and trees compete for light in the upper strata of the forest. Alluvial Dense Ombrophyllous Forests are typically found along the banks of major rivers. This type of forest is found in areas subject to seasonal flooding and is ecologically adapted to intense variations in water level. These forests benefit from regular soil renewal from seasonal floods.

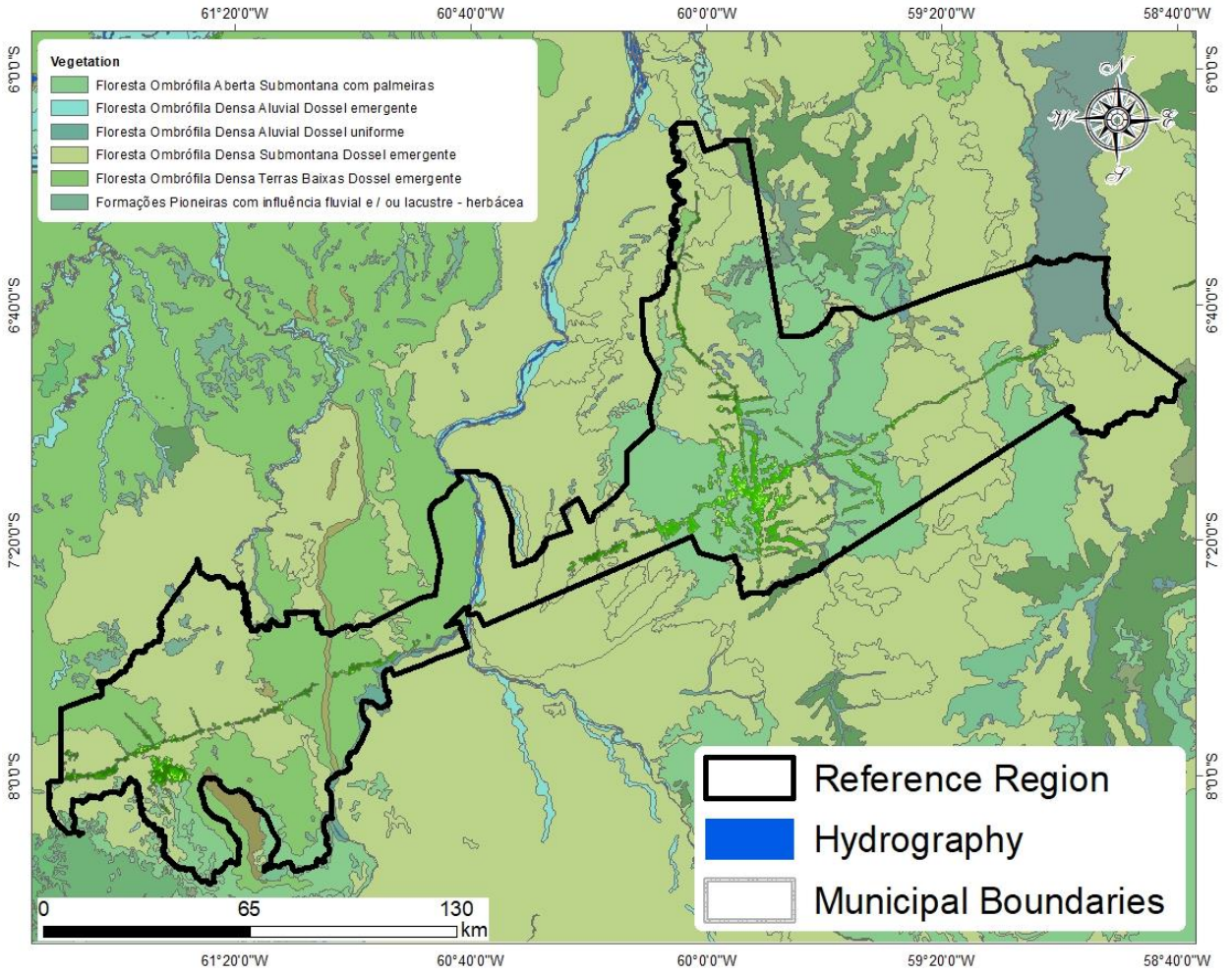

Figure 7. Forest subtypes in the reference region.

Open Ombrophyllous Forest (As)- originally occupies 22% of the RR. This type of forest is composed of more widely spaced trees, with a less dense canopy cover, generally composed of palm trees. It occurs in transition regions between the Amazon biome and neighboring areas with more dry months than in regions where dense rainforest occurs.

The Reference region also presents areas of contact Forest/Savanna (7%) Savanna formations (1%), and pioneer herbaceous vegetation (1%).

Land use

Over the last 13 years, Amazonas annual deforestation area increments had been greater than Rondônia only once. As of 2018, there has been stead deforestation in the state of Rondônia and an increase in annual deforestation in Amazonas. This is a result of migration of actors to the region from other states, in particular from Rondônia, Mato Grosso and Pará, which has intensified since 2018 and takes place precisely in the municipalities around the BR-230, BR-319 and BR-317 in the south of Amazonas, bordering the aforementioned states (Carrero 2022, Carrero et al. 2020). This pattern occurs due to land speculation and the opportunity cost of land, since the cost of land in Amazonas is lower compared to Rondônia, Acre, Mato Grosso and Pará, attracting entrepreneurs who enter the state of Amazonas with enough capital for land acquisition, implementation of new rural properties and the consequent opening of new agricultural

frontiers (Carrero et al. 2022a, 2022b). This region is part of the Amazonian Arc of Deforestation, a region of high vulnerability, risk, and rate of deforestation (Figure 8). In addition, it is a region of intense and traditional livestock activity, fueled by a growing cattle economy to attend demand for beef (Carrero et al. 2022a).

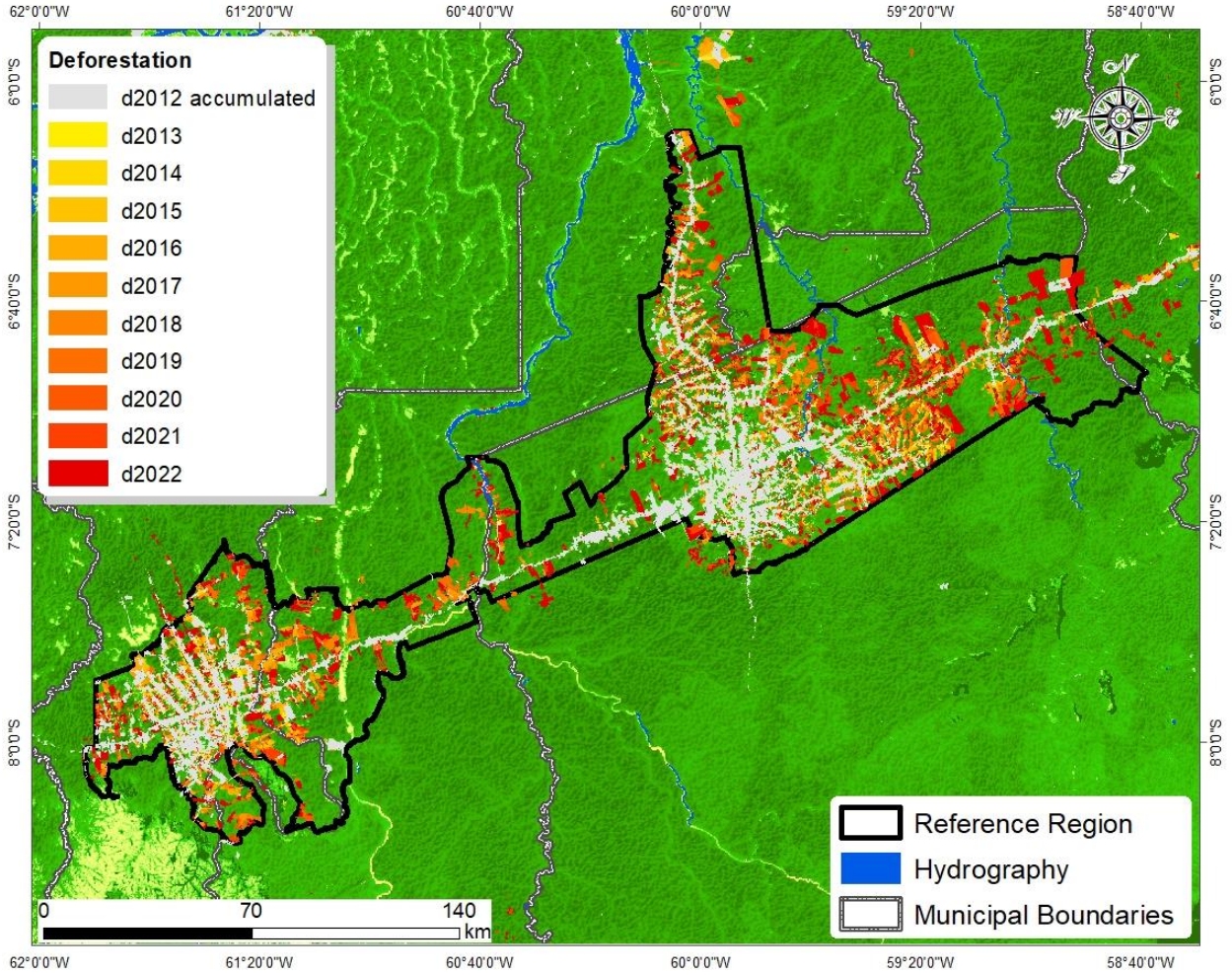

Figure 8. Deforestation expansion in the Reference Region and surrounding areas.

The land use in the RR, is predominantly extensive pastures for livestock (Figure 9), especially in areas close to past deforestation and road networks. See a detailed description of the land use change agents, drivers and underlying causes in section 3.1 of this document.

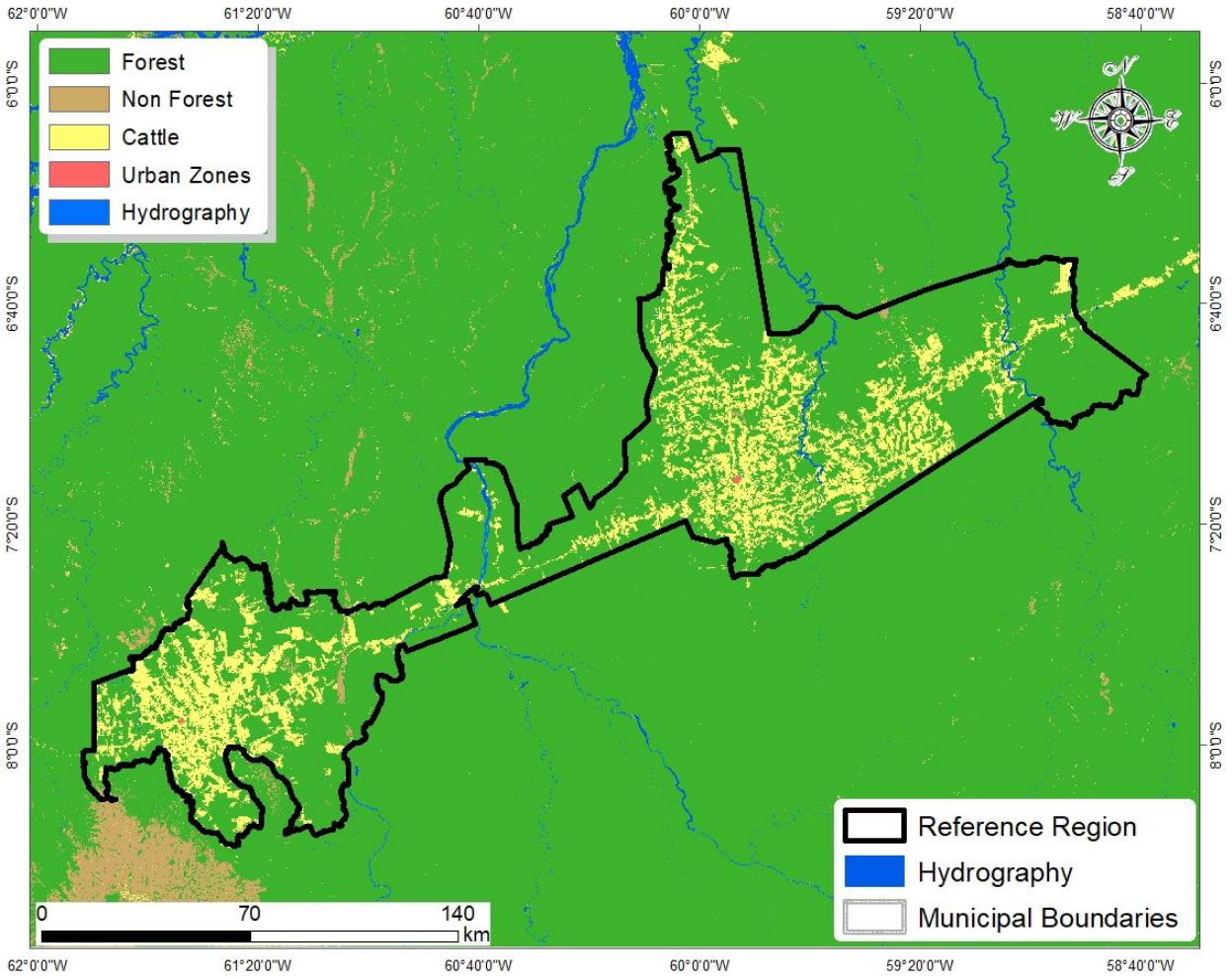

Figure 9. Land cover in 2021 in the reference region. (Source: Mapbiomas Land cover collection 7)

2.1.6 Social Parameters (G1.3)

The REDD+ CAA project region is marked by considerable sociocultural diversity. The region was originally inhabited by a wide range of indigenous peoples, with a varied intensity of complex interactions with colonial agents during various historical periods. Some archaeological records include pottery, cave painting, and successive layers of black earth, ecological niches that demonstrate various periods of occupation, permanence, and dispersion of groups (Levis, et al. 2017). Currently, indigenous peoples occupy portions in the adjacencies of the project region, such as to the east of the Southern Amazonas region, the Munduruku, Kayabi, and Apiaká, and to the western portion, the Diahui, Mura, Mura-Pirahã, Parintintin, and Tenharim ethnic groups. In addition, there are constant records of indigenous peoples in voluntary isolation throughout the region as colonization fronts advance, such as the records of Rio Preto and Bararati. According to current records, southern Amazonas has large areas of undesignated public lands, as well as a substantial indigenous population of 11,000 people, spread across 15 ethnic groups (FUNAI, 2021; ISA, 2021).

From the mid-19th century until the opening of the Transamazonian (BR-230) and Porto Velho-Manaus (BR-319) highways in the 1970s, indigenous and riverine communities inhabited southern Amazonas, living

mainly along the region's abundant waterways. The main transportation route was the Madeira River, and the only substantial population concentration was Humaitá town. Except for indigenous villages, the first communities engaged in extractive activities focused on rubber (*Hevea brasiliensis*), Brazil nuts (*Bertholletia excelsa*), and sorva (*Couma utilis*). The community residents consisted mainly of migrants from the Northeast fleeing drought and poverty and hoping to take advantage of the rubber boom (Barham & Coomes, 1994).

When the rubber market collapsed in 1920, rubber tappers shifted to Brazil nut extraction, which was also subjected to the debt-peonage labor regime. However, this shift favored the development of autonomous communities that would later become community villages and Extractive Reserves (Chaves, 2011; Costa, 2009; Mathews, 2009). In 1970, southern Amazonas had about 95,000 people. The most populous municipality, Manicoré, on the banks of the lower Madeira River, had 21,000 (IBGE, 2022a).

Until the 1970s, most of the region was considered undesignated public land. The development policy of Brazil's military government (1964-1985) to populate and exploit the Amazon's natural resources began with the construction of federal roads, with BR-230 (the Transamazon highway) completed in the mid-1970s. The policy allowed the appropriation of state lands by the federal government in the interest of colonization and biodiversity conservation and brought many people in search of cheap land for agriculture.

The reference region comprises part of three municipalities in the southern portion of Amazonas State, bordered to the east by Pará State and to the south by Mato Grosso and Rondônia States, Apuí, Novo Aripuanã, and Manicoré. They cover an area of ~19,874 km^2, mostly rural, and have an estimated population in 2021 of 106,587 individuals (IBGE, 2022a), of which more than half are in the municipality of Manicoré/AM. The available indexes on human development, and economic income point to a low development of all three municipalities. Table 6 shows socioeconomic indicators for these three municipalities.

Table 6. Socioeconomic indicators for three municipalities in the project region (Source: IBGE, 2022a).

INDICATOR	APUÍ	MANICORÉ	NOVO ARIPUANÃ
Territorial Area (km2) - [2021]	54.240,55	48.315,02	41.179,66
Urbanized Area (km2) - [2019]	5,69	12,80	5,04
Population (people) - [2021]	22.739	57.405	26.443
Infant Mortality (deaths per thousand live births) **- [2020]**	11,32	12,05	8,13
GDP per capita (BRL) - [2020]	R$12.170,22	R$10.981,24	R$8.431,61
Average monthly salary of formal workers (minimum wages) **- [2020]**	1,9	2,1	1,7

The three municipalities have a relevant role in livestock production and have significantly increased the herd since the 2000's (Figure 10). They are among the ten municipalities with the largest number of cattle in the state of Amazonas - Apuí occupying the 3rd place, Manicoré in 4th place and Novo Aripuanã in 9th place. The cattle herd in the three municipalities totaled 327,500 animals in 2020 and represents 23% of the total number of cattle in the state (Pesquisa da Pecuária Municipal - PPM - IBGE, 2022b).

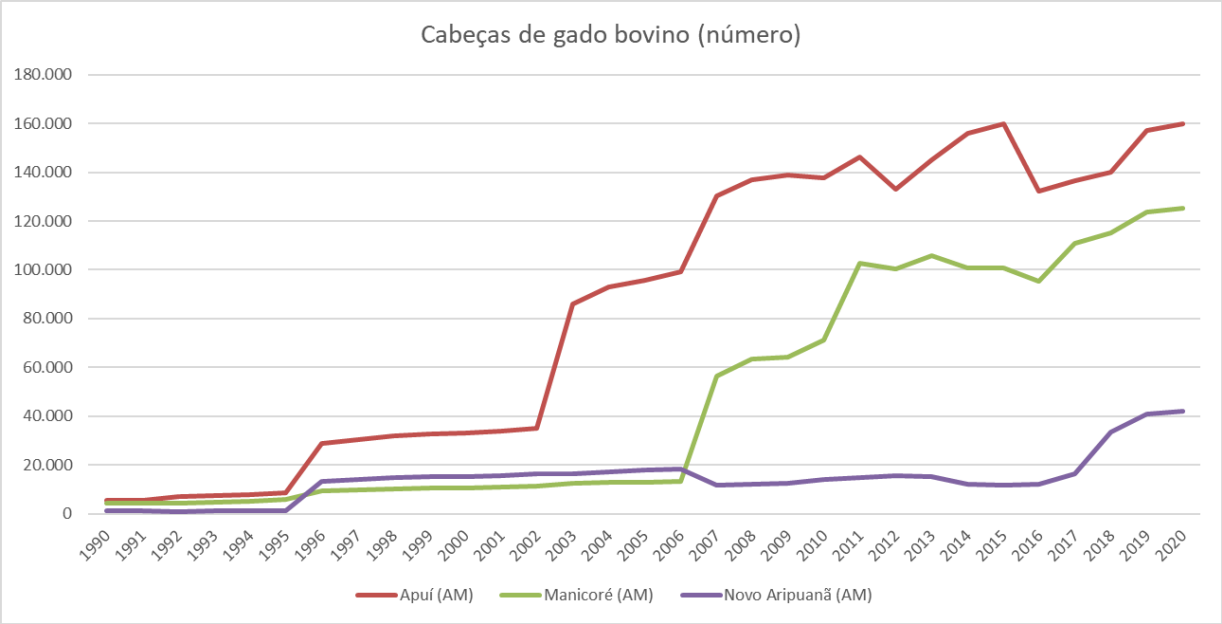

Figure 10. Heads of cattle in the municipality of Apuí, Manicoré e Novo Aripuanã (PPM - IBGE, 2022b)

The municipalities also present a significant contribution to deforestation in the state. Apuí, Manicoré, and Novo Aripuanã totaled 667km^2 of deforestation in 2021, being among the five most deforested municipalities in the state and among the 10 in the Legal Amazon. Apuí ranked 2nd in deforested municipalities in Amazonas and 7th in the Legal Amazon in the same period. The project's Reference Region, which represents 9% of the state of Amazonas, lost 7,185 km^2 by 2022.

Three conventional settlement projects (Projeto de Assentamento – Pas, with individual farm lots) created between the 1980s and 1990s are part of the project region: PA Rio Juma (Apuí), PA Matupi (Manicoré), and PA Acari (Novo Aripuanã) (Figure 11). PA Rio Juma was created in 1981 and is the largest settlement of this type in Latin America, covering more than 650,000 hectares. Of these settlements, the first two functioned as central villages in the region and have attracted people and investments in agricultural production, especially livestock. These settlements had the objective of colonizing the region by farmers who migrated from various regions of the country, especially from Southern Brazil, who were allocated individual plots and were supposed to deforest and start agricultural production (Leal, 2009; Carrero and Fearnside, 2001). With the advance of road infrastructure, and public policies for agricultural and ranching expansion, the region has received new capitalized migrants who have invested in land acquisition and deforestation (Carrero et al. 2022a, Yanai et al. 2020, 2022). There are also two communal projects in the region, in which there are no individual property boundaries, lands are communal (PAE São Benedito and PAE Aripuanã Guariba), in which NTFP extraction happens, and there is encroachment of ranchers performing deforestation (Figure 11).

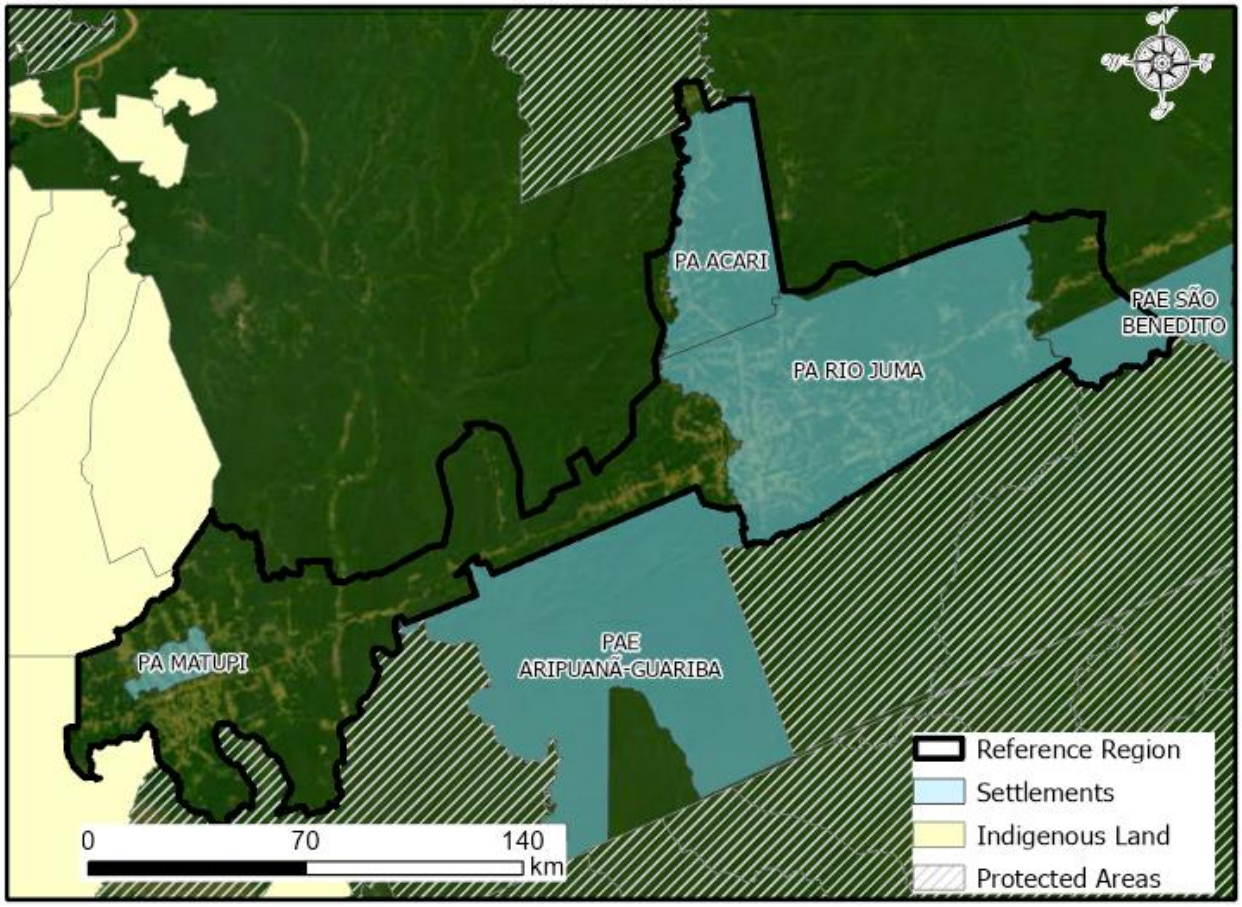

Figure 11. Reference Region showing Settlement projects and public land tenures

Migrant farmers aimed to obtain definitive land title (full rights of private property), but only 18% of the region's farmers have land title (Carrero and Fearnside, 2011, Silva 2012). Factors associated with the low titling rate include INCRA's low capacity to supervise, inspect, and issue land titles in the region, but also the low provision of basic services (education, health, infrastructure, technical assistance) and the high incidence of tropical diseases, factors which resulted in a high rate of evasion of settled families (Leal, 2009; Carrero and Fearnside, 2011; Silva 2012, Galuch 2019). What followed was a disorderly occupation that contributed to the accumulation of properties by capitalized agents who acquired land from settlers at low prices, in a process of land speculation (Carrero et al. 2020, Carrero 2022, Yanai et al. 2022). The regularization of land tenure, essential for producers' livelihoods and permanence in the farm, is a central factor in the scenario without the project. To achieve land security, agricultural producers must obtain land titles, which should encourage investments in perennial crops and agroforestry systems, dependent on strengthening these production chains.

In the scenario without the project, the influx of capital for land purchases fuels the increase in land prices, creating positive feedback between land speculation and deforestation that drives pasture expansion as a form of demonstrate land use and claim titles. Although large ranchers are already well known for bringing in external resources to invest in these activities (Walker, Moran & Anselin, 2000), this trend was observed even in small and medium-sized landowners in Apuí. (Carrero et al., 2020: 351, Carrero 2022).

The region surrounding the project has the Apuí Mosaic of Conservation Units, a unit created in 2005 that comprises 9 Conservation Units, including state parks, state forests, sustainable development reserve and extractive reserves, occupying an area of 2.5 million hectares. The Mosaic covers the municipalities where the project region is and other areas in southern Amazonas state, northern Mato Grosso state and southwestern Pará state - permeated by the Brazilian Amazon's deforestation arc.

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

Figure 12 presents the Reference Region, Project Area of PAIs 1 to 42 (Initial Project Activities Instances), Potential new PAIs mapped, the Leakage Management Areas, and Leakage Belt. HCV areas are considered to be the Project Zone, which includes the Project Area, Leakage Management Areas and the Leakage Belt.

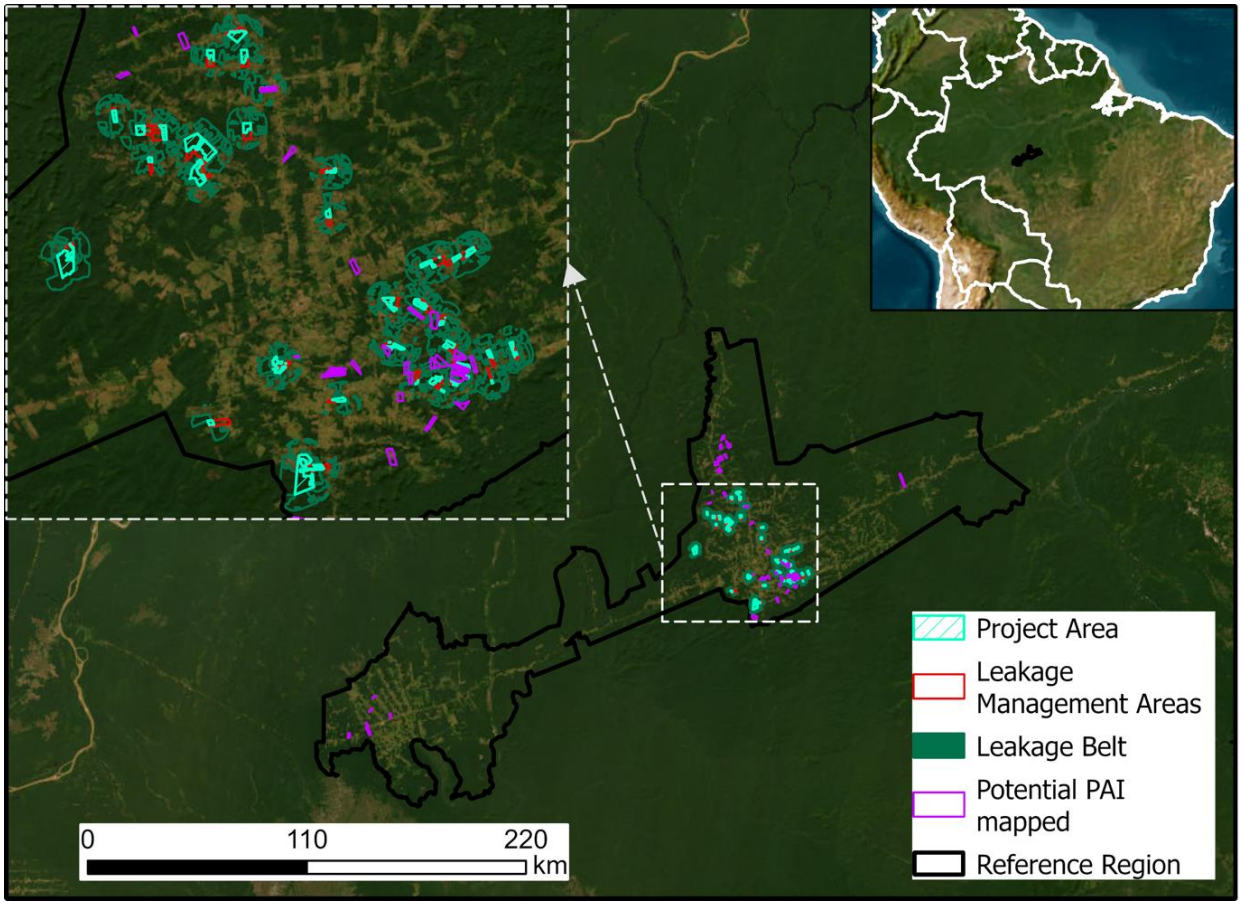

Figure 12. Project Zone Map

2.1.8 Stakeholder Identification (G1.5)

The identification and analysis of stakeholders was done by compiling information from documents and studies in the project and its reference region, including the social actors involved with activities in the region, and that connect with planned activities to be developed by the project. The identification was done by the technical partner Idesam and by the project proponent Amazônia Agroflorestal.

According to the databases and research carried out, as well as the experience of Idesam and Amazônia Agroflorestal, the following stakeholders were identified:

- Rural family farmers in the municipalities of Apuí, Manicoré and Novo Aripuanã
- City Hall (Prefeitura) of Apuí, Manicoré and Novo Aripuanã
- Municipal Secretariat of Environment of Apuí (SEMMA- Apuí)
- Secretary of Environment of Amazonas (SEMA-AM)
- National Institute for Colonization and Agrarian Reform (INCRA)
- Institute of Environmental Protection of the State of Amazonas (IPAAM)
- Institute of Agricultural Development and Sustainable Forestry of the State of Amazonas (IDAM)
- Council of Mosaic of Conservation Units in Apuí
- Municipal Council for Sustainable Rural Development (CMDRS) of Apuí
- Ouro Verde Family Producers Association (APFOV)
- Association of Rural Producers of the Vicinal Estrada Nova (ASPRUVEN): km65
- Association of Rural Producers of Rio do Couro (ASPRORICO): sector Três Estados
- Association for the Sustainable Development of Sucunduri (ADSSAM)
- Aripuanã-Guariba Agro-extractivist Association (ASAGA)
- Maniva AgroEcology Network (Rede Maniva de Agroecologia)

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

A summary of the stakeholder identification is in Appendix 1 and below a detailed description of relevance for project activities.

Family farmers in the municipalities of Apuí, Matupi, and Novo Aripuanã

Family farmers are the group of stakeholders benefited by the project. They are located throughout the rural extension of the municipalities of Apuí, Manicoré, and Novo Aripuanã. The relevance of these actors to the project is based on their direct influence on the activities that the project will develop and on the project's performance results, since they are the key actors responsible for avoiding deforestation.

The rural family farmers of Apuí, Manicoré and Novo Aripuanã are the priority audience for the actions and activities of the project described in section 2.1.11 - Project Activities and Theory of Change. The families involved in this context are multi-generational with children, youth, adults and elder. The profile of these families is described in section 2.1.6 - Social Parameters, and is detailed according to a Socioeconomic Survey carried out by the project presented in section 4.1.1 - Descriptions of Communities at Project Start (CM1.1).

Municipalities of Apuí, Manicoré and Novo Aripuanã

The municipal governments of Apuí, Manicoré and Novo Aripuanã, represented by their City Halls, are relevant to the project as they are responsible for the application of local public policies that can influence, mainly, the well-being of the project's beneficiary population or the progress of its planned activities.

Additionally, the identified municipalities governments are also responsible for taking decisions about actions related to the prevention of wildfires in the territories, one of the risks mapped by the project.

The project will share information about the activities to be developed with the municipalities of Apuí, Manicoré and Novo Aripuanã, and integrate efforts in the development of actions related to improving the well-being of the population of family farmers participating in the project and the region.

Secretaria Municipal de Meio Ambiente de Apuí (SEMMA- Apuí).

The Municipal Secretariat of Environment of Apuí (SEMMA) is the local environmental agency closest to the project activities related to implementing environmental restoration plans in rural properties and land tenure regularization. SEMMA/Apuí has a relationship with the project's technical partner, Idesam, and the project proponent, Amazônia Agroflorestal, in collaborations for the development of projects in Apuí related to the landholding regularization of properties in the Rio Juma Settlement Project, activities of the project Coffee in Agroforestry, and the planning of a project to promote the sustainable livestock chain through the implementation silvipastoral sytems.

Secretary of the Environment of Amazonas (SEMA-AM)

The Amazonas State Environment Secretariat - SEMA/AM is the state agency responsible for carrying out activities related to environmental licensing and inspection in the state of Amazonas, in addition to promoting environmental education, regulation, control, regularization, protection, conservation, and recovery of natural resources.

The relevance of SEMA/AM to the project is noteworthy for its role as the Managing Body of the State Environmental Policy - Law 4.266/2015, which establishes the State of Amazonas Policy for Environmental Services and the Environmental Services Management System. It is SEMA's responsibility to implement the State REDD+ Subprogram under the Environmental Services Law (Law 4.266/2015, Article 14 § 4 item III), and develop activities under the State REDD Plan (Law 4.266/2015, Article 16 item IV).

National Institute of Colonization and Agrarian Reform (INCRA)

INCRA is the federal agency responsible for carrying out agrarian reform in Brazil, maintaining the national registry of rural properties and managing public lands. In Apuí, Manicoré and Novo Aripuanã, INCRA is a stakeholder in the project because of its responsibility for creating Settlement Projects and granting the right to use the land to settled families.

Within the project's reference region there are five settlement projects and non-designated public lands. INCRA is the agency responsible for land regularization in these areas, including issuing the land title, or Título de Domínio, the document that proves the transfer of the property to the owner. Because of this attribution INCRA is a stakeholder in the project. The project intends to develop actions for the land regularization as a local socio-economic development activity.

Instituto de Proteção Ambiental do Amazonas (IPAAM)

It is a state autarchy linked to the Secretary of Environment of the State of Amazonas (SEMA/AM). The purpose of the agency is environmental management, implementation, and execution of national and state environmental policies - control and monitoring of enterprises and activities that use natural resources, environmental inspection of areas (fires, illegal deforestation), environmental licensing, execution and monitoring of the CAR – Rural Environmental Registry, monitoring of fires and illegal deforestation, and environmental education. In Apuí, IPAAM has a service station located the center of the municipality.

Institute of Agricultural Development and Sustainable Forestry of the State of Amazonas (IDAM)

The Institute for Agricultural and Forestry Development of the State of Amazonas (IDAM) is a state agency under the Amazonas Secretary of State for Rural Production (SEPROR), and has local units in Apuí, Manicoré and Novo Aripuanã. Its purpose is to supervise, coordinate and execute technical assistance activities and agricultural and forestry extension according to the strategic policies of the Federal and State governments. In the municipalities where the project is located IDAM develops relevant activities such as the Greener Amazon Program, which aims to contain deforestation and irregular burning, as well as licensing activities, registration of properties in the Rural Environmental Registry (CAR) and rural credit.

Advisory Council of the Mosaic of Conservation Units of Apuí

The Advisory Council of the Apuí Mosaic of Conservation Units is the advisory board responsible for proposing plans and actions aimed at protecting the Mosaic of Conservation Units of Apuí, promoting articulations for cooperation among agencies and entities to promote protection of the Mosaic, responding and opining on deliberative issues in the Mosaic's area and stimulating the raising of funds to be applied in actions, activities and others in the Mosaic and monitoring the Mosaic's Management Plan. The body is composed of government representation, civil society representatives, federal and state institutes, military police, among others.

Municipal Council for Sustainable Rural Development of Apuí (CMDRS)

The CMDRS is a consultive, deliberative, and managerial body for sustainable rural development in the municipality of Apuí. It is responsible for the construction and implementation of the municipality's sustainable rural development plan, and for ensuring the participation of rural communities. It is composed of representatives from the government and from entities that represent farmers and the rural community in general.

Ouro Verde Family Producers Association (APFOV)

The Ouro Verde Family Producers Association (APFOV) is the local association in Apuí that aggregates and organizes Apuí's rural family farmers, mainly agroforestry coffee producers. Its creation was facilitated through the Agroforestry Coffee project developed by Idesam, with the objective of guaranteeing a minimum scale of production and processing, generating quality control systems for coffee production, formalizing sales and financial accounting, as well as allowing access to public policies, such as the participative certification process (SPG). Its relevance to the project is mainly because it is a social organization that aggregates family farmers with the profile of the producers who own the properties involved in the project, mainly located in the side roads Raulino, Sebastião Pedro,10 and 11 in Apuí.

Associação dos Produtores Rurais da Vicinal Estrada Nova (ASPRUVEN), Associação dos Produtores Rural do Rio do Couro (ASPRORICO), Associação de Desenvolvimento Sustentável do Sucunduri (ADSSAM) and Associação Agroextrativista Aripuanã-Guariba (ASAGA). Associação dos Produtores Rurais de Mautpi (ASPROMAT).

These are representative entities of rural producers and agro-extractivists where the landholdings of family farmers participating and expected to join the project are located.

Maniva Network of Agroecology (Rede Maniva de Agroecologia)

The Maniva Network of Agroecology is a social movement formed by farmers, technicians, students, consumers, and organizations with the objective of promoting agroecology and organic production in Amazonas. The Network counts with the participation of producers from the municipalities of the Metropolitan Region of Manaus, São Gabriel da Cachoeira, Tefé, Maués, Parintins, Apuí, and Novo Airão.

In the context of the project, the Rede Maniva de Agroecologia is the institution responsible for conducting the audit and the organic certification process of the Apuí Agroforestry Coffee, produced in the agroforestry systems of family farmers from the Apuí and Matupi Village. The farmers involved in the project will have the support of the Maniva Network of Agroecology to certify their organic production through the Participative Guarantee System (SPG) and thus obtain more added value in the sale of their products.

2.1.10 Sectoral Scope and Project Type

The Café Apuí Agroforestry Project is part of the Agriculture, Forestry and Other Land Use (AFOLU) sectoral scope in the Reducing Emissions from Deforestation and Degradation (REDD) project category. The activity type is Avoided Unplanned Deforestation and/or Degradation (AUDD). This document refers to the bundled project description and monitoring of the Initial Instances of Project Activities (PAIs#1-42).

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

The main objective of the REDD+ Café Apuí Agroforestry project is to reduce deforestation and conserve native forests in rural properties in rual areas of the municipalities of Apuí, Manicoré and Novo Aripuanã. Integrated into this main objective are payments for environmental services from forest conservation and support to the agroforestry production chain, along with other activities that will increase climate, community and biodiversity benefits.

The specific activities of the project are grouped into four categories (A. Forest protection and environmental monitoring, B. Payment for environmental services, C. Sustainable Production, Income Generation and Gender Inclusion and D. Land and environmental regularization), which are presented in Appendix 2. The construction of the Theory of Change makes explicit the logical sequence between activities, how they help achieve the project's main objective, and their expected results and impacts generated.

Information in detail on the four categories of the project's activities is presented below.

A. Forest protection and environmental monitoring

In addition to monitoring forest cover and forest carbon stocks, the project will monitor fire outbreaks and conduct training on this topic and on the use of agrochemicals. Forest fires and wildfires are widespread in the region and have intensified in recent years due to the longer and drier seasons, especially in El Niño years. With forest fragmentation and degradation, the edges of the forests dry out and experience tree mortality, generating more flammable dry matter. Thus, the forests become more susceptible to higher intensity fires, which increases the extent and severity of damage caused by forest fires. Another problem is the use of agrochemicals to control weeds and bushes in the pastures, which in the region are being done with the use of airplanes. The drift of pesticides by aerial spraying has the risk of affecting forests and agroforests and leading to tree mortality, with associated carbon emissions.

As mitigation activities, the project will strengthen plans to prevent and control fires in forest and agroforestry areas in the project area regions. This includes partnerships with fire brigades for the strengthening of trained and equipped fire brigades, as well as the implementation and maintenance of firebreaks. As a main strategy, the project foresees the realization of awareness campaigns about the risk of fires and contamination by agrochemicals and alternative techniques in the regions of the project participants' properties. These campaigns and training will be open to producers who are not part of the project, but whose actions pose a risk to the project's success.

The project will also monitor forest and agroforestry systems biodiversity and stimulate tree planting at forest edges, as well as establish protected area warning signs for hunting, fishing and logging in the project forests. It will use eDNA to monitor invertebrates and trap cameras for terrestrial vertebrates.

B. Payment for environmental services

One of the CAA project's central axes is the implementation of a payment mechanism for environmental services derived from avoided deforestation from the participant producers. The payment for avoided deforestation will be performance-based and has as its legal instrument a long-term contract with the project proponent. Private landowners and landowners with eligible land tenure status for regularization commit not to deforest their properties for 30 years. In exchange, they will receive all the benefits previously agreed upon with the project proponent, plus cash remuneration for the conserved forest. With this mechanism, the project aims to keep small producers on the land, reducing farm turnover, thus avoiding increased speculation and greater deforestation caused by large landowners.

C. Sustainable Production, Income Generation and Gender Inclusion

Developing sustainable rural production chains and organic certification is another central axis of the project. It seeks to increase producers' income and improve well-being. The leading strategic activity is the implementation of agroforestry systems focused on coffee production in unproductive and degraded areas (mainly pastures), and the continuous technical assistance in all production stages, such as implantation, management, production, harvesting, post-harvest, processing, marketing, and sales. The project will also support producers to obtain organic certification and pay a premium on agroforestry and organic coffee beans, foster productivity increase and infrastructure and machinery acquisition, such as nurseries and suspended terraces for dry coffee beans. Activities focused on women and youth entrepreneurship are planned to support diverse small businesses for income generation, gender inclusion, and food security. In addition, residents of the project region may be hired to assist the proponent's work in the field to develop specific services, contributing to increasing income and boosting the local economy.

D. Land and environmental regularization

The project will provide assistance to landowners in land regularization and necessary steps, such as connecting with professionals and institutions/organizations that work in environmental regularization, providing guidance, etc. To speed up the process, it also foresees partnerships with the National Institute of Colonization and Agrarian Reform (INCRA) to enable information analysis.

2.1.12 Sustainable Development

The main objective of the project REDD+ Café Apuí Agroforestry is to promote the conservation of native forests in rural properties in the municipalities of Apuí, Manicoré and Novo Aripuanã.

This objective and its integrated activities, presented in section 2.1.11 - Project Activities and Theory of Change, contribute to the achievement of commitments or statements made by the Brazilian Government, as follows:

- Sustainable Development Goals (SDGs)

Brazil assumed, from the Rio+20 Conference, the commitment to achieve sustainable development, from which were outlined the 17 Sustainable Development Goals that should guide policies and actions of the signatory countries (ODS Brazil, 2022). The project will help to directly achieve 7 goals, as described below:

Goal 1 - Eradication of Poverty: The project foresees the investment of part of the resources obtained with the sale of the credits in activities that allow for an increase in income and an increase in sustainable rural production, as a way to improve the quality of life and expand income generation for rural producer families that live in the project area and reference region. Thus, the project specifically contributes to the goals:

"1.4 - By 2030, ensure that all men and women, particularly the poor and vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technologies, and financial services, including microfinance."

"1.5 - By 2030, build the resilience of the poor and those in vulnerable situations, and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters."

Goal 2 - Zero Hunger and Sustainable Agriculture: One of the main activities developed by the project is the promotion of the agroforestry productive chain as an alternative and high value-added form of rural production. The project area is located in rural properties that have or will have the implementation, through the project, of agroforestry systems with a focus on the production of organic coffee and forest species products that also have economic and food uses. This system has a positive impact on the environment because it is based on regenerative production practices, without the use of agrochemicals and maintaining the soil's ecological functions, and it allows the diversification of food and income for rural producer families. Besides promoting the implementation of agroforestry systems, the project will also invest in technical assistance for sustainable rural production and offers guaranteed income from the purchase of coffee produced in agroforestry. Thus, the project specifically contributes to the goals:

"2.1 - By 2030, end hunger and ensure access for all people, particularly the poor and people in vulnerable situations, including children, to safe, nutritious and sufficient food throughout the year."

"2.3 - By 2030, double the agricultural productivity and incomes of small-scale food producers, particularly women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment."

"2.4 - By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen adaptive capacity to climate change, extreme weather, droughts, floods and other disasters, and that progressively improve land and soil quality."

Goal 4 - Quality Education: The project aims to promote educational and formative activities (training and workshops) on topics related to social and environmental development. In this way, the project specifically contributes to the achievement of the goal:

"4.7 - By 2030, ensure that all learners acquire knowledge and skills necessary to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development."

Goal 5 - Gender Equality: The project has as one of its planned activities the inclusion of women and young people in income-generating activities focused on productive activities. Examples of these activities are training in organic vegetable gardens and in social control mechanisms to guarantee the organic certification of the products from the agroforestry systems implemented by the project, aiming at a greater participation of women and young people in activities that generate income for the family. Thus, the project specifically contributes to the achievement of the goal:

"5.5 - Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life."

Goal 12 - Responsible Consumption and Production: The main objective of the project is to encourage forest conservation from remuneration for ecosystem services provided by standing forest. The project proponent and the participating property owners will obtain resources from forest conservation through credits for emissions reductions from avoided deforestation in the project area, thus being a sustainable economic alternative with positive environmental and social impact. In this way, the project specifically contributes to the goal:

"12.2 - By 2030, achieve the sustainable management and efficient use of natural resources."

Goal 13 - Action Against Global Climate Change: Through the conservation of the project area, composed of native forests, the project will achieve the reduction of greenhouse gas (GHG) emissions. Thus, the project's main activity is configured as an action against climate change and its consequences. In parallel, the project foresees training and awareness-raising actions in safe forest management practices, prevention against forest fires, and promotes the monitoring of forest fires and deforestation in order to take efficient measures to combat forest loss. Thus, the project specifically contributes to the goals:

"13.1 - Strengthen resilience and adaptive capacity to climate-related risks and natural disasters in all countries."

"13.3 - Improve education, raise awareness and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning."

Goal 15 - Earth Life: The conservation of native forests, the main objective of the project, also promotes the maintenance of ecosystem resources and ecological balance. Thus, the project contributes as a consequence to the preservation of terrestrial life and maintenance of biodiversity, and also promotes the recovery of degraded areas through the implementation of agroforestry systems. Thus, the project specifically contributes to the goals:

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

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

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

- Nationally Determined Contributions under the Paris Agreement

Another important commitment assumed by Brazil, and which is related to the project activities, is the Nationally Determined Contributions (NDCs), under the Paris Agreement. Forest conservation and the promotion of sustainable development carried out by the project are related to the following objectives of the second update of the first Brazilian NDC:

- Zero illegal deforestation by 2028;
- Reduce greenhouse gas emissions by 37% by 2025, by 50% by 2030 and compared to 2005 levels, achieve climate neutrality by 2050.

- Leaders' Declaration on Forests and Land Use (Forest Deal) in the scope of the United Nations Climate Change Conference/COP26;

Also in the scope of declarations presented by Brazil within the United Nations, the country signed during the 26th United Nations Climate Change Conference (COP26) the Leaders' Declaration on Forests and Land Use . The Declaration on Forests and Land Use has as its main goal to achieve zero deforestation by 2030, and has 6 guidelines to be followed by the signatory countries, among them forest conservation and accelerated restoration and promotion of sustainable agriculture - to which the project contributes through its activities.

- Plan for the Control of Illegal Logging and Recovery of Native Vegetation (Planaveg 2020-2023)

The country currently has as its main guideline related to the combat of deforestation, the Plan for the Control of Illegal Deforestation and Recovery of Native Vegetation (Planaveg 2020-2023), which replaced the Action Plan for Prevention and Control of Deforestation in the Legal Amazon (PPCDAm) in force from 2004 to 2020. The Planaveg is implemented by the Executive Committee for the Control of Illegal Deforestation and Recovery of Native Vegetation, coordinated by the Ministry of Environment (MMA), and has the following main goal:

- To achieve zero illegal deforestation by 2028 in the Legal Amazon, reducing deforestation by 15% from 2022 to 2024, by 40% in 2025 and 2026, and by 50% in 2027 using as base value the deforestation in 2021.

The project contributes to the goals assumed in Planaveg through its main objective of conserving native forests and reducing deforestation.

2.1.13 Implementation Schedule (G1.9)

Project planning began in October 2021, with provisioning and fundraising, and its implementation began in January 2022, following the steps below:

- Planning – October/2021 to January/2022: project proponent and technical partner plan the schedule, activities and use of resources.
- Financing - November/2021 to December/2021: search for funding to fund the start of project activities.
- Project pre-design field activities - January/2022 to December/2022: With a team of consultants and field technicians already hired, field activities are carried out to collect information that will serve as the basis for the Project Design Document (PDD):
- Mapping and engagement of participants.
- Free, Prior and Informed Consultation to obtain the commitment and consent of the producers regarding the elaboration of the Project;
- Collection of information on Biodiversity;
- Consolidation of information about the Communities involved;
- Review of land documentation
- Geospatial Analysis;
- Implementation of the agroforestry systems (August 2022 to March 2023).
- Write the Project Design Document (PDD) – April/2022 to March/2023: preparation of the PDD.

- PDD submission to Verra and public consultation - March - April/2023: PDD is accepted by Verra and listed for public consultation.

- Project validation with contracted VVB and VCS - March-May/2023: Validation audit carried out by VVB evaluates and applies methodology to the PDD, the project and validation audit are accepted by VERRA and the project is registered on the platform to proceed with verification steps and issuance of VCUs.

- Verification - May-August/2023: Contracted VVB verifies all aspects presented in the PDD and if they meet the requirements of the VM0015 + CCB standard for Grouped Projects. Auditing will depend on field visits, and auditors may come and go in the project areas and adjust points in the PDD.

- Issuance of VCUs - from September-December/2023: After a positive audit assessment, VCS confirms the generation of emission reductions by the project and certifies credits that can be sold.

- Commercialization of credits - from January-February/2024: The credits generated by the first verification of the project are available for purchase and can be transacted between proponent and buyers.

- Distribution of benefits - from March/24: Project proponent receives for the credits sold and distributes part of the resource received to the owners participating in the project.

Table 7. Project milestones

Date	Milestone(s) in the project's development and implementation
October/2021	Start of project planning activities
February/2022	Start of project presentation workshops for landowners and registration of producers
March/2022	Beginning of visits to properties mapped to compose the project area and application of a Socioeconomic Survey
01/March/2022	Start date of the project to reduce emissions
July/2022	FPIC Workshops – Free Prior and Informed Consent and Signing Contracts with family farmers
September/2022	Implementation of the biodiversity monitoring plan (with Terrabio) and obtaining basic data for biodiversity indicators
October/2022	Starting date of mapping and implementing agroforest plots
November/2022	End of data collection on properties mapped to compose the project area and start of analysis of data and results obtained
December/2022	Definition and Baseline and Reference Region
February/2023	Application for registration in Verra
March/2023	Beginning of the Validation process with VVB
April/2023	Public consultation and meetings with project stakeholders
June/2023	Delivery of the first project monitoring report
July/2023	Field visit for validation audit and first project verification

Table 8. Project Activities Schedule

Project Activities	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031 ...

Implementation of Agroforestry Systems	x	x	x	x	x	x	x	x	x	x
Organic Certification	x	x	x	x	x	x	x	x	x	x
Marketing of agroforestry products	x	x	x	x	x	x	x	x	x	x
Training for fire prevention and support in the implementation of firebreaks	x	x	x	x	x	x	x	x	x	x
Technical assistance and training in agroforestry management and cultivation	x	x	x	x	x	x	x	x	x	x
Training course for women and young people in sustainable agriculture	x	x	x	x	x	x	x	x	x	x
Technical cooperation with INCRA for land regularization	x	x	x	x	x	x	x	x	x	x
Application for Socioeconomic Survey for partner producers	x				x				x	
Producer engagement - visits for registration, survey and contract signing	x	x	x	x	x	x	x	x	x	x
Assemblies and meetings with partner producers	x	x	x	x	x	x	x	x	x	x
Collection of soil samples for evaluation of aspects of the soil and eDNA (invertebrates) and evaluation in the laboratory	x		x		x		x		x	
Installation of camera traps for monitoring biodiversity			x							
Monitoring and data collection of camera traps for biodiversity			x	x	x	x	x	x	x	x
Monitoring report: climate, community and biodiversity		x		x		x		x		x
Verification		x		x		x		x		x
Payment for environmental services			x		x		x		x	
Including new Project Activity Instances				x		x		x		x
(Re)agreement of rules with family farmers who own property composing the project area	x									
Simple consultation with stakeholders every 3 years	x			x			X			x

2.1.14 Project Start Date

The REDD+ CAA project began on 1 March 2022.

The first presentation and registration meetings of interested participants took place on 7 February 2022, when interested family farmers voluntarily filled out a registration form indicating their interest in participating in the project.

From 1 March 2022 on, the project's technical team started the process of visiting the properties of the registered family farmers to carry out a survey and gather information on the households and their farms. This date represents the beginning of the project because, from that moment on, project participants were aware that they would not carry out deforestation on their properties as part of the project commitments.

As shown in section 2.1.13 – Implementation Schedule, Table 8, after technical visits to the properties to apply the survey and obtain information about the areas, the Free Prior and Informed Consent (FPIC) meetings occurred in July 2022, in which more details about the project were implemented and contracts

were signed between family farmers, Amazônia Agroflorestal (project proponent) and Idesam (technical partner). Some contracts had a long negotiation before being signed, and the period between FPIC meetings and contract signing lasted from July to December 2022. All documentation will be provided to the auditors during the validation process.

2.1.15 Benefits Assessment and Crediting Period (G1.9)

The REDD+ CAA project will generate GHG emission reductions eligible for emission as VCUs for 30 years. The crediting period starts on 1 March 2022 and ends on 28 February 2052.

Initial Project Activity Instances (PAIs #1-42) will generate GHG emission reductions eligible for emission as VCUs for 10 years, i.e., the first baseline period. A legal agreement in contract format (available for VVB) has been signed with the landowner to continue management practices that will lead to conservation of the project area for at least 30 years. The longevity of the project activity instances is 30 years for the Initial Project Activity Instances (PAIs #1-42) and would be less for the subsequent PAIs that enter the project. New PAIs will have different crediting period start dates based on the year and signed contract they joined the project. All project activities will be monitored for a period of 30 years.

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

The project has a baseline designed for a period of 10 years (subject to change with the REDD+ AUDD consolidated methodology being proposed by VERRA and not published till the present date), while the crediting period is 30 years. Therefore, at each baseline update, the project must recalculate its emission reduction potential.

The project activity monitoring period will follow a specific frequency for each activity, as presented in section 2.1.13 - Implementation Schedule, Table 9.

2.1.17 Estimated GHG Emission Reductions or Removals

Table 9. Estimated GHG Reductions

Year	Estimated GHG emission reductions or removals (tCO_2e)
2022	0
2023	282,131
2024	175,985
2025	244,477
2026	170,438
2027	188,977
2028	118,002
2029	92,782
2030	110,042
2031	63,005
2032	100,214
2033	2,187
2034	43,086
2035	69,638
2036	29,599
2037	28,543
2038	9,472
2039	7,083

2040	495
2041	-191
2042	4,375
2043	1,292
2044	228
2045	-1,431
2046	908
2047	-269
2048	3,338
2049	-6,969
2050	-303
2051	768
2052	1,168
Total estimated ERs	1,739,069
Total number of crediting years	30
Average annual ERs	57,969

2.1.18 Risks to the Project (G1.10)

Risks mapped to the project's climate, community, and biodiversity benefits are community engagement, forest fires, and participant dropout due to reduced alternative income sources could contribute to project abandonment. Appendix 3 presents the main activities to be implemented to mitigate the identified risks.

Applying the tool “AFOLU Non-Permanence Risk Tool v4.0” resulted in 12% of risks that were applied to the total net GHG emissions reductions to obtain the VCUs, as summarized in Tables 11 and 12. Detailed information is presented in the AFOLU non-permanence Risk Tool Report annexed to this project document.

Table 10. Summary of risks to the project

Risk Category		Rating
a)	Internal risk	11.00
b)	External risk	0.00
c)	Natural Risk	1.00
Overall risk rating (a + b + c)		**12**

Table 11. Main risks and mitigation measures for the project

Risk	Mitigation Measures
Community Engagement	100% of the household reliant on the project area were consulted, and the project will generate net positive impacts on local communities who derive livelihoods from the project area, as described in the Project Design Document, section 4.2. Net positive economic impacts. The project will have continuous technical assistance and support of project participants with over 5 technicians working full time for the project.

Project participants' dropout and alternative income	The risk of losing project participants (family farmers) due to high pressure of cattle ranching and buyers in a scenario of increasing land prices is mitigated by long-term contract agreements and with strengthening income (via payments for forest conservation, and support implementation, production and sales of agroforestry products), and well-being throughout the entire project lifespan.
Forest fires	Uncontrolled fires scaping from agricultural areas are a risk to adjacent forest. The project's mitigation measures include monitoring fire outbreaks monthly, strengthening existing partnerships for firefighting plans and action, and creation of and support for maintaining firebreaks, and awareness-raising workshops on fire, impacts, control and management.

2.1.19 Benefit Permanence (G1.11)

Given the context described in session 4.1.1 - Descriptions of Communities at Project Start (CM1.1) and considering the project activities described in session 2.1.11 - Project Activities and Theory of Change and exposed in Appendix 2, the permanence of the benefits generated by the project will occur mainly through:

i. direct payment for forest conservation

ii. actions for the development of productive agroforestry chains with high-added value

iii. technical assistance and capacity building

iv. support for land regularization

The sustainability of the project's benefits will be guaranteed by direct payment for forest conservation and the strengthening of crops under Agroforestry Systems (SAFs) in order to add value to local family farming products (in this case, coffee), together with technical assistance and training for producers to produce on their properties in a sustainable way. The project fosters the entire agroforestry coffee supply chain, from implementing the SAFs areas to purchasing and marketing the product, guaranteeing support to the producer from end-to-end, besides paying premium prices.

Moreover, the improvement of the producers' well-being is a crucial factor for their permanence in the properties and for the conservation of the remaining forest areas, which demands an alternative source of income obtained through the purchase of coffee produced in agroforests. Staying on the farms inhibits land speculation and pasture expansion over forests, guaranteeing the project's climate and biodiversity benefits.

In parallel, the lack of land titles is a relevant factor for the producers' willingness to deforest and/or abandon/sell their properties. Thus, the project will support producers with advisory and technical documentation to increase ownership security and allow land tilting to those who don't yet have the definitive documentation. Once the land title is issued, the owner can't legally sell the property for a period of 10 years. More details of this process for land titling are presented in section 2.5.1 - Statutory and Customary Property Rights (G5.1)

2.1.20 Financial Sustainability (G1.12)

The project proponent is a limited liability company (LTDA – according to Brazilian categorization) aiming to commercialize products from the Amazonian socio-biodiversity and associated assets. Its financial sustainability is guaranteed through the sale of agroforestry and organic coffee and is financed by partner investors and an investment fund.

The financial sustainability analysis for the project was carried out based on the integration of the costs of all the activities foreseen by the project to the operational costs and of the company's assets, as well as the combination of the revenues generated with the project's credits with the revenues generated by the sale of company's products.

Considering the projection on the project's potential to generate emission reductions, the results to be obtained from the sale of generated credits the results are positive and will allow for the sustainability of the project and the agroforestry coffee chain in the region throughout the duration of the project. The financial modeling for the project will be provided to VVB during validation process (Economic and Financial Model REDD CAA Project).

2.1.21 Grouped Projects

Eligibility Criteria for Grouped Projects (G1.14)

The main objective of the project is to involve at least 300 farmers with rural properties within a defined geographic area in the first 10 years. New project activity instances of the project will adopt the same requirements for the initial instances PAIs#1-42, described in this document, as follows:

- Adopts and applies project activities and measures in the same manner as specified in the project description documentation.

- Meets the applicability conditions established in methodology VM0015 v.1.1, as follows: a) Includes AUDD and the latest VCS AFOLU requirements; b) involves AUDD; c) in old growth and secondary forests, d) project area only includes land classified as forest for at least 10 years prior to the project start date; and e) May include flooded forests that do not include peat.

- Are subject to the same non-project community and biodiversity scenarios as determined for the project.

- Are subject to the baseline scenario determined in the project description for the specified project activity and geographic area.

- Have characteristics with respect to additionality that are consistent with the initial instances for the specified project activity and geographic area.

- Are subject to the same stakeholder engagement processes described in G3 and respect for rights to lands, territories and resources, including free, prior and informed consent described in G5.

- Will have the same monitoring elements.

As per the VCS Standard v.4.4, the Project meets the Baseline and Additionality requirements for a grouped Project as below:

"3.6.10. Grouped projects shall have one or more clearly defined geographic areas within which project activity instances may be developed."

The project has a defined geographical area within which instances of project activities are developed, totaling 19,874 km^2. This area is composed of native forests and agricultural areas, mainly planted pastures, in addition to some enclaves of natural non-forest pioneer formations. This area covers the areas of PA Rio Juma and PA Acari and surroundings within the municipalities of Apuí and Novo Aripuanã, also including the city of Apuí, and extends along the Transamazônica Highway to also include PA Matupi and expands to the north and south of Transamazônica Highway, in the municipalities of Manicoré and Novo Aripuanã, encompassing the district of Matupi.

"3.6.11. Determination of baseline scenario and demonstration of additionality are based upon the initial project activity instances. The initial project activity instances are those that are included in the project description at validation and shall include all project activity instances currently implemented on the issue date of the project description."

All rural properties within this geographic area are subject to the same laws and the same agents of deforestation as those identified for instances of PAIs#1-42. The pressure for land sales and agricultural expansion is intense and real for the entire geographic area, as well as the low rate of titling of rural properties and little or no support for adopting sustainable production techniques such as Agroforestry Systems.

"3.6.12: As with non-grouped projects, grouped projects may incorporate multiple project activities. Where a grouped project includes multiple project activities, the project description shall designate which project activities may occur in each geographic area".

The only project activity that appears in the PDD and in all other instances will be avoided unplanned deforestation and will occur throughout the defined geographic area. All project and project monitoring activities will occur equally. Specific assessments for baseline and additionality for each new instances of project activities will be carried out as needed.

To avoid unplanned deforestation, the proponent will establish conservation agreements with rural landowners for the conservation of forest remnants and will develop activities to pay for forest conservation, strengthen agroforestry production, environmental management and conservation, leakage mitigation, and activities and monitoring related to communities and biodiversity, described in sections 4.4 Community Impact Monitoring and 5.4 Biodiversity Impact Monitoring.

"3.6.31 - The baseline scenario for a project activity shall be determined for each designated geographic area, in accordance with the methodology applied to the Project."

Only one defined geographic region is part of the project, in which the baseline scenario was determined. Rural properties are subject to the same land and environmental laws and regulations (See section 2.5 Legal Status and Property Rights and 3.1.4 Baseline Scenario).

"3.6.14. - The additionality of the initial project activity instances shall be demonstrated for each designated geographic area, in accordance with the methodology applied to the project."

Only one defined geographic region is part of the project and used in the project document to create the baseline scenario. Rural properties are subject to the same land and environmental laws and regulations and similar agents and drivers of deforestation (See section 3.1.5 Additionality).

"3.6.15 - Where factors relevant to the determination of the baseline scenario or demonstration of additionality require assessment across a given area, the area shall be, at a minimum, the grouped project geographic area."

As described above, all factors relevant to determining the baseline and additionality of the project are common to the entire defined geographic area. Especially, the area allows private property regime, subjected to current laws, and excludes areas where different laws apply such as conservation units, and Indigenous Lands.

Scalability Limits for the Grouped Projects (G1.15)

Not applicable. There is no scalability limit, since it is possible to include rural properties within the geographic limits stipulated in this document and the participants meet the necessary requirements.

Risk Mitigation Approach for Grouped Projects (G1.15)

Not applicable as there are no limits to scalability.

2.2 Without-project Land Use Scenario and Additionality

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

The baseline scenario is the same as the conditions existing before the start of the project presented in section 3.1.4 - Baseline Scenario. Additional information on the land use scenario is also detailed in sections 2.5.1 - Statutory and Customary Property Rights (G5.1) through 2.5.7 - National and Local Laws (G5.6).

2.2.2 Most-Likely Scenario Justification (G2.1)

Several scientific studies in the project region point to this scenario of high deforestation rates due to the expansion of the agricultural frontier in the region (Carrero and Fearnside, 2011; Carrero et al. 2020; 2022a; 2022b; Yanai et al. 2020, 2022). In this scenario, the low price of land compared to other regions of the Amazon and less monitoring and control activities (Miranda et al., 2019; Carrero, 2022), combined with the high proportion of public forests (Azevedo-Ramos et al., 2020; Alencar et al., 2021), have attracted agents that are investing in the occupation and consolidation of farms, with high rates of deforestation, as verified by official (INPE, 2022) and unofficial (IMAZON, 2022) remote sensing monitoring systems.

Table 13 summarizes the trends and the main references that corroborates the scenario in the without-project scenario.

Table 12. Main references used to describe the land use scenario without the project

Trend verified in the without- project scenario	Relevant references
Increase in the pasture area and cattle herd in Apuí, Manicoré and Novo Aripuanã	Carrero et al. 2015 PPM - IBGE, 2022b Mapbiomas Land Cover Collection 7.
Increase in deforestation in Apuí, Manicoré and Novo Aripuanã	PRODES - INPE, 2022 SAD – IMAZON, 2022
Threats to deforestation due to livestock and increasing land prices	Carrero et al. 2020, 2022 Carrero 2022 Yanai et al. 2020, 2022

Sections 3.1.4 - Baseline Scenario), 4.1.4 - Without-Project Scenario: Community (CM1.3) and 5.1.3 - Without-project Scenario: Biodiversity (B1.3) provide additional information and details that justify the construction of the without-project scenario.

2.2.3 Community and Biodiversity Additionality (G2.2)

The target public of the project is family farmers currently holding properties in the rural region of the municipalities of Apuí, Manicoré and Novo Aripuanã. See section 4.1.1 - Descriptions of Communities at Project Start (CM1.1) for more details.

According to the historical background of the producers who occupy the region, as described in section 2.1.6 - Social Parameters, these are family farmers who either settled in the region during the first waves of migration encouraged by the State, or arrived in the region in later waves, motivated by the commitment to produce on lands which they can obtain title and, therefore, definitive possession (Silva, 2012, Carrero et al. 2020, Carrero 2022).

In this context, financial incentives and cultural status promote a growing cattle economy and land speculation, encouraging the expansion of pastures to meet the demand for beef. According to Carrero and Fearnside (2011) there is also a tendency to over-deforest the remaining forest areas to demonstrate productive use via pasture implementation, with the expectation of facilitating land ownership and increased land values, which are not necessarily related to income from cattle ranching activity. The region experienced increasing deforestation rates in the last ten years, as described in detail in section 3.1 – Application of Methodology.

The main existing and applicable law to mitigate the effects described above is the Brazilian Forest Code - Federal Law 12.651, of 25 May 2012, which oversees the general rules on land use regarding the protection of native vegetation in Brazil. The Brazilian Forest Code determines that 80% of area under native vegetation in landholdings in the Amazon should be conserved (known as Legal Reserve) and institutes the CAR – Rural Environmental Registry, a registration system for environmental regularization of rural properties in Brazil that has a self-declaratory registration process completed by landholders. However, the reality is that most of the landholdings have deforested more than what the law allows, as described in detail in Section 3.1.5 – Additionality.

The project is additional for community and biodiversity as it fosters agroecological practices that are not common practice in the reference region. These practices regenerate soil and support a higher diversity of plants, animals, and microbiota in productive systems when compared to extensive pastures. With the activities implemented by this project, that is, fostering sustainable productive chains of organic coffee and paying for environmental services with VCU resources, the participant farmers would be less willing to sell their areas for ranchers or themselves to expand pasture areas over forests.

Additionality for the communities is met because the project will contribute to increasing and diversifying income, food production and security, and increased opportunities for capacity building and training in sustainable agriculture, small businesses, and other rural practices.

Additionality for biodiversity is met by reducing habitat loss, forest fragmentation, and environmental degradation, and restoring diversity in degraded lands. Biodiversity conservation activities are rare in the region, which still has a high proportion of forests and is surrounded by protected areas. Forest conservation in areas highly likely to be deforested is the main additional benefit, in addition to the implementation of agroforestry systems in degraded areas, which includes the planting of threatened and vulnerable tree species. The project is also committed to monitoring biodiversity in its forests and productive systems.

For detailed description, see Sections 4.1.4 - Without-Project Scenario: Community (CM1.3) and 5.1.3 - Without-project Scenario: Biodiversity (B1.3), 4.2.3 - Net Positive Community Well-Being (CM2.3, GL1.4), 5.2.3 - Net Positive Biodiversity Impacts (B2.2, GL1.4), Section 4.4 – Community Impact Monitoring (CM4.1, CM4.2, GL1.4, GL2.2, GL2.3, GL2.5), and Section 5.4 - Biodiversity Impact Monitoring.

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

The project does not intend to use the community and biodiversity benefits generated as offsets. Although the community and biodiversity benefits generated by the project have additionality compared to the context and trends observed for the region, as described in the Community and Biodiversity Additionality section (G2.2), the use of offsets relates only to climate benefits, with the avoided deforestation emissions reductions described in detail in component 3 - Climate.

2.3 Stakeholder Engagement

2.3.1 Stakeholder Access to Project Documents (G3.1)

Considering the list of mapped stakeholders described in section 2.1.9 - Stakeholder Description and presented in Appendix 1, the project established a process of access to information for stakeholders that will undertake the following process: scheduling of meetings (face-to-face or online), presentation of materials and publicity of information about the project.

Considering the process of providing information to stakeholders, presentation documents of the project will be available through the following means:

- E-mail of representatives of the proponent Amazônia Agroflorestal and technical partner Idesam;
- Website and ombudsman channel of the proponent Amazônia Agroflorestal (https://www.cafeapui.com.br/) and Idesam technical partner (https://idesam.org/biblioteca/);
- Visit to the local office of the technical partner Idesam in Apuí or the headquarters in Manaus, where materials about the project are available and staff can provide information (orally);
- Visit to the proponent Amazônia Agroflorestal office in Apuí or headquarters in Manaus, where materials about the project are available, as well as staff can provide oral information.
- Website for public consultation and registration of VCS projects;

The proponent and the technical partner teams will be available for meetings and clarifications about the project.

2.3.2 Dissemination of Summary Project Documents (G3.1)

The summary documentation about the project, available through the channels described in section 2.3.1 - Stakeholder Access to Project Documents, presents the main objectives of the project, activities to be developed, actors involved in the project and their roles and responsibilities. This documentation is available in Portuguese and will be shared with all stakeholders mapped in section 2.1.9 - Stakeholders Description through meetings during the public consultation process.

In the case of the community of family farmers, the project participants will benefit from the sharing of benefits obtained from the project, the process for consultation, availability of documents and continuous flow of information that follows a special protocol described in Annex – Guidelines and Protocol for the Consultation Process for Project REDD+ CAA.

As mentioned in 2.3.1 - Stakeholder Access to Project Documents (G3.1), the project documents and their summarized versions will be available through the listed channels.

Information related to monitoring results will be made publicly available on the proponent's website and communication media, as well as in the VCS registry.

2.3.3 Informational Meetings with Stakeholders (G3.1)

A series of meetings and one-to-one conversations to present the project was held with family farmers from Apuí, Manicoré and Novo Aripuanã before signing the contract for consent to participate in the project, and happened in two phases.

Pre-consultation Phase: The meetings - documented in meeting transcriptions and participation lists - took place between February 7 and 26, 2022. See description in sections 2.3.4 - Community Costs, Risks, and Benefits (G3.2) and 2.5.3 - Free, Prior and Informed Consent.

Consultation Phase: in July 23rd and 26th, 2022, FPIC (Free, Prior, and Informed Consent) workshops were held for this same audience to present more detailed information about the project and sign the participation contract. The meetings were documented in meeting transcriptions and participation lists. See description in sections 2.3.4 Community Costs, Risks, and Benefits (G3.2) and 2.5.3 - Free, Prior and Informed Consent.

For the rest of the stakeholders mapped in section 2.1.9 - Stakeholders Description, project presentation meetings will be scheduled. This process will in April 2023, during the public consultation period of the project on the VCS/Verra website and should involve government administrative bodies, local organizations, social organizations, and others.

Some meetings prior to the registration of the project in VCS/Verra were held to present the project's initial design to relevant local stakeholders such as:

- Meeting in Apuí/AM with City Hall and SEMMA (Secretrary of Environment of Apuí) held in March 2022 – the secretary of environment of the municipality of Apuí: the secretary of production, the mayor of Apuí, the executive director of Amazonia Agroflorestal and Idesam's representatives were present;
- Meeting with the Apuí City Council held on 9th August 2022: attended by President of the City Council and the CEO of Amazonia Agroflorestal;
- Meeting with INCRA – National Institute of Colonization and Agrarian Reform; held on 16th December 2022 at Idesam's headquarters in Manaus: the regional superintendent and a representative of the technical partner Idesam were present;
- Meeting with the Secretary of Environment of Amazonas - SEMA/AM held on 08th March 2023 at SEMA/AM headquarters in Manaus: the state secretary of environment and their advisory team, and the CEO of Amazonia Agroflorestal and Idesam's representatives were present.
- Meeting with the Council of Mosaic of Conservation Units in Apuí held on 3rd March 2023: the council members and Idesam representatives were present.

For project presentation activities to other stakeholders, the project proponent and technical partner teams will present the project in a clear and inclusive manner, using appropriate language for each participating audience. In addition, the meetings with stakeholders will provide presentation materials about the project and the contacts of the proponent and technical partner for clarification follow-ups or for additional requests. For each project presentation meeting, the following process will take place:

a) Scheduling a meeting with representatives of the stakeholder group – appointed by the group itself.

b) Face-to-face or virtual meetings with: presentation of material on the project, Q&A session, recording of comments and meeting memory, information on the next steps of the project, schedule and information for the contact channels.

C) Sending of meeting memory and documents presented to stakeholders.

Supporting evidence of the described meetings with the stakeholders will be provided to the VVB.

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

The main costs, risks and benefits of the project are related to the community of rural family farmers in the region of Apuí, Manicoré and Novo Aripuanã.

To ensure that information about the costs, risks and benefits of the project were communicated to the community of family farmers, the project developed a robust process that includes a presentation about the project, the application of a registration form and a Socioeconomic Survey, and the FPIC workshops. This process was described in Annex - Guidelines and Protocol for the Consultation Process for Project REDD+ CAA based on nationally and internationally recognized guidelines for safeguards (Convention 169 of the ILO, Brazilian Constitution of 1988, CCBA).

The process took place following the steps described in item 2.5.3 - Free, Prior and Informed Consent and presented in Appendix 4. It is worth mentioning that the costs, risks and benefits were presented to the community of family farmers mainly in the pre-consultation and consultation phases.

In the pre-consultation, mobilization and diagnosis phase (First Phase), informative meetings were held, in which family farmers from the municipality of Apuí and Novo Aripuanã were invited to learn about the project's proposal. In these meetings, the project was presented in general terms, with information about the concepts involved, project benefits and responsibilities involved in participation - responsibilities of participating producers, project proponent (Amazônia Agroflorestal) and technical partner implementer (Idesam). Three meetings were held in February 2022 with the public from different sectors of the rural region of Apuí and Novo Aripuanã. Details of attendance and materials used at these meetings are recorded in the meeting minutes and will be provided to the VVB.

After these meetings, the interest of participating producers was collected through a free registration in which the producer declared an interest in participating in the project and informed the technical team of the project about his property and contact information - at this time, it was explained to the producers that A second meeting would be held, the Free Prior and Informed Consultation, where the project would be presented in more detail and the producer would sign the term for formalizing participation in the project.

In the consultation phase (Second Phase), the project consolidated the transfer of information about the project and agreed, after signing the contract, the producers' commitment to participate. The consultation phase included invitations to the FPIC workshops, holding meetings in each sector of the project participants who declared interest in the first stage, and via one-to-one meetings with producers who were unable to participate at the scheduled meeting. Three meetings were held in July 2022 with the public of rural family farmers in the rural region of Apuí and Novo Aripuanã. Details of attendance and materials used at these meetings are recorded in the meeting minutes and will be provided to the VVB.

At the consultation pahses, which included the discussion about the commitments, the project details, the contract for signature, and the book of project rules were presented and discussed with participants. The project rules are called Our Agreements' Book (*Nosso Livro de Acordos*) and details the rights, duties and responsibilities of each party, and allowed participants to evaluate costs, risks and benefits individually. These materials – Contracts and Our Book of Agreements - will be available for VVB.

This process described above was carried out for the first group of participants, Initial Project Activity Instances (PAIs#1-42), and will be replicated for the next groups that will be grouped with the new PAIs.

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

The project's expected schedule, described in Section 2.1.13 - Implementation Schedule, was presented to the family farmers and other stakeholders during the consultation and information process, including the validation and verification process.

For the family farmers participating in the project, the validation and verification process was also mentioned and described in the rule book (Our Book of Agreements) as part of the necessary steps for developing a REDD+ project. Through the presentation, the interested parties were informed about how carbon credits are generated, which mechanism the project uses for accounting emissions reductions and, in general terms, how the validation and registration platforms carry out the conversion of emission reductions into credits, and what is the expected period and duration in each step. Furthermore, it was emphasized during the consultation and informative meetings that, within the process of validation and verification, the activity of a third-party auditor is necessary, carrying out visits to the project areas and interviewing participants to assess the project against the standards and methodology to grant validation and verification. It is worth mentioning that in the contracts with the participants (document provided for auditing), there is a clause where the producer agrees to receive auditing visits from the project on his property.

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

As described in section 2.3.5 - Information to Stakeholders on Validation and Verification Process, the whole process of validation and verification, including the third-party audit (VVB), was informed to the family farmers during the process of consultation and informative meetings. The auditor's visit in the project area will be informed previously by the local teams. The information about the VVB visit will be shared with the participant landowners through formal or informal meetings, email, telephone, or pamphlets with the support of the local technical teams of Idesam and Amazônia Agroflorestal. The communication between farmers and other stakeholders with the audit representative(s) will be facilitated through representatives and the technical team of Idesam and Amazônia Agroflorestal.

2.3.7 Stakeholder Consultations (G3.4)

During the process of consultation and informational meetings, described in sections 2.3.3 - Informational Meetings with Stakeholders and 2.3.4 - Community Costs, Risks, and Benefits, the project management team (from Idesam and Amazônia Agroflorestal) will take notes and record comments from interested parties. Meetings with stakeholders will take place during the project's public consultation period, as described in section 2.3.3 - Informational Meetings with Stakeholders.

From the meetings already held with family farmers, described in sections 2.3.3 - Informational Meetings with Stakeholders and 2.3.4 - Community Costs, Risks, and Benefits, Table 14 summarizes project suggestions.

Table 13. Family farmer's suggestions during stakeholder consultation

Stakeholder	Suggestions	Forwarding
Family farmers	That the project will provide information on the value of	Project proponent and Idesam have improved the presentation material so that stakeholders would have

	the payment for environmental services before requesting for the family farmers to join the project	more information and understand that the value paid per VCUs depends directly to variables such as deforestation rates in the PA and VCUs prices (ton CO2).
	Resource must be greater than the opportunity cost of using that forest area for other purposes	Project proponent has designed the benefit sharing mechanism to consider a significant income generation to family farmers, using the premise that the same percentage will be shared between proponent and farmers.
	Payment for environmental services done monthly	Project proponent and Idesam have improved the presentation material so that stakeholders would have more information and understand the project's verification periods.
	Including ASF reforestation areas to generate carbon credits	Project proponent and Idesam have improved the presentation material so that stakeholders would have more information on the REDD+ mechanism.
	Provide information on the allowances of use on the area to be conserved by the project: which activities will and won't be allowed after contract signing	Project proponent and Idesam have listed the rules for the use of the conservation area in the contract to be signed, and developed a complementary material to the contract (Our Book of Agreements) with examples of permitted and not permitted activities, based on suggestions and research carried out on land use with producers.

The design of the project incorporated the suggestions of the stakeholder group composed of family farmers from Apuí, Manicoré and Novo Aripuanã. This group raised important concerns, definitions, and conditions regarding participation in the project during the pre-consultation and consultation process (FPIC) – directly influencing the design of the project's benefit sharing. Relevant evidence from the pre-consultation and FPIC process will be provided to the VVB.

In summary, three pre-consultation meetings were held in the municipality of Apuí, two at the headquarters of Idesam in Apuí and one at the municipal school Ulisses Guimarães (vicinal Estrada Nova) on 7, h and 26 February 2022. The pre-consultation meetings were attended by a total of 42 family farmers from Apuí. In addition to the pre-consultation meetings, visits were made to properties for filling out the registration form, which formally declares the interest and commitment and provides relevant information for the project design.

Three FPIC workshops were held, one at the municipal school São João at Km 65, one at the headquarters of Idesam, and one at the headquarters of Ouro Verde Family Producers Association (APFOV). These meetings took place on 23, 25 and 26 July 2022, respectively, totaling 34 family farmer attendees. In addition to FPIC meetings, individual visits were made to the other family farmers unable to attend the FPIC meetings.

Figure 13. Invitation being handed to Family farmers by project's' technical team

Figure 14. Informational meeting to present the project's initial idea and to apply registration form

Figure 15. FPIC meeting

Figure 16. Contract Reading during FPIC

2.3.8 Continued Consultation and Adaptive Management (G3.4)

The Project is expected to carry out the following consultation events to collect information and continuously adapt the management, operation, and activities of the project:

1. Frequent farm visits by the project's technical team (Amazônia Agroflorestal and Idesam): the project's activities, in addition to monitoring conservation in forest areas, are strongly focused on the implementation and management of agroforestry systems and related actions. These activities demand continuous and specific Technical Assistance and Rural Extension, with periodic and frequent monitoring. Thus, the project foresees that comments and suggestions on its functioning may be collected and recorded by the project's technical team during these activities, which will take place throughout the year and annually for the project's duration.

2. Renegotiation of rules every 10 years with family farmers who own property comprising the project area: in the project schedule and the contract signed with the family farmers, foresees the renegotiation of project

rules (excluding the 30-year commitment to forest conservation) and renewal of the commitment to participate in the project every ten years.

3. Simple consultation with stakeholders every three years: the project intends to undertake a simplified consultation process with the project's stakeholders, listed in section 2.1.9 - Stakeholder Description – Appendix 1, every three years. The process will take place by sending emails with a consultation form, supported by a summary of project activities and results for comments. In case communication by e-mail is not possible, the project management team will contact via another contact instrument for scheduling virtual or face-to-face meetings.

4. Project ombudsman channels and registration of comments/inputs: the project has, as described in section 2.3.1 - Stakeholder Access to Project Documents, an ombudsman channel on Amazônia Agroflorestal's website (https://www.cafeapui.com.br/ouvidoria). This ombudsman channel will be active throughout the project's duration. The management team is responsible for responding to entries in the ombudsman channel and to address comments relevant to the project.

2.3.9 Stakeholder Consultation Channels (G3.5)

Based on the stakeholder mapping presented in section 2.1.9 - Stakeholder Description, representatives of the stakeholders will be chosen.

For the stakeholder group formed by family farmers from Apuí, Manicoré and Novo Aripuanã, more details of the consultation process carried out and planned can be seen in sections 2.3.3 Informational Meetings with Stakeholders, 2.3.7 Stakeholder Consultations and 2.3.8 Continued Consultation and Adaptive Management.

The project has a governance instance, called the Advisory Board, which will be established exclusively for the project with the election of one representative of rural family farmers for each of the main regions (sectors) where the properties registered in the project are located. The election of representatives will not be limited to the number of regions and will be defined in consultation with the family farmers who signed a contract with the project.

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

As described in sections 2.3.8 - Continued Consultation and Adaptive Management and 2.5.3 - Free, Prior and Informed Consent, the project provides a series of events and channels for participatory contributions to the project, such as the project re-agreement of project rules every ten years, communication with project stakeholders every three years, the ombudsman channels, and frequent field/onsite contact between the technical team and participant family farmers. Moreover, as described in item 2.4.1 - Project Governance Structures, the project actions are discussed in a participative way in the scope of the Management Committee, assuring through the Advisory Board (to be created) the participation of representatives of the involved groups.

Considering the objective of gender-equitable participation, based on information from the applied Socioeconomic Survey and on information about the cultural context of the region presented in section 4.1.1 - Descriptions of Communities at Project Start (CM1.1). Of the registrations made in the pre-presentation phase of the project (does not represent the final group that signed a contract with the project), only 17% have the woman of the family as the main representative and the majority have a family configuration dependent on productive activities.

For the project to influence and expand women's participation in decisions about the project activities, mainly related to forest conservation and sustainable rural production, the project team, especially field technicians, is instructed to promote women and youth inclusion in all activities carried out - making sure that women can have representation on productive activities' decisions. Furthermore, the project, as described in section 2.1.11 - Project Activities and Theory of Change, includes activities aimed at promoting the increasing women and youth leadership in income generation.

2.3.11 Anti-Discrimination Assurance (G3.7)

Amazônia Agroflorestal has an ESG policy (https://www.cafeapui.com.br/asg) that guarantees the ethical conduct of the company, employees and suppliers, in the sense of respect and diversity, anti-corruption, transparency, ethics and risk management.

Idesam implementing partner has a Code of Ethics, an Anti-corruption Policy, and an Integrity Program, ensuring conducts that follow these documents' guidelines.

Regarding discrimination, the ASG Policy of Amazônia Agroflorestal and the Code of Ethics of Idesam foresee a) Act with respect for human rights and the environment; b) Act ethically; c) Repudiate harassment in any form; d) Respect diversity; e) Promote the right to freedom; f) Condemn aggressive or embarrassing attitudes; g) Abdicate prejudiced or discriminatory behavior in relation to race, color, origin, gender, personal aesthetics, physical conditions, nationality, sex, age, marital status, sexual orientation, social position, religion and other acts that harm people's dignity; h) Value the occupation of women in institutional staff. All the contracts signed foresee the adjustment to the ASG policy, including service providers, suppliers, partner producers and employees.

The entire technical and management team involved in the project signed this commitment when hired, and must follow such policies and guidelines, conducting activities accordingly under penalty of dismissal in case of non-compliance.

In relation to the rural family farmers registered in the project - engagement arising from their consent through the FPIC processes, done in good faith, and culturally appropriate - the project's contract of adhesion includes the commitment not to practice measures, speeches, or discriminatory actions of any nature: race, color, culture, sexual orientation, physical or mental disability, and not to perform any practice of harassment or moral and sexual abuse. Producers may be subject to sanctions and dismissal of the project in the event of failure to comply with this commitment - measures to be evaluated by the Management Committee (see information about governance in item 2.4.1 - Project Governance Structures (G4.1)).

2.3.12 Feedback and Grievance Redress Procedure (G3.8)

As described in section 2.3.1 - Stakeholder Access to Project Documents, the project has an ombudsman channel anchored on the website of Amazônia Agroflorestal. This channel is open for any interested party to the project to add comments, suggestions, or complaints about the project. The process for entering the ombudsman channel is described below:

1. Entry into the ombudsman channel is registered (by the Amazônia Agroflorestal Ethics and Transparency Committee) in an entry control tool, where anonymized notes are taken on: name or origin of the interested party, type of entry (categories: complaint, praise, suggestion, denouncement or demand), severity of the entry (severe, medium, light), deadline for forwarding and resolving measure.

2. Entries are evaluated by the Ethics and Transparency Committee and, if necessary, shared with the Management Committee, Commercial Board, Executive Board or Legal Support for decision-making.

3. Decision-making must indicate a responsible person (among the Ethics and Transparency Committee) for resolving the comment, respecting a reasonable deadline for returning to the person who made the entry and indicating necessary actions for mediation.

The flowchart and conduct for resolving conflicts and addressing responses to the Ombudsman channel will be shared with the VVB, as well as formalization of the Ethics and Transparency Committee and Management Committee.

In addition, the project also made available telephones, e-mail and face-to-face contacts with representatives of Amazônia Agroflorestal and Idesam at their headquarters and local offices in in Apuí to clarify doubts and register comments and suggestions about the project. Any comment that arrives outside the ombudsman channel must be reported to the project management team, which will carry out the entire process described above.

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

The entries through the ombudsman channel are recorded in an ombudsman log sheet in an anonymized form, following the process summarized in section 2.3.12 - Feedback and Grievance Redress Procedure (G3.8).

The occurrences registered during project actions and activities will be registered in an occurrence's spreadsheet by any member of the technical or management team of the proponent and technical partner of the project. The meeting notes of the project meetings will be made available to the family farmers, printed, and delivered to the representatives of the Advisory Board, and may be consulted at any time by anyone at Idesam and Amazônia Agroflorestal offices.

2.3.14 Worker Training (G3.9)

The project team is composed by Amazônia Agroflorestal technical team and Amazônia Agroflorestal and Idesam management team. Moreover, as described in the project activities in section 2.1.11 - Project Activities and Theory of Change, the participation in the project (community of rural family farmers of Apuí, Manicoré and Novo Aripuanã) provided specific training in production, management and processing of coffee.

The permanent technical team of the project is hired directly by Amazônia Agroflorestal, following the Brazilian hiring laws (Consolidation of Labor Laws - CLT, nº 5.452, of May 1st, 1943) and is based in the region of the project. Training and capacity building in technical areas such as agricultural and agroforestry production, remote sensing, and management is provided for this team.

The technical staff of Amazônia Agroflorestal is trained in the following capabilities:

- Implementation of agroforestry systems, including restoration techniques, ecological succession, seedling planting, organic fertilization, and coffee production and post-harvesting facilities;
- Technical assistance and rural extension to family farmers;
- Management of agroforestry systems;
- Coffee production, harvesting and processing;

- Use of tools for remote sensing and analysis via satellite images;
- Use of Microsoft Office;
- Collection of soil samples;
- Social organization and associativism/cooperativism;
- Management techniques and planning of field activities;
- Monitoring techniques of restored and conserved areas, including use of tools for collecting points and geographic coordinates and reporting;
- Seedling nursery management and seedling production;
- Organic certification;

Amazônia Agroflorestal will expand the local technical staff team as needed. New staff will receive training in the areas listed above. The hiring process will give preference to local labor, aiming to promote the qualification of workers in the project site and will follow the laws described in item 2.3.16 - Relevant Laws and Regulations Related to Worker's Rights.

The project management team is composed by local labor and external and remote labor. The management team involved in the project is trained in:

- People management;
- Project management;
- Microsoft Office Package

The technical team and management team meet periodically to assess and discuss project development techniques and approaches, increasing the opportunity to acquire knowledge about skills needed for the project.

2.3.15 Community Employment Opportunities (G3.10)

During project activities related to the theme of Communities, described in section 2.1.11 - Project Activities and Theory of Change, the local project community, mainly rural family farmers, will also be involved in capacity building and training.

The project will promote one-off or continuous training for producers to improve their agricultural practices, focusing on agroforestry systems (SAFs), actions in Technical Assistance and Rural Extension (focused on good practices) and training processes to strengthen social participation and associativism, crucial for the improvement of public policies necessary for the well-being of family farmers, as well as for reducing farming abandonment, to increase productivity and reduce the risk of enter in land speculation and environmentally degrading practices.

In addition, the project will offer participants workshops and courses, throughout its term, in actions to combat the use of fire, organic certification, planting, handling, and processing of coffee, composting, production and non-timber use of forest products, processing of products from Agroforestry Systems, solid waste management, production of biofertilizers, drying and processing of coffee, among others.

Evidence of courses and training already been carried out with the public participating in the project under the Coffee in Agroforestry Project are shown below.

Figure 17. Organic coffee quality competition on Apuí's municipal fair of family agriculture

Figure 18. Agroforestry systems management workshop

Figure 19. Agroforestry implementation activities

Figure 20. Soil sampling collection training

Figure 21. Fire brigade support and educative training on fire fighting with local brigade in 2020

The project will conduct trainings like those presented above.

Furthermore, to promote its actions, the project includes the hiring of technical workers from the local community and the hiring of day laborers and local services to implement project activities – thus promoting job opportunities and income generation within the project. 100% of the day laborers and services that operate in project activities, especially during the implementation of agroforestry systems, are hired locally – as well as most of the purchase of inputs for the implementation of activities.

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

As described in item 2.3.14 - Worker Training, the project employs and involves technical and management staff directly hired by Amazônia Agroflorestal, project proponent, and Idesam, technical partner.

The main Brazilian labor law is the Consolidation of Labor Laws (CLT), created by Decree-Law No. 5452 on May 1, 1943 to regulate labor relations in Brazil. The following regulations are added to the CLT:

- Precedents of the Superior Labor Court (TST);
- Law no 13,709 of April 23, 2014 - General Law for the Protection of Personal Data (LGPD);
- Law no 6,514 of December 22, 1977, which amends Chapter V of Title II of the Consolidation of Labor Laws (CLT), relating to safety and occupational medicine and other provisions.

The hired team is informed about their rights and duties under the above mentioned laws through the work contract signed by each collaborator.

The project also employs on a “daily labor model” local family farmers and service providers as part of the project's activities - there are occasional remunerated work actions with daily rates in which there is a term of signature of the day laborers hired as individuals and service provision contracts as freelancers or via the Ouro Verde Family Producers Association (APFOV). It is noteworthy that the hours dedicated to work with day laborers represent only a small part of the hours employed in project activities, which are undertaken by technicians hired via CLT law by the Amazônia Agroflorestal.

2.3.17 Occupational Safety Assessment (G3.12)

To address the risks related to the work safety of the team involved in the project, the existing risks in the project steps and activities described in section 2.1.11 - Project Activities and Theory of Change and 2.1.13 - Implementation Schedule were mapped.

Annex EHS Risk Assessment REDD+ CAA Project presents the mapping and assessment of risks related to health and safety at work, including risk description and characterization, probability of occurrence, severity of occurrence and impact generated, as well as mitigation and damage reduction measures. Connected to this mapping and risk assessment tool, the project will maintain a tool used to record and monitor occurrences related to health and safety at work.

Amazônia Agroflorestal, project proponent, is responsible for monitoring, recording and following up on these occurrences.

In addition, according to the Regulatory Norms (NR) of the Consolidation of Labor Laws (CLT) in Brazil, the following documents are required from the company Amazônia Agroflorestal: Technical Report on Environmental Working Conditions – LTCAT, PGR – Risk Management Program, Technical Report on Unhealthy, Technical Report of Dangerousness, Occupational Health Medical Control Program - PCMSO. In 2022, an audit was carried out to prepare these documents and they were registered on the E-Social portal for the company Project proponent. The E-social Portal also registers occurrences related to work. These materials will be available for the VVB.

Risks associated with project activities will be widely disclosed to the team involved in the project and posted in work environments such as offices and coffee processing sheds.

2.4 Management Capacity

2.4.1 Project Governance Structures (G4.1)

The structure presented below proves that the project has sufficient human resources for its implementation, development, and monitoring of the project.

The project has 3 (three) main actors involved: Amazônia Agroflorestal, IDESAM (Institute for Conservation and Sustainable Development of Amazonia) and the rural family farmers participating in the project.

The project will be developed by Amazônia Agroflorestal, project proponent, in partnership with Idesam, technical partner and implementer of the project activities (Figure 22).

Amazônia Agroflorestal:

Amazônia Agroflorestal is the company project proponent, responsible for the investment in the project, execution, and sale of the carbon credits for the emissions reductions achieved by the project. Amazônia Agroflorestal has participated and will actively participate in the design, construction, and development of the project, as well as its implementation, follow-up, and monitoring.

The Amazônia Agroflorestal team is composed by a management team, responsible mainly for the project management, financial, purchasing, supply, and commercialization fronts; and a technical team located in Apuí, responsible for the implementation, follow-up, and monitoring of the field operations in Apuí.

Project responsibilities: overall management of project activities and resources; financing of the pre and post PDD stages of the project; provision of technical and managerial manpower for the project; provision of project infrastructure, vehicles and implements; verification, validation and commercialization of project credits and co-development of project implementation and monitoring activities, payment of benefit sharing to family farmers.

Instituto de Conservação e Desenvolvimento Sustentável da Amazônia (Idesam):

Idesam is the technical implementing institution of the project. It is a private, non-profit civil society organization, which aims to develop socio-environmental projects in Amazon territories. The institute works in the areas of territorial management, acceleration of new business in bioeconomy, structuring and development of sustainable production chains, payments for environmental services, public policies and sustainable rural production.

Idesam is responsible for the design, construction, and development of the project, as well as implementation of project activities. Idesam has a management and technical team involved in the project to develop the planned activities.

Project responsibilities: overall coordination of the pre-project social activities (engagement and mapping of participating producers), including design and application of registration form and Socioeconomic Survey; development of the Project Design Document (PDD); coordination and development of baseline scenario, project limits, GHG emission reductions; remote sensing monitoring; implementation of project activities (activities reported in the Project Activities Doc).

Family farmers:

Family farmers represent the group of individuals with a family farmer profile, who own properties in which the project area of the property makes up the Project Area. The group is located in the region of Apuí, Manicoré and Novo Aripuanã and are participants of the Café Apuí Agroforestry Initiative developed by Idesam and Amazônia Agroflorestal.

Responsibilities in the project: conservation of the native forest area of their properties, management of the agroforestry systems implemented in the project and compliance with the rules agreed upon in the project contract.

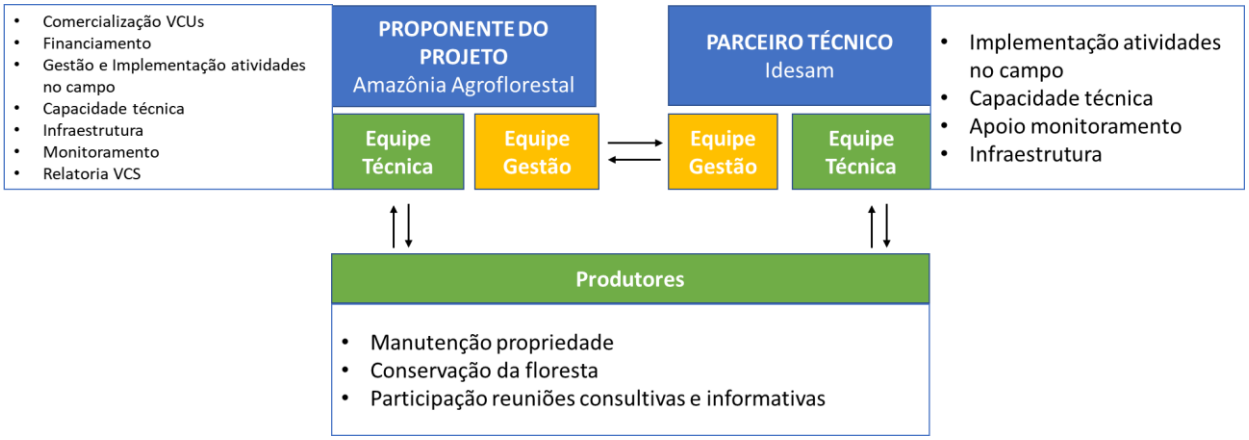

Figure 22. Diagram of parties directed involved in the project

In terms of governance, the actors involved in the project are divided into the Management Committee, Advisory Board, Technical Team, and Producers/family farmers. The description and role of each party involved in the project can be seen in Figure 23.

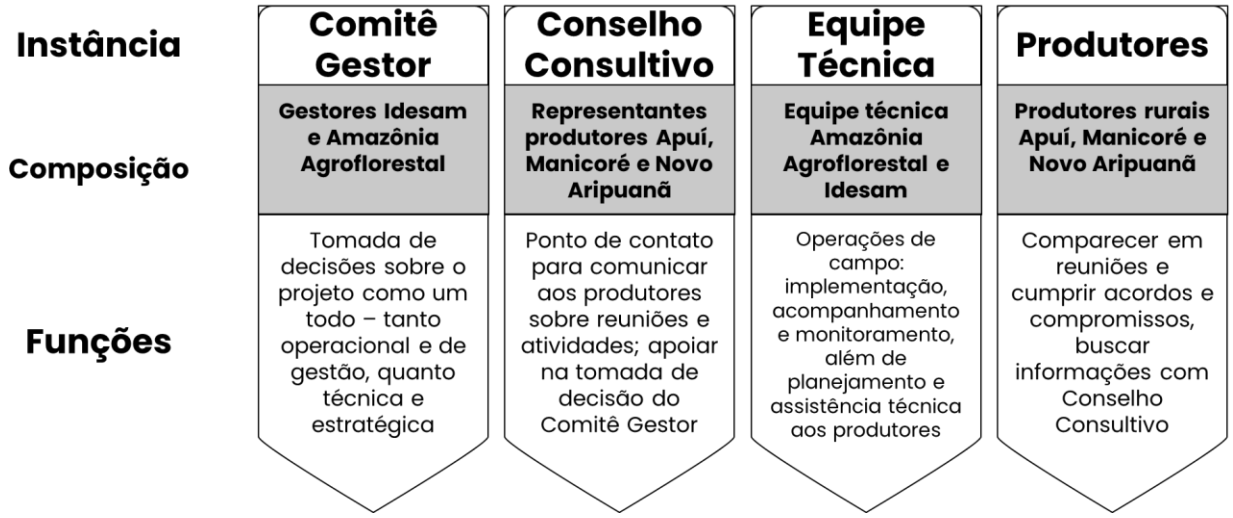

Figure 23. Governance instances, roles and responsibilities

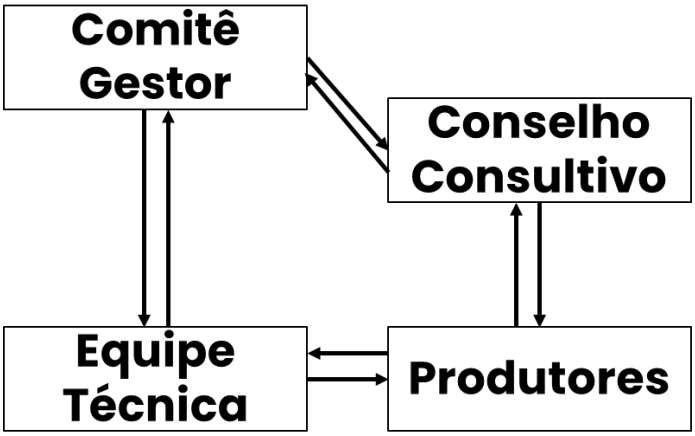

Figure 24. Flow of communication among instances of the project

During the project design and actions and activities prior to validation and verification, the project counted on the technical support of other organizations such as Terrabio, INCRA and SBSA - their activities and responsibility over the project are described in section 2.4.4 Project Management Partnerships/Team Development (G4.2).

2.4.2 Required Technical Skills (G4.2)

The knowledge and skills required to implement the project are related to the development of restoration and conservation projects in the Amazon; generation and analysis of satellite land use monitoring information; implementation, management and provision of technical assistance for agroforestry production and; processing and commercialization of agroforestry coffee as a product.

As described in section 2.4.1, Amazônia Agroflorestal, as the project proponent, and Idesam, as the main technical and implementing partner, are the institutions with staff directly involved in the implementation and development of the project - considering both technical and management staff.

In terms of experience, Idesam's historical work with carbon forestry projects and sustainable production value chains stands out.

Instituto de Conservação e Desenvolvimento Sustentável da Amazônia (Idesam):

In more than 18 years of operation in the Amazon, The Institute for Conservation and Sustainable Development of the Amazon (Idesam) has increasingly consolidated itself as one of the most relevant and impactful non-governmental organizations, standing out in Brazil and internationally for its work with the rural milieu, producers, traditional communities, riverine communities, and indigenous peoples. In this period, Idesam reached around 5,000 families, distributed in 10 municipalities in the region. In 2020, Idesam received the "Best NGO in Brazil" award from the Doar Institute - the most recognized standard for the sector in the country.

Since 2005, Idesam has played a key role in building the Amazonas State Climate Change Policy, and has been deeply involved in the discussion of the Brazilian federal bill for a National REDD+ System. Idesam participated in the construction and regulation of its environmental services policy and REDD+ subprogram, actively contributing to the construction and design of the state REDD+ system. In addition, Idesam coordinated the GCF task force program in Brazil for 5 years between 2011 and 2016, working closely with all 09 GCF states in the country.

Idesam is also one of the organizations responsible for the development of the VM0015 methodology with Verra/VCS and was the technical coordinator of the first two REDD+ projects validated under the Climate Community and Biodiversity Standards (CCB) and Voluntary Carbon Standards (VCS) in Brazil: the Surui Forest Carbon Project and the Juma Reserve REDD Project.

In the private sector, Idesam was also responsible for structuring the entire technical and methodological component of two forest insertion projects for the companies Natura & co and Vert Shoes. The projects were developed to reward the companies' suppliers for the area of forest conserved on their lots to reduce emissions from deforestation. This process included the development and creation of the project area, reference region, baseline and benefit sharing model.

In the Apuí region, Idesam has been active since 2012, carrying out projects related to the promotion of sustainable rural agriculture, technical assistance and rural extension (ATER) and support for production chains. With the project Coffee in Agroforestry, Idesam started its work with rural family farmers of PA Rio Juma in Apuí, implementing and monitoring agroforestry systems with a focus on agroforestry coffee production. In 2016 the project evolved to the organic certification of agroforestry coffee, and in 2019 a company was created for the commercialization of this product, Amazonia Agroflorestal. In Apuí, Manicoré and Novo Aripuanã, Idesam provided technical assistance to over 500 households settled by INCRA during 2014 and 2016. In addition, Idesam is a secretariat chair of the CMDRS (Municipal Council for Sustainable Rural Development of Apuí) and a member of the Council of the Mosaic of Conservation Units of Apuí. The years of experience and performance in the territory demonstrate technical capacity and strong alliances formed with local actors such as the municipality, SEMA/AM and others.

Amazônia Agroflorestal:

Amazônia Agroflorestal was founded in 2019 from the Coffee in Agroforestry project, promoted by Idesam since 2012. The company was created with the objective of supporting the production chain of agroforest coffee produced in Apuí as a commercially viable and sustainable product, based on the conservation of native forests and adding value to coffee and fair negotiation practices with producers.

The company has experience in providing technical assistance in the implementation, management, and monitoring of agroforestry systems with a focus on coffee production, in addition to the purchase, distribution, and sale of the product that comes from the agroforestry production in the project's participating properties - a premise activity for the conservation of the forest areas that make up the project area. Its team is composed of a management and operational team, and field technical staff, agricultural and agroforestry technicians who work in monitoring, follow-up, implementation, and technical assistance with the rural properties participating in the project.

From 2019 to 2022, Amazônia Agroflorestal increased its team by 1000% and received significant funding to leverage and expand its activities in the production chain of the Café Apuí Agroflorestal by the ABF (Amazon Biodiversity Fund).

Amazônia Agroflorestal has been growing more and more and intends to be an example for other companies that operate in the region, proving that sustainable economic development is possible and can be adopted by other companies in the region. For this, it operates in network and with the essential support of Idesam, technical partner for the expansion of the Café Apuí Agroforestry Initiative. Through a model that combines non-reimbursable investment and private investment, Amazônia Agroflorestal intends to regenerate 300 hectares with native species and *Coffea robusta* in 5 years.

2.4.3 Management Team Experience (G4.2)

The management and technical team for REDD+ CAA Project is presented in Table 16.

Table 14. REDD+ CAA Project team experience

Team	Name	Role	Description
Amazônia Agroflorestal	Sarah Sophia Sampaio	CEO of Amazônia Agroflorestal	Graduated in International Relations from the University of São Paulo (USP), Sarah is CEO of Amazônia Agroflorestal and leader of the Café Apuí Agroflorestal Initiative. Working in different sectors of society, she has experience in the areas of customer relations, sales, agile management, project management and strategic development of organizations. He worked in the educational area in the states of Mato Grosso do Sul, São Paulo and Amazonas, in the latter he worked in the Department of Education of Amazonas for a more efficient full-time education, with improvement in management processes until he became leader of Café Apuí Agroflorestal in 2022. Sarah is responsible for managing the Amazônia Agroflorestal and improving its governance processes, It is also responsible for ensuring the expansion of the Initiative with a focus on the company's socio-environmental impact and financial sustainability, managing all the Initiative's projects together with the respective field, commercial and carbon teams. He is also responsible for the areas of Human Resources, Institutional Relations and Partnerships, Administration and Finance.
Amazônia Agroflorestal	Anderson Moreira de Jesus	Agroforestry Production Coordinator	Forestry Engineer graduated from the Federal University of Recôncavo da Bahia. Master's student in the Rural Extension and Territorial Development Program at the Federal University of Vale do São Francisco (UNIVASF). More than five years of experience with projects related to technical assistance and rural extension for traditional peoples and communities and family farming. She has experience with the participatory certification process for organic products for family farming families in the Recôncavo da Bahia. Experience as an educator, and volunteer multiplier in agricultural family schools, with an alternating pedagogy regime. Collaborator of the NGO Grupo Ambientalista Nascentes (GANA), coordinating the Technical Assistance and Rural Extension board,
Amazônia Agroflorestal	Geovani de Almeida Machado	Technical Field Leader	Agricultural Technician from the Federal Agrotechnical School of Manaus/AM. Professional with more than 10 years of experience in the field of Technical Assistance and Rural Extension to organic agroforestry coffee producers. Experience in good practices in the coffee harvesting and post-harvesting process and coffee classification by defects. Experience in clonal coffee plantations in Agrofloresta.
Amazônia Agroflorestal	Antonio Carlos do Nascimento	Field Technician	Forestry technician from CETAM (Amazon Technological Education Center) and undergrated student in Environmental Management from the Institution of Higher Education (Estácio). Has experience in Technical Assistance and Rural Extension projects, especially with the registration of rural producing families and environmental regularization of properties, in addition to projects aimed at the social, environmental and economic development of communities, associations and cooperatives and incentives for the creation of new cooperatives and associations. He also has

			experience using tools such as GPS and trackmaker software.
Amazônia Agroflorestal	Marcelo do Amaral Jacauna	Field Technician	Agriculture and Forest Management Technician by the Federal Institute of Education, Science and Technology Manaus / AM. Professional with 16 years of experience in the area of Technical Assistance, with extensive knowledge in Reforestation and Implementation of Forest Restoration models. He has experience in structuring a seed network and producing nursery seedlings, as well as structuring a seedling nursery and its documentation and legal requirements.
Amazônia Agroflorestal	Ludmilla Colares Rodrigues	Field Technician	Agronomist Engineer graduated from the Federal University of Amazonas (UFAM) with internships carried out in Nursery of Seedlings and Institute of Agricultural Development of Amazonas (IDAM) in Apuí / AM.
Idesam	Mariano Colini Cenamo	Director of Business Development at IDESAM	Forestry Engineer graduated from the Luiz de Queiroz School of Agriculture (ESALQ/USP), Mariano is Co-founder and Director of New Business at IDESAM and CEO at AMAZ - Accelerator & Impact Investments. With more than 15 years of experience in the Amazon, Mariano led the construction of several policies, programs and projects related to forest conservation, climate change and REDD+. In recent years, Mariano has become a reference in the construction of an ecosystem of businesses with impact and attraction of private investments in the Amazon. Mariano is part of the Lemann Foundation's network of leaders, in addition to several councils and initiatives aimed at sustainable development in Brazil.
Idesam	Victoria Bastos	Coordinator at the Environmental Services Initiative at IDESAM	Environmental Manager graduated from the Luiz de Queiroz School of Agriculture (ESALQ/USP) and has a post-graduation degree on Project Management from the Fundação Getúlio Vargas. It is current leader at the Environmental Services Initiative and a member of IDESAM since 201. Victoria develops strategies aimed at creating new financing mechanisms for forest conservation and sustainable development in the Amazon, and has 4 years of experience with project's related to payment for environmental services mechanisms through forest conservation, having worked on projects with the private sector (Natura & Co, Veja Shoes) and supporting the Amazonas State government with is REDD+ strategy.
Idesam	Elen Blanco Perez	Project Assistant at the Environmental Services Initiative at IDESAM	Elen Blanco is a project manager at the Environmental Services Initiative at IDESAM. Elen is an Environmental Manager graduated from the Luiz de Queiroz School of Agriculture (ESALQ/USP) and Master in Environmental Services from the Center for Nuclear Energy in Agriculture (CENA/USP). Member of IDESAM since 2020, Elen participates in the development of studies and project management related to forest restoration, regenerative agriculture and carbon credits in the Amazon.
Idesam	Gabriel Cardoso Carrero	Associate Senior Researcher at IDESAM and consultant	Biologist (UFSC), Master in Ecology (INPA) and PhD in Geography (University of Florida). He has been working with IDESAM since 2007. Gabriel has led many initiatives and projects that combine conservation, community development and sustainable rural production, including REDD+ projects. Themes researched include forest monitoring, land use changes, sustainable practices and, more recently, frontier heterogeneity, development processes and land appropriation in the Amazon basin. He uses knowledge from

			the disciplines of Ecology, Geography (RS and GIS), Environmental Science, Forestry and Agronomy.
Idesam	Pablo Pacheco	GIS and RS Consultant	Biologist and Master in Plant Biology from the Federal University of Santa Catarina; PhD student at UDESC on land use change and its impacts on soil biology. He has been working on environmental projects for 16 years, with an emphasis on deforestation analysis and soil change assessment in the Amazon. Specialist in GIS (geographical information systems) and RS (remote sensing).
Idesam	Marina Yasbeck Reia	Organic Certification and support to APFOV (Ouro Verde Family Producers Association (APFOV)	Environmental Manager graduated from the Luiz de Queiroz School of Agriculture (ESALQ/USP) with a Master's degree in Agronomy, Marina Reia has been a collaborator at IDESAM since 2014 and has worked with rural extension in Amazonas since then, focused on supporting the socio-biodiversity, agro-ecology and organic production chains. Currently, she works at the front line of the Café Apuí Agroflorestal project and is also part of the coordination of the Maniva Agroecology Network (Rema) and of the State Organic Production Commission (CPORG-AM).
Idesam	Aparecida Martins Sardinha	Project Assistant	Graduated in Forest Engineering from the State University of Mato Grosso, she has a postgraduate degree in project management. She has been with Idesam since 2013, residing in Apuí, where she develops actions through the Cidades Florestais project, focusing on structuring the vegetable oil chain.
Idesam	Thiago Marinho	GIS consultant	Bachelor in Geography from the Federal University of Amazonas (2010), and Master in Physical Geography (Hydrology and Remote Sensing) from the Graduate Program in Geography-UFAM (2014). He has been an environmental consultant since 2012 and since 2018 he has worked at Idesam in the area of GIS.
Idesam	Vanilse Constante	Administrative and logistical officer.	With a degree in Environmental Management from UEA and a postgraduate degree in Marketing Management, she works in the administrative and logistical sector of Idesam in Apuí/AM, at the forefront of relations with producers and institutions in the municipality. She sits on the secretariat chair of the CMDRS (Municipal Council for Sustainable Rural Development of Apuí), a council in which Idesam is a member. It also works in the countryside, developing projects in partnership with institutions and associations, with environmental education, awareness and social organization activities, strengthening the role of women and young people in the countryside.

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

The project will have specific technical partnerships for the implementation of some activities:

Biodiversity Alliance/CIAT and USAID for the use of the Terrabio methodology: the project will have the involvement of the company Terrabio for monitoring biodiversity and soil conditions in the properties involved in the project. In the project Terrabio will be responsible for collecting soil samples, analysis for eDNA in the soil, and determination of possible interventions and contributions to biodiversity conservation. The indicators evaluated are: (i) Number of key species due to intervention, (ii) Change in abundance of key/priority species due to interventions, (iii) Change in biodiversity indices due to interventions, and (iv) Change in species richness due to interventions. The Terrabio team will work in partnership with the

project's technical team. More information on biodiversity indicators is described in section 5.4 - Biodiversity Impact Monitoring.

INCRA - National Institute for Colonization and Agrarian Reform: Technical partnership with INCRA to catalyze the process of landholding regularization of the public participating in the project - small farmers from the Settlement Project (PA) Rio Juma and PA Acari in Apuí and PA Matupi in Manicoré and Novo Aripuanã. The Project, on behalf of the Project proponent and technical partner will sign a Cooperation Agreement with the INCRA regional superintendent representative in Amazonas to support the land regularization applicants in the municipalities that have partnership with the REDD+ CAA project.

Szazi, Bechara, Storto, Reicher e Figueiredo Lopes Advogados (SBSA Advogados): contractual partnership for legal support of the project, more specifically the elaboration of terms of cooperation, contracts with suppliers, partnership contracts with producers, elaboration of legal opinions on issues such as land title regularization, fair trade and others, and elaboration of internal policies of the project proponent. SBSA Advogados is a pioneer law firm specialized in civil society organizations and impact businesses that has been in the legal market for 20 years.

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

Amazônia Agroflorestal is a private company, a limited liability company (Ltda), which has been operating since 2019 with the commercialization of Apuí Agroforestry Coffee and Apuí Organic Agroforestry Coffee produced in Apuí. Its capital is composed by the sale of the product Café Apuí Agroforestry and, in 2022 the company received investment from the ABF fund (Amazon Biodiversity Fund) and the company Axcell, totaling a capital of R$11 million to operate and expand its activities in the production chain of agroforestry coffee and conservation of native forest areas of rural properties in the region of Apuí. The revenue obtained with the carbon credits from the reduction of emissions generated by the REDD+ CAA project will compose and guarantee the financial health of the company, as well as the sustainable production chain of the Apuí Agroforestry Coffee. The company is audited by an independent third party annually, and the company's financial statements are not public, but may be provided to the project's auditors.

The Institute of Conservation and Sustainable Development (Idesam) has been operating for over 18 years through funding by mostly philanthropic capital from private and public institutions through funding edicts and funds, and is also active in providing services related to the themes of conservation, preservation, and sustainable production chains. Idesam's accounts are audited annually by a third-party organization, and the Institute has annual accountability approval. The financial statements and statements from audits performed on Idesam's accounts are publicly available on the website (https://idesam.org/sobre/). In addition to the third-party audit, for each project funded by Idesam, accountability statements are provided to funders and donors.

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

As described in the item 2.4.5 - Financial Health of Implementing Organization(s), the proponent company Amazônia Agroflorestal and the technical implementing partner, Idesam, act according to good financial practices performing annual independent audits.

The company Amazônia Agroflorestal has an ASG policy (https://www.cafeapui.com.br/asg) in which it assumes the commitment of acting with anti-corruption practices: the company and its partners and directors repudiate any fraudulent or corrupt practice (bribery, influence trafficking, money laundering, concealment of assets, undue advantages, and others) or of illicit or criminal acts of any kind. The company repudiates any illicit conduct in its activities, adopting precautions to prevent and mitigate any deviations by

its employees. In terms of commitment to transparency, the company periodically prepares a newsletter that is distributed to partners, internal staff, and financiers, where relevant situations regarding the company's activities are informed. In risk management, it has permanent legal and accounting advisory services. In 2021, the company went through a rigorous Due Diligence at the request of an investor, having obtained satisfactory results, and will be audited annually by a specialized company.

Amazônia Agroflorestal also has a public anonymous and non-anonymous ombudsman channel (ethics and privacy channel) that facilitates the management and mapping of corrupt practices or those that deviate from the company's ethical values - https://www.cafeapui.com.br/ouvidoria.

The Institute of Conservation and Sustainable Development (Idesam) has an Anti-corruption Policy (https://idesam.org/sobre/) that establishes the guidelines and responsibilities of Idesam that ensure and reinforce the institution's commitment to preventive practices and combat corruption and other similar illegalities established in the legislation in force. In addition, the Policy also describes behavioral rules to be followed in the conduct of activities developed by Idesam, which ensure compliance with the laws, in particular, with the Anti-corruption Law and the rules for prevention of corruption and similar offenses. Idesam also has a Code of Ethics and Conduct and Integrity Policy for internal activities and those of its suppliers and partners, guiding and repudiating actions and activities that go against morals, ethics and the law in its operations.

Idesam also has a public anonymous and non-anonymous ombudsman channel that facilitates the management and mapping of corrupt practices or those that deviate from the ethical values of the Institution - https://idesam.org/ouvidoria/.

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

For the REDD+ CAA project, some information relevant according to the VCS and CCB standard has been considered commercially sensitive and will not be publicly available. The information and documents that will be shared only with the audit (VVB) for validation process are:

- Project Proponent's Financial Statements;
- Financial modeling of the Café Apuí Agroforestry Initiative - Project Proponent's business model;
- Contracts with family farmers participating in the project;
- Report of responses to the registration form applied to the project participants;
- Report of responses to the socioeconomic survey applied to the project participants;
- Land documentation of project participants;

2.5 Legal Status and Property Rights

2.5.1 Statutory and Customary Property Rights (G5.1)

The REDD+ CAA Project Area is composed of native forest areas belonging to the properties of family farmers in the region of Apuí, Novo Aripuanã and Manicoré municipalities located in the southern region of the State of Amazonas. The project proponent, Amazônia Agroflorestal, does not own the properties involved in the project – Project Activity Instances. Details on project ownership are described in Section 2.5.9.

To achieve land ownership in Brazil is a complex process, especially in the Amazon region due to multiple land claims and abundant public lands (Reydon, Fernandes & Telles, 2015, Reydon, Fernandes & Telles, 2020) and even more in the project zone due to high farm turnover, difficulted access and low government agencies resources and personnel for survey and issuing titles (Carrero and Fearnside, 2011, Silva 2012).

In the Project Zone there are groups with different situations of legal regulation regarding the rights over the land that are subject to land regularization according to the laws that govern it. From the mapping of the different situations of land regularization of the PAI #1-42 properties participating in the project, an argumentation was constructed based on the relevant legislation (see section 2.5.7 - National and Local Laws (G5.6) and is shown in Table 16.

Table 15. Different property rights situations on Project Zone

Main Type	Sub-type	Count of PAI	% PAI	PAI Area (ha)	% of PAI Area
1. 1. Property with registered land title	1.1 Individual property with CAR or SIGEF;	1	2.4%	205.1	3.1%
	1.2 Individual property with CAR or SIGEF;	10	23.8%	952.9	14.2%
	1.3 Individual property without CAR and SIGEF;	1	2.4%	85.0	1.3%
2. INCRA settlement;	2.1. With domain title;	3	7.1%	433.5	6.4%
	2.2. Without domain title.	9	21.4%	1,089.5	16.2%
3. Owners' condominium with possibility of dismemberment		2	4.8%	53.5	0.8%
4. Remnants of settlement areas and non-designated public lands possessions		16	38.1%	3,903.7	58.1%
Total		42	100%	6,723.1	100%

1. Property with registered land title

This is the legitimate ownership of the property, on behalf of the producer who uses it for the REDD+ CAA Project, duly registered with the property registry office of the city where the property is located. Registering with a notary is essential to publicize the ownership of the asset and is sufficient to provide legal certainty and guarantee that the property is not being used illegally from the point of view of property rights. There are cases where the property has a title deed in the name of another person and the owner has a purchase contract signed and registered with the local notary. In these cases, the transfer of the property must be made in the Land Registry Office to achieved full legal security, a simple procedure to be completed, which will be supported by project.

In addition to the aforementioned registration, these are rural properties must be duly registered and inscribed in the Rural Environmental Registry (CAR) and in the Land Management System (SIGEF).

1.1. Individual property, with CAR and SIGEF

The property that is individualized, registered in the name of the producer in the Land Registry Office and that is duly registered in the CAR and SIGEF is completely in accordance with current legislation and has the broadest legal security. This is the status that must be achieved by all producers participating in the REDD+ CAA Project.

1.2. Individual property, with CAR or SIGEF

In this case, for it to be fully regular, the owner must endeavor to obtain the remaining registration, either the CAR or the SIGEF, based on the following guidelines:

For enrollment in the Rural Environmental Registry (CAR), the following must be submitted to the Brazilian Forestry Service: (a) data on the property owner, rural owner or person directly responsible; (b) data on documents proving ownership or possession; (c) georeferenced information on the perimeter of the property, areas of social interest and areas of public utility, with information on the location of remnants of native vegetation, Permanent Preservation Areas, Restricted Use areas, consolidated areas and of Legal Reserves.

For enrollment in the Land Management System (SIGEF), the owner with total area over 400ha must hire a surveyor/topographical professional who is accredited to the SIGEF system, whereas owners with areas smaller than that, the State (under INCRA's attribution) should provide this service free of charge. Through this system, INCRA manages the land information of rural properties, managing all the georeferenced information on the boundaries of the properties.

1.3. Individual property without CAR and SIGEF

If the producer finds himself in this situation, he will need to guide him to follow the steps to obtain the Rural Environmental Registry (CAR), with the Brazilian Forestry Service, and to enroll in the Land Management System, with INCRA. Considering that the property right is already duly registered in the real estate registry office, the situation is not considered delicate, since obtaining CAR and SIGEF does not tend to be complicated.

2. INCRA settlement

Another way of obtaining property ownership by being officially settled by INCRA in one of its settlement projects (*i.e.,* land reform projects), under the terms of Law 8629/1993. In this modality, farmers receive the farm lot with the commitment to exploit it for their livelihood, using family labor, and INCRA may grant them the right to the property, subject to compliance with legal requirements.

According to Law 8.629/1993, in the implementation of the settlement project, a free, non-negotiable use concession agreement will be signed with the beneficiary of the agrarian reform program, ensuring the concessionaire the right to acquire the title of domain or the CDRU under the terms of the Law (art. 18, § 2o).

Therefore, the lot will belong to INCRA until the issuance of the title in favor of the beneficiary, which is why it will be important to verify the situation of the producer in case of settlement, to verify if the property still belongs to INCRA or if it has already been transferred for the producer.

2.1 With domain title

The producer who has obtained his lot through the settlement by INCRA, and already has the title of domain, is the owner of the property and will be duly in accordance with the applicable legislation that guarantees security of the property right. This category is equivalent in terms of land security as the 1.

2.2 No domain title

If the scenario is a rural settlement in which the property is still owned by INCRA, the conditions for the owner to obtain the title of domain must be verified, under the requirements described below.

For proper titling, it is necessary that: (a) the producer is a beneficiary of the agrarian reform and has a regular registration; (b) the castrate of the beneficiary at INCRA is up to date; (c) the use concession contract (instrument that guarantees the permanence and exploitation of the lot in the settlement) is duly

complied with; (d) the settlement area is definitively registered in the name of Incra or the Union; (e) the farm lot area and settlement perimeter are georeferenced and certified; (f) the settlement is registered in the Rural Environmental Registry (CAR).

The title request is made electronically, through the INCRA territorial governance platform, at the following link: https://pro-pgt-incra.estaleiro.serpro.gov.br/pgt/home.

3. Owners' condominium with possibility of dismemberment

In the event that the producer owns a fraction of the property, he will be facing a condominium of owners. In this scenario, the fruition of the property, including for the purpose of planting coffee, requires the consent of the other owners. In addition, there is a considerable risk in this modality since any environmental violation or any other illegal practice in the property could be the responsibility of all owners. For this reason, it is necessary to seek the division of the area so that the producer's property is duly individualized before the Real Estate Registry Office to achieve the ideal scenario provided for in topic 1 above.

For a rural property to be dismembered and have an individual registration in the name of the producer/owner, it is necessary to respect the Minimum Fraction of Installment of the city of Apuí, which is 4 hectares. If the ideal fraction belonging to the producer corresponds to an area greater than 4 ha, it will be possible to start the procedure of dismemberment of the property and individualization of the registration. This occurs through the following steps: (a) elaboration of a descriptive memorial duly signed with the signature recognized by a technical manager; (b) preparation of plans depicting the current area, the area that will be dismembered (from the producer) and the current area after the dismemberment; (c) request for annotation of the dismemberment with the competent real estate registry office, presenting the ART/CREA duly paid by the responsible technician.

It is important to note that after the division of the area and the individualization of the property, the producer must endeavor to obtain the Rural Environmental Register and registration in the Land Management System, as already explained above.

4. Remnants of settlement areas and non-designated public lands possessions

There are situations in which the producer started to occupy a settlement area without being one of the beneficiaries of the agrarian reform program – irregular occupation, therefore. According to Law 8.629/1993, this occupation can be regularized by INCRA, through a use concession contract, provided that: (i) the settlement project has been created by December 22, 2014 and (ii) the occupation and exploitation of the land by the producer has been initiated by, at the latest, December 21, 2015 (art. 26-B of Law 8.629/1993). Having the proper documentation able to prove the exploration and occupation of the land and the existence of the project until the respective deadlines, the regularization does not present complexities.

The same applies to land regularization resulting from the occupation of non-designated public land (Union land), regularized either by granting the right to use the land or by transferring the land to the occupant under favorable conditions. Here, occupations of land remnants of settlements mentioned in the above paragraph are included. This type of regularization is governed by Federal Law No. 11,952/2009.

Article 40-A of Law n.º 11.952/2009 states, in fact, that such law is applicable to the land regularization of occupations outside the Legal Amazon in the urban and rural areas of INCRA, including in the remaining areas of settlement projects created by INCRA with characteristics of colonization, inside or outside the Legal Amazon, on a date before October 10, 1985 – as is the case of PA Rio Juma (created in 1982).

In 2017, Law 13,465/2017 amended the wording of Law 11,952/2009. This allowed, among other facilitations for land regularization, a) the expansion of the area subject to titling to 2,500 hectares (art. 6, §1 of Law no. 11,952/2009); b) the definition of values well below the market for the purchase of these areas by individuals and c) the possibility of renegotiating debts until December 2021 for those who received title until December 22, 2016 (art. 19 of Law n.º 11.952/2009).

Under the terms of this regulation, in order to regularize the occupation, the occupant and his/her spouse or partner must: a) be a native or naturalized Brazilian; b) not be the owner of rural property in any part of the national territory; c) practice effective agriculture production; d) prove the exercise of occupation and direct, calm and peaceful exploitation, by himself or by his predecessors, prior to July 22, 2008 and e) not have benefited from an agrarian reform or land regularization program in a rural area, subject to the situations allowed by the Ministry of Agrarian Development (art. 5 of Law n.º 11.952/2009).

The regulation is implemented by Decree 10.592/2020, which, among other factors, presents in its art. 10 the possibility of obtaining an Occupation Recognition Certificate (CRO). Although it does not generate recognition of the property right, the CRO is a document that allows proving the occupation of the public area in the process of land regularization by the applicant with the official credit institutions for financing, thus guaranteeing some protection until the regularization is carried out – which, it is reiterated, is possible in all mapped cases, observing the rules in force.

2.5.2 Recognition of Property Rights (G5.1)

As described in section 2.5.1, all property rights are recognized, respected, and supported, and follow the land rights described in Section 2.5.6. The project will only include new project activity instances that comply with land laws or can achieve full law compliance. In the later, the project will support land regularization of participants as part of its activities.

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

The project will not occupy private or community areas without consent and will not occupy public areas.

The project will be limited to areas of rural properties where the owners meet the minimum requirements stipulated in items 2.5.1 - Statutory and Customary Property Rights and 2.5.2 - Recognition of Property Rights for titling or legal possession of the land.

The owners of the lands that make up the Project Area sign a contract for the assignment of carbon credits from rural properties (which they have tame or legal ownership) in which they determine the responsibilities, rights and duties of each party. The contract established between Family Farmers and the Project Proponent, containing details and information about the partnership and concessions, will be provided for the VVB during the validation process.

In order to conclude the contract, the FPIC process was carried out, following the protocol presented in Annex - Guidelines and Protocol for the Consultation Process for Project REDD+ CAA and the process presented in Appendix 4. The FPIC follows the validating and certifying standards VCS and CCB, on the one hand, and, on the other, the criteria and guidelines for prior consultation included in the legislation. In short, the FPIC will follow the following guidelines, arising from the set of rules and enshrined in the jurisprudence of the Inter-American Court of Human Rights (see Caporrino, 2019), where the following

items follow in addition to i) prior, ii) free, and iii) informed: iv) will be in good faith and v) culturally appropriate.

The process will be carried out in two phases.

Phase 1: mobilization, pre-consultation, and Socioeconomic Survey - In this initial phase, for information purposes only, producers were invited to learn about the proposal in detail and provide important information for the Project. It can also be considered a pre-consultation phase, since the Project is presented in general terms, doubts about it are collected to subsidize studies that may supply the information they need at the time of the consultation (which needs to be backed by clear information and in-depth to meet ILO 169 criteria and provide information about themselves that will be important for the completion of the Project).

Phase 2: prior consultation. - At this stage, a prior, free, informed and good-faith consultation process begins. In order to comply with the prior consultation guidelines stipulated by ILO 169 and jurisprudence, and taking the criteria of the validating agencies, this phase will have the following steps:

Information – project presented to participants through public meetings, with presentation of the project and delivery of an informative document. The material presented during the FPIC meeting will be made available for the VVB and its content was described in item 2.3.5 - Information to Stakeholders on Validation and Verification Process.

Agreement – participants meet without the proponent in groups delimited by regions or sectors to decide on the individual signature of the contract for the assignment of carbon credits from the properties, and the consent of the participants will be documented and delivered to the project proponent through the celebration of the contract.

The process, its materials and participants can be seen in Appendix 4, taken from the project's Guidelines and Protocol for the Consultation Process (Annex).

FPIC meeting minutes, report, signed contracts and other relevant documents from this process will be provided during project audit.

2.5.4 Property Rights Protection (G5.3)

For its implementation, execution and maintenance, the REDD+ CAA project does not foresee the relocation or removal of family landowners from their lands. This applies to any landowners participating directly or not in the project (i.e., with areas registered as forest area in the REDD+ CAA project).

Similarly, no activities performed by the project will require the relocation of cultural or livelihood-relevant activities of family landowners.

2.5.5 Illegal Activity Identification (G5.4)

Illegal activities that may occur in the Project Area, and therefore impact project outcomes, are primarily related to the illegal use of forest resources. Examples are: deforestation, illegal logging, human-induced fires, illegal hunting or fishing, and illegal land occupation. Other illegal activities that may occur but are not directly connected to land use would be: employment of slave labor for work on the rural properties

participating in the project and use of the project area to perform illegal activities such as drug production or trafficking.

To mitigate the occurrence of the above illegal activities, the project intends to develop the project activities as presented in section 2.1.11 Project Activities and Theory of Change and discourage the occurrence of illegal activities on the properties participating in the project. The contract signed with the owner-producers of the properties participating in the project makes it clear that the project resources obtained through the payment for environmental services through the benefit sharing mechanism cannot be used for illegal activities.

Furthermore, the project is monitored periodically through technical field visits to the project areas by the proponent's technical team. The team must register any occurrence of illegal activity on the participating properties or illegal activity carried out by the producers who own the land. The occurrence record will follow the flow described in section 2.3.17 - Occupational Safety Assessment (G3.12).

2.5.6 Ongoing Disputes (G5.5)

As described in section 2.5.1 - Statutory and Customary Property Rights (G5.1), the project area is composed of a grouping of areas of native forest from rural properties in the municipalities of Apuí, Manicoré and Novo Aripuanã. Considering that the vast majority of the properties in the initial Project Activity Instances are in Settlement Projects, a relevant dispute or conflict for the project would be a dispute over land tenure.

However, considering that the land documentation for all the properties participating in the project was analyzed, there is no sign of conflict over land tenure or other disputes over resource use. The land documentation analysis will be carried out for each new Project Activity Instance (PAI) as presented in section 2.5.1, seeking to understand if there are already existing disputes and evaluating documentation criteria.

Any disputes that have occurred in the project area or area of influence of the project in the last 20 years of which the project is aware will be considered as a risk to the project and mitigation measures will be applied.

2.5.7 National and Local Laws (G5.6)

Laws related to employment and labor activities are presented in section 2.3.16 Relevant Laws and Regulations Related to Worker's Rights (G3.11).

There is great complexity of land ownership because property rights is originated from the dismemberment of public property in Brazil. Because of this, all land documents, to have legal validity, must be linked to an act issued by a competent authority that ensures that the land was disincorporated from the public patrimony (Treccani, 2009).

Between 1822 and 1850, the form of land acquisition was possession. In this period, however, there was no instrument capable of transforming occupations into property. With the advent of the Land Law (Law 601, of 18/09/1850), this regime of possessions was interrupted. This law, besides formally recognizing the legal institute of private property and requiring documentary evidence of titles, brought the institute of legitimation of possession, for example through proof of cultivation of the land (Treccani, 2009).

This right to legitimize the possession of public lands, in its most diverse facets, still exists in Brazil today, with provisions in laws and regulations that will be addressed below. However, the land chaos that the Land Law sought to combat also remained present, especially in the Amazon region.

In the Amazon, there are at least 22 agencies with competence for some type of landholding regularization. Usually, the definition of the agency or institution is made considering two criteria: jurisdiction of the area, (i.e., federal or state), and the type of occupant or intended use of the land. Between one jurisdiction and another, there may be discrepancies between the procedures required for titling and even between the amounts charged, in the hypotheses of sale of public land (Brito et. al., 2021).

The pulverization of institutions responsible for different types of land title regularization can be seen as a model of polycentric governance, with some levels of independence and a certain degree of overlapping roles among the players. A positive side of this type of arrangement is the attendance to varied publics with a closer look at specificities. However, this requires coordination and efficiency, which is not the case in the Amazon. There is no space for dialogue between state governments, the federal government and representatives of the various groups that require landholding regularization (Brito et. al., 2021).

Once the competent body or institution is established, two other criteria are important for meeting the requirements for regularization: time of occupation/use and size of the occupied area. For example, in all situations, at the federal or state level, of alienation or concession of public lands with an area that exceeds 2,500 hectares, authorization from the National Congress is required (art. 49, XVII of the Federal Constitution).

It is also necessary to understand how the Rural Environmental Registry (CAR), with the Brazilian Forest Service, and the Land Management System (SIGEF), with INCRA, work.

The Rural Environmental Registry (CAR), a responsibility of the Brazilian Forest Service, was established by the Forest Code, Law 12651/2012, and is regulated by MMA Normative Instruction 2/2014. It aims to provide the grouping of information on properties with attention focused on environmental preservation, with regard, for example, to Areas of Permanent Preservation (APP) and Legal Reserve.

The Land Management System (SIGEF), on the other hand, was created by Law 10.267/2001, is regulated by INCRA and deals with certifying the property in order to prevent the overlapping of areas by means of georeferencing. SIGEF condenses the land registries in an online platform (https://sigef.incra.gov.br), thus carrying out the certification of the data referring to the rural property limits (§ 5º of art. 176 of Law nº 6.015, from December 31st, 1973) and the management of georeferencing service contracts with the public administration.

In addition to the legislation already cited in the paragraphs above, the following laws and norms in force are relevant to assess the ownership and law compliance of the PAI landholings participating in the REDD+ CAA project:

- Law 4.504/1964 - Provides on the land statute.
- Law 8.629/1993 - Provides on the regulation of the constitutional provisions related to agrarian reform provided in Chapter III, Title VII of the Federal Constitution.
- Law 11,952/2009 - Provides on the agrarian regularization of occupations occurring in lands located in areas of undesignated public lands (the Union), in the scope of the Legal Amazon
- Law 12.651/2012 Brazilian Forest Code - Provides on the protection of native vegetation.
- State Law (AM) No. 3.804/2012 - Provides on the destination of lands located in areas of Amazonas State domain.
- Law 13,465/2017 - Provides for rural and urban landholding regularization, on the settlement of credits granted to agrarian reform settlers and on landholding regularization within the Legal

Amazon; institutes mechanisms to improve the efficiency of the procedures for disposing of Union properties.

- Decree 9.310/2018 - Institutes the general norms and procedures applicable to the Urban Land Regularization and establishes the procedures for the evaluation and disposal of Union properties.
- INCRA Normative Instruction No. 99/2019 - Establishes the administrative procedures for titling rural properties in Agrarian Reform Settlement Projects, created on lands owned or possessed by INCRA or the Union, as well as verifying the conditions of permanence and regularization of the beneficiary in the National Agrarian Reform Program (PNRA).
- Municipal Law 455/2021 - Provides for the new municipal program of land regularization in the municipality of Apuí, called "MEU IMÓVEL LEGAL".

The land situations and the description of recognition of property rights, as well as measures to reach full land ownership are described section 2.5.9. Project Ownership.

Another related law has to do with environmental embargos. The embargo of an activity and their respective areas can be applied by the environmental inspection body in two situations:

- as a sanction resulting from an environmental infraction, after the exercise of full defense by the assessed person and judgment of the infraction notice.
- as a precautionary measure, even before the exercise of the defense and/or judgment of the notice of infraction, to avoid the aggravation of the damage and the environmental recovery.

In both cases, the embargo must be restricted exclusively to the place where the offense was actually committed, not reaching those unrelated to the infraction (art. 15-A and art. 101, § 4 of Decree 6514/2008). In this way, the non-embargoed areas of a property can continue to be used. In addition, if there is a condominium of owners, it is not necessary to dismember the property if the embargoed area is in the fraction of another condominium.

Another group of legislation that is important for the development of the project activities is the environmental and climate change legislation framework of Amazonas. The state of Amazonas has:

- State Climate Change Policy (PEMC-AM), instituted by Law No. 3,135/2007;
- State Policy for Environmental Services, instituted by Law No. 4.266/2015;
- Regulation of the PSA - State Policy for Environmental Services and Bolsa Floresta Program (State Decree No. 44.968/2021).

At the federal level, Law No. 14.119/2021 institutes the National Policy for Payment for Environmental Services that recognizes and encourages payment mechanisms for environmental services in Brazil and gives guidelines and definitions about their formats.

2.5.8 Approvals (G5.7)

The REDD+ CAA project within the voluntary carbon market does not require formal approval by federal or Amazonas state government agencies. Likewise, letters of approval from agencies responsible for the rights of traditional communities are not required since the Project Area is located in properties where the property owner has private and peaceful possession and has constitutional rights over the land, even if within public lands, as is the case of the Rio Juma and Acari Settlement Projects.

However, the REDD+ CAA project will seek letters of support from the following entities:

- INCRA - National Institute of Colonization and Agrarian Reform;
- Secretary of Environment of Amazonas - SEMA/AM;
- Secretary of Environment of the Municipality of Apuí;
- Secretary of Environment of the Municipality of Manicoré;
- Secretary of Environment of the Municipality of Novo Aripuanã.

It is worth mentioning that until February 2023 the Amazonas state government does not have a jurisdictional REDD+ program operating or a voluntary carbon market project registration system for alignment with a Jurisdictional Program.

2.5.9 Project Ownership (G5.8)

Family farmers have the right to the project area and have granted the right to generate carbon credits within the project area to Amazonia Agroflorestal, the project proponent, through a contract in which it is clearly defined that the farmers are landowners and give Amazonia Agroflorestal the right to generate credits in exchange for payment for environmental services through a benefit-sharing mechanism.

To assess the different land regularization situations in the Project zone, the REDD+ CAA project team conducted interviews and collected documentation for proof of land ownership for PAIs#1-42. With this, it was possible to analyze and compile information in a database that is presented for the auditing process, as summarized in Section 2.5.1 Statutory and Customary Property Rights.

2.5.10 Management of Double Counting Risk (G5.9)

The project does not seek or receive any other form of environmental credit. The only program eligible to receive environmental credit for forest conservation in Brazil and the Amazon is the Federal Government's Floresta+ project, Conservation modality, which is being implemented with resources from the Green Climate Fund (GCF).

In the contract signed between the REDD+ CAA project and the farmers that own property registered in the project, it is specifically forbidden to register the same property in another project or remuneration program for payments for environmental services (or environmental credit) for conservation or reduction of avoided deforestation/deforestation. In this way, the project will avoid double counting.

Regarding double counting in jurisdictional programs and the regulated carbon market, see section 2.5.15 - Double Counting (G5.9).

2.5.11 Emissions Trading Programs and Other Binding Limits

As described in section 2.5.1 - Management of Double Counting Risk (G5.9), the REDD+ CAA project prohibits, by contract, the adhesion of areas participating in the project to other environmental credit programs such as the Floresta+ Conservation modality program of the Federal Government.

The REDD+ CAA project will seek to send a letter from the Floresta+ program pointing out the native forest areas that make up the project area so that they are not considered for remuneration by the Program.

In addition, the REDD+ CAA project will seek official registration with SEMA/AM - Secretary of Environment of Amazonas by sending a summary document of the project so that SEMA/AM, despite not having

formalized a state registry of projects in the voluntary carbon market, may become aware and register it once the state registry system is operational.

2.5.12 Other Forms of Environmental Credit

Not applicable. The project proponent will not seek to issue other forms of GHG emission reduction environmental credits.

2.5.13 Participation under Other GHG Programs

The project is not registered or seeking registration in any other GHG emissions reduction program.

2.5.14 Projects Rejected by Other GHG Programs

Not applicable.

2.5.15 Double Counting (G5.9)

The REDD+ CAA project aims to generate credits within the voluntary carbon market and therefore the credits generated by its project area should not be used to generate credits in jurisdictional programs or the regulated carbon market. Brazil, to date (February 2023) does not have a regulated carbon market.

The State of Amazonas was a pioneer in the formulation of its State Policy on Climate Change (PEMC-AM), instituted by Law No. 3.135/2007. The PEMC-AM was created in accordance with international agreements for climate change mitigation and had as main objectives: the creation of economic, financial and fiscal instruments; the promotion of markets for Reducing Emissions from Deforestation and Forest Degradation (REDD+); the stimulus to regional models of sustainable development; the elaboration of Action Plans for climate change mitigation and the creation of Conservation Units.

Subsequently, the state instituted the State Policy for Environmental Services (Law No. 4.266/2015), which provides for the creation of a REDD+ Subprogram within the Climate and Carbon Regulation Program (Art. 14),and has a legal device for the collection of resources for socioeconomic development and the conservation of its forests. The Law establishes a framework for the government, companies, organizations, and civil society to invest in the environmental services provided by the forests of the state of Amazonas.

In 2022, Amazonas became eligible to raise funds based on the results of deforestation reduction between 2006 and 2015, through the limits defined by the National REDD+ Commission (CONAREDD) - CONAREDD+ Resolution No. 6. The State's eligibility is stated in the Decree No. 46.596/2022.

Furthermore, Amazonas has the State Council of Environment (Cemaam) and a Scientific and Methodological Committee for REDD+ (Portaria SEMA 099/2022), of which Idesam, technical partner of the REDD+ CAA project is a member.

In the above context, it is evident that the state of Amazonas, location of the REDD+ CAA project, has legislation in accordance with the principles of resource generation by the REDD+ mechanism, however, it does not have a State REDD+ System implemented and in operation and does not have, until February 2023, a State REDD+ Plan as provided by Law No. 4.266/2015, Article 16.

Amazônia Agroflorestal, the project proponent, and Idesam, the technical partner, contacted the Amazonas Secretary of Environment (SEMA/AM) - the managing body of the State Policy for Environmental Services - and the Scientific and Methodological Committee for REDD+ (CMM) to formally present the REDD+ CAA project and its details in terms of projected emissions reductions and credit generation. However, the state

informed that it does not officially have a channel or process for registering projected emissions reductions and credits generated by the project.

Thus, the REDD+ CAA Project understands that there is no risk of double counting between credits generated in its project area and those accounted for by the State of Amazonas, since the state does not have a jurisdictional REDD+ program in place and does not have an official registry system to recognize credits generated by the REDD+ CAA project. In any case, the project proponent and technical partner have notified the relevant agencies (SEMA/AM and CMM) of the project's existence and commit to periodically monitor Amazonas' progress towards a jurisdictional program – aiming at transparency and to avoid double counting.

3 CLIMATE

3.1 Application of Methodology

3.1.1 Title and Reference of Methodology

Methodology for Avoided Unplanned Deforestation, VM0015 version 1.1 of December 3, 2012.

AFOLU Non-Permanence Risk Tool v4.0, 19 September 2019.

VT0001 Tool for the Demonstration and Assessment of Additionality in VCS AFOLU Project Activities, v3.0, 1 February 2012.

3.1.2 Applicability of Methodology

The VCS VM0015 methodology, version 1.1 is applicable to this project because it meets the following applicability criteria:

• Project baseline activities include unplanned deforestation as a result of agricultural activities and livestock, according to the latest version of VCS AFOLU Requirements.

• Project activities include forest protection controlled and selective logging, in accordance with the description of the scope of "D" of the methodology used (details see page 12, Table 1 and Figure 2b document VCS VM0015)

• The project area has different types of forests, especially old growth forests that are consistent with the definition of "forest".

• The project area includes only areas classified as "forest" for a minimum of 10 years before the project start date.

• Forest types found in the project area do not include rainforests in swampy areas ("forested wetlands") or common forested areas in peatlands ("peatswamp forests").

3.1.3 Project Boundary

VM0015, Step 1.1 – Project spatial limits

The Reference Region presented in Figure 25, and project area, leakage belt and leakage management areas in Figure 26, and detailed information on the Reference Region and these boundaries are presented

in the sequel. All project spatial limit files are available for the auditing process, as well as some intermediary products. Below is presented the step-by-step procedure to define each of the project's spatial boundaries.

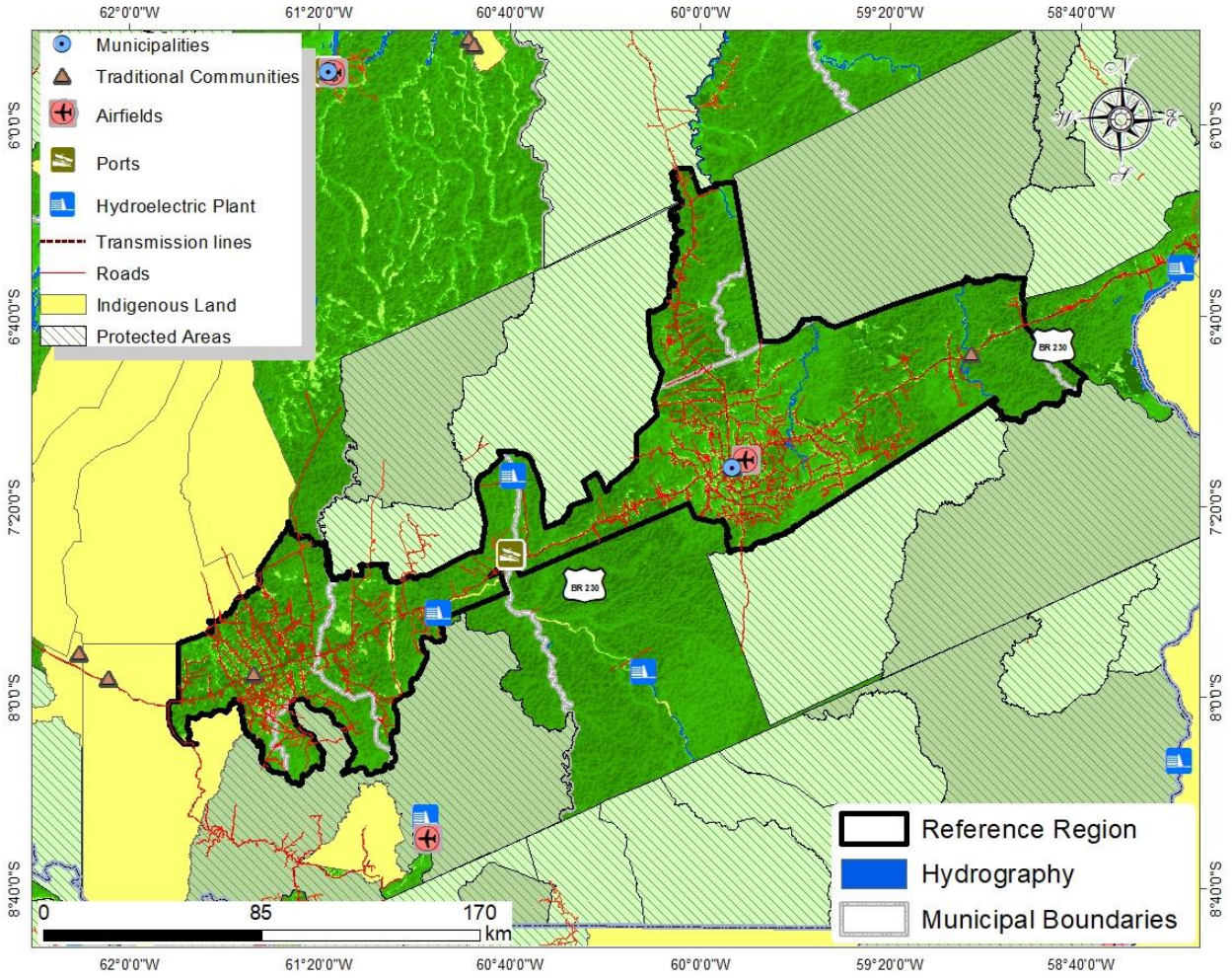

Figure 25. Reference region, infrastructure and protected areas.

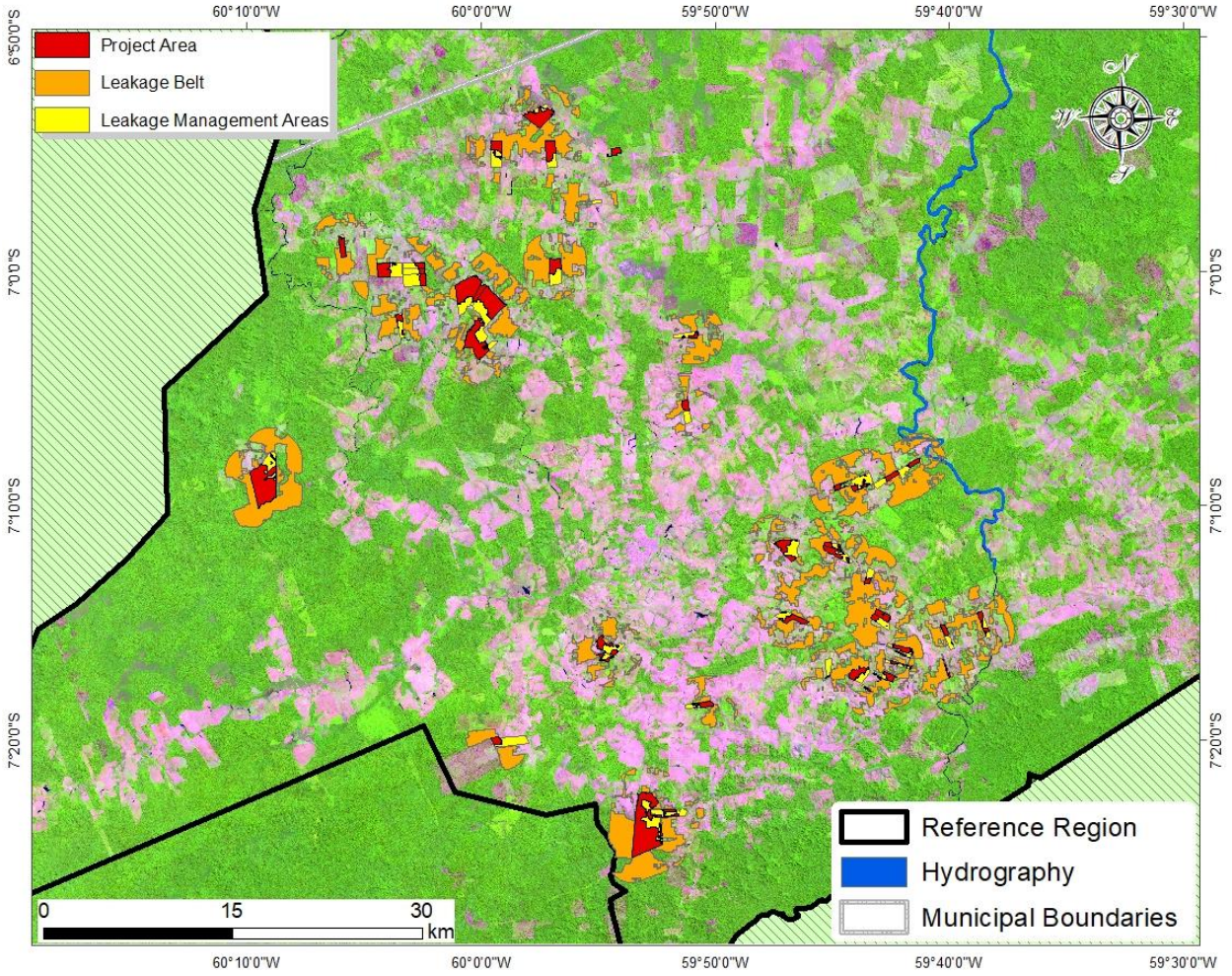

Figure 26. Project Area, Leakage Belt and Leakage Management Areas.

Reference Region

The Reference Region encompasses areas under influence of the Transamazon Highway (BR-230) in the Amazonas State in the municipalities of Apuí, Manicoré and Novo Aripuanã. This region has been under intense agricultural conversion over the last decade. The highway section in Amazonas was completed in 1974, and since then, large areas of public lands have been allocated to conservation as well as to agricultural production. Federal and State governments have allocated a considerable portion to Indigenous Lands, and Conservation Units, but also created rural settlements for agricultural purposes (Figure 11). The PA Rio Juma, PA Matupi, and PA Acari have functioned as economic nodes that attracted farmers and capital to explore agriculture at the forest's expenses within and around them (Carrero, 2022). As a result, Apuí, Novo Aripuanã, and Manicoré were the 6th, 12th and 22nd most deforested municipalities between 2016 and 2021 in the Brazilian Amazon, respectively (INPE, 2022).

The Reference Region has recently been the focus of many infrastructure and agricultural projects, and many people chose to invest in agricultural development there. Under the auspices of IIRSA Latin American integration, the annual renovations on the Transamazon highway in the last decade, have facilitated enormously the influx of migrants. Relatively lower land prices and untapped forest and mining resources have stimulated public and private investments in land acquisition and land change in the region.

Specifically, the region was nationally recognized as free of foot-and-mouth disease with vaccination in 2017 (MAPA, 2017) and internationally without vaccination in 2021 (Rodrigues, 2021). The herd, once confined within the state, can now not only reach national but global markets, whether by providing beef or calves to be fattened in other states (Carrero et al., 2020). This has undoubtedly stimulated the deforestation sector, generating a speculation surge in the region to control land as a factor of production (Carrero 2022).

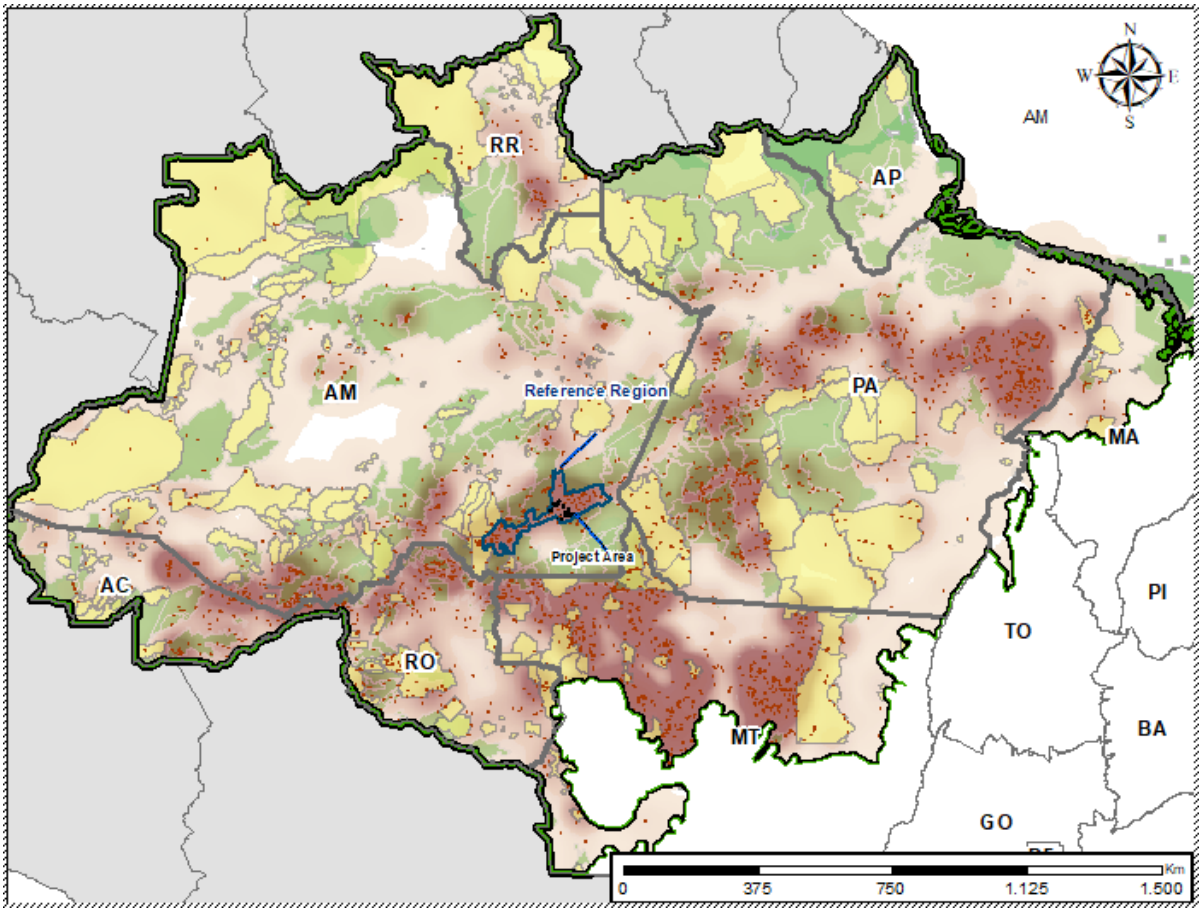

Figure 27. Location of the Reference Region in relation to deforestation pressure and fire events. Yellow are Indigenous lands, and light green Protected Areas.

The reference region encompasses rural settlement areas and undesignated public lands, excluding legally protected areas such as Conservation Units, Indigenous Territories, or other protected land tenure categories (Figure 11). The rationale for this outline is due to the following. First, a geographic region where the agents, drivers and underlying causes of deforestation are similar, with same likelihood of deforestation. This region is under the influence of the Transmazon Highway and is not within protected areas or indigenous territories. It is under high deforestation pressure due to low land prices when compared to other regions in the Biome. Second, a geographic region where the project proponent delimited to expand the supply of agroforestry coffee is actively engaging with rural landowners to expand this grouped project area over the first ten years of the project. Idesam has been working in Apuí since 2007 and started the Agroforestry Coffee initiative in 2012. During 2014 and 2016, Idesam expanded its reach in the region by providing technical assistance to +500 family farmers in the three municipalities in areas within the RR from

2014 to 2016, including the implementation of coffee agroforestry properties in Matupi Village, in Manicoré, 220km to west of Apuí town.

Apuí, the town that emerged from the Rio Juma Settlement Project (PA Rio Juma) and the largest of the three. It has a total population of 22,000 people, a GDP per capita of 9,037 BRL (IBGE, 2022a), a cattle herd of 140,000 animals, with 8,000 cows producing milk (IBGE, 2019). Manicoré municipality has 55,750 people and a GDP per capita of 9,065 BRL (IBGE, 2022a). The area in RR, the Matupi district, is located south of Manicoré town on the margin of the Madeira River. Matupi, commonly known as "Village of Km-180" (referring to the distance by road from Humaitá), borders the PA Matupi created in 1994, and hosts 12,000 people, 115,000 cattle heads, and 7,500 dairy cows (IBGE, 2022a). Novo Aripuanã's total population is 26,443 people, a GDP per capita of 8,263 BRL, and the area within the RR is under the influence of the PA Acari, created in 1992, and have economic and social ties with Apuí municipality, bordering PA Rio Juma. A considerable portion of recent deforestation in Novo Aripuanã can be attributed to the expansion of cattle ranching in the Matupi district.

The Reference Region encompasses an area of 1,987,4.33 ha, around 280 times larger than the project zone of the first project activity instances (PAIs #1 to 42), with a total area of 6,723 ha. The project zone is planned to increase at least ten-fold during the first 10 years of the project within the Reference Region, which will sum up to 67,230ha. Thus, the Reference Region will be 29.6 times bigger than the Project Zone. Considering the project area would be 62% of the area of the project zone (according to the remaining forest in RR), the Project Area is estimated to be 41,682ha, and thus, the RR is 47 times larger than the estimated PA.

The project land dynamics is mainly deforestation guided by relatively low land prices driving agricultural expansion dominated by cattle ranching, to attend national and global demands. Thus, the following criteria set on pages 18 and 19 of VM0015 v1.1 are summarized below:

- Agents and causes of deforestation: As explained in detail later in this section (Step 3 of VM0015 v1.1) the agents mapped were grouped as follows: Group 1- small and medium landholders focused on agricultural production; Group 2 - traditional communities and families with communal land rights usufruct; Group 3 – Large ranchers and illegal agents involved in unplanned deforestation.

- Infrastructure drivers: There is no direct infrastructure drivers beside the built roads. However, the plans for building two hydroelectric dams planned for the Aripuanã River and two for its tributary, Roosevelt River (Table 17), three of which are within the RR, would result attract thousands of people to the region, workers and service providers who could invest in land acquisition and change, increasing future deforestation (EPE, 2012). Nevertheless, there is no information on when the construction of these hydroelectric plants will start, so we decided not to consider them as drivers in the baseline scenario.

Table 16. Planned and Inventoried Dams affecting the Reference Region

Dam name	River	Status	State	capacity (MW)
Inferninho	Roosevelt	Inventoried	Amazonas	361.1
Sumaúma	Aripuanã	Planned	Amazonas	458.2
Cachoeira Galinha	Roosevelt	Inventoried	Amazonas	399.8
Prainha	Aripuanã	Planned	Amazonas	796.4

- Landscape configuration and ecological conditions: 100% of the Project Area has the same vegetation classes found throughout the Reference Region; 100% of the Project area is within the range of elevation of the Reference Region; 100% of the slope of the Project area is within the slope

variation of the reference region; The project area has an annual average rainfall of 2645mm, within the same rainfall range of more than 90% of the reference region, as shown in Table 18.

Table 17. Spatial Landscape attributes and ecological conditions in RR and AP

Vegetation Class	Reference Region	Project Area
Floresta Ombrófila Aberta Aluvial com palmeiras	Yes	No
Floresta Ombrófila Aberta Submontana com cipós	Yes	No
Floresta Ombrófila Aberta Submontana com palmeiras	Yes	Yes
Floresta Ombrófila Densa Aluvial	Yes	No
Floresta Ombrófila Densa Aluvial com dossel emergente	Yes	No
Floresta Ombrófila Densa Aluvial com dossel uniforme	Yes	Yes
Floresta Ombrófila Densa das Terras Baixas com dossel emergente	Yes	No
Floresta Ombrófila Densa Submontana com dossel emergente	Yes	Yes
Floresta Ombrófila Densa Submontana com dossel uniforme	Yes	No
Formação Pioneira com influência fluvial e/ou lacustre arbustiva com palmeiras	Yes	No
Formação Pioneira com influência fluvial e/ou lacustre arbustiva sem palmeiras	Yes	No
Formação Pioneira com influência fluvial e/ou lacustre herbácea	Yes	No
Savana Arborizada	Yes	No
Savana Florestada	Yes	No
Savana Parque	Yes	Yes
Elevation Range (meters)	25 to 280	67 to 263
Average Slope (degrees)	1 to 78	1 to 46
Average Annual Rainfall 2013-2021 (mm)	2513	2645

Table 19 shows that the main vegetation classes in that Ombrophyllous Dense and Open Forests cover 90% of the Reference Region, whereas these forest classes cover 99.7% of the Project Area, therefore meeting the requirement.

Table 18. Area and percentage per main original vegetation class within the Project Area and the Reference Region

Main Vegetation Class	Reference Region			Project Area		
	Area (ha)	% Area	% Cumulative	Area (ha)	% Area	% Cumulative
Ombrophyllous Dense Forest	1,343,339	68%	68%	2,775.99	74.9%	74.9%
Ombrophyllous Open Forest	441,257	22%	90%	919.82	24.8%	99.7%
Savanna	21,109	1%	91%	11.00	0.3%	100.0%
Contact Forest/Savanna	148,085	7%	98%	0.00	0%	100.0%
Pioneer formation	22,364	1%	99%	0.00	0%	100.0%

As shown in Table 20 for slope, 89.69% of the project area within slope classified as flat to undulating, whereas this slope range is 95.05% of the Reference Region.

Table 19. Area and percentage per slope class within the Project Area and the Reference Region

Slope %	Project Area			Reference Region		
	Area (ha)	Area (%)	% Cumulative	Area (ha)	Area (%)	% Cumulative
Flat (0 to 3%)	87.48	4.10%	4.10%	331,940.52	17.49%	17.49%
Gently undulating (3 to 8%)	953.19	28.87%	32.97%	839,802.24	44.26%	61.75%
Undulating (8 to 20%)	2,158.96	56.72%	89.69%	631,790.55	33.30%	95.05%
Strongly undulating (20 to 45%)	423.78	10.30%	100.00%	93,635.91	4.93%	99.98%
Mountainous (45 to 75%)	0.19	0.00%	100.00%	362.16	0.02%	100.00%
Steep (>75%)	0.00	0.00%	100.00%	0.09	0.00%	100.00%

For the elevation, the project area has 96.9% of its area between 60 and 230 meters of elevation, whereas the Reference Region as 97.0% of its area between this same range, as shown in Table 21, therefore meeting the requirement.

Table 20. Area and percentage per Elevation classes within the Project Area and the Reference Region

Elevation (m)	Project Area			Reference Region		
	Area (ha)	Area (%)	% Cumulative	Area (ha)	Area (%)	% Cumulative
0-30	0.0	0.0%	0.0%	1,049.3	0.055%	0.1%
30-60	0.0	0.0%	0.0%	48,439.0	2.552%	2.6%
60-90	84.9	2.3%	2.3%	293,286.2	15.453%	18.1%
90-110	187.7	5.2%	7.5%	492,180.6	25.933%	44.0%
110-140	980.3	27.0%	34.6%	458,647.3	24.166%	68.2%
140-170	1,181.4	32.6%	67.2%	289,297.4	15.243%	83.4%
170-200	681.2	18.8%	86.0%	233,169.1	12.286%	95.7%
200-230	396.6	10.9%	96.9%	74,976.1	3.951%	99.6%
230-260	111.6	3.1%	100.0%	6,765.7	0.356%	100.0%
>260	0.6	0.0%	100.0%	62.6	0.003%	100.0%

- Socio-economic and cultural conditions: All legal status of the land and land tenure within the project area are privately owned, land possessions within official settlements and non-designated public lands that can be granted a land title (according to section 2.5.2), which are the same status found throughout the Reference Region and excludes Protected Areas or Indigenous Lands. Land use is also the same, mostly covered by pasturelands, native forests, and secondary forests, all enforced by the same laws and regulations.

Project Area

The REDD+ CAA Project Area's Project Activity Instances #1-42 (PAI#1-42) encompass an area of 3,707.2 ha of forest under the control of 42 small and medium landholders, as shown in Table 22. The PA boundaries are the existing forests of the 6,723.1 ha of household farms in the project start year. The spatial

boundaries of the farms were taken from the documentation provided by the landowners and coordinates from official documentation that includes CAR registries, farm lot parcels outline from INCRA, and from SIGEF. For some case, boundaries were validated by collecting ground control points using GPS devices (See Annex - List of Project Area Coordinates (PAI#1 - 42) for a list of coordinates for the PA #1-42). The project area was obtained from the forests within these landholdings, according to the following:

1. The Forest 2022 class from PRODES within the farm lots was clipped using the' clip' tool.
2. A visual check on the boundaries was made using the Planet mosaic basemap of August 2022. Forest polygon boundaries were manually adjusted to remove any part of a polygon that was not visually interpreted as covered by forest at a scale of 1:50,000. This reduced the total area of Forest 2022 from PRODES product.
3. We visually check for overlap between deforestation polygons dated as 2022 from DETER dataset with deforestation polygons data as 2022 from PRODES dataset (until August of 2022). We then checked in DETER attribute table the data of the satellite image used. If the image date was after 1 March 2022 (Project Start Date), the polygon within the Project Activity Instance (Property Boundaries) was reclassified to forest class and added to the Project Area. Following this procedure, 30.48 ha was calculated to be deforested between 1 March 2022 and 31 August 2022.

Table 21. Project Area divided by Project Activity Instances (PAI)

PAI #	Code	Area (ha)	PAI #	Code	Area (ha)
1	cadastro_04	31.84	22	cadastro_75	27.08
2	cadastro_05	24.22	23	cadastro_76	57.17
3	cadastro_06	34.25	24	cadastro_78	5.09
4	cadastro_08	50.30	25	cadastro_80	23.70
5	cadastro_14	75.79	26	cadastro_81	55.11
6	cadastro_19	49.79	27	cadastro_82	4.42
7	cadastro_21	62.98	28	cadastro_84	88.61
8	cadastro_28	66.72	29	cadastro_85	47.31
9	cadastro_29	63.40	30	cadastro_90	19.53
10	cadastro_31	43.19	31	cadastro_92	16.00
11	cadastro_53	267.48	32	cadastro_95	63.84
12	cadastro_54	106.81	33	cadastro_96	20.83
13	cadastro_56	40.61	34	cadastro_97	23.40
14	cadastro_58	274.22	35	cadastro_99	476.45
15	cadastro_59	262.80	36	cadastro_100	38.26
16	cadastro_61	176.77	37	cadastro_102	99.18
17	cadastro_64	47.12	38	cadastro_103	58.99
18	cadastro_67	4.53	39	cadastro_104	3.78
19	cadastro_71	8.13	40	cadastro_105	40.32
20	cadastro_72	99.11	41	cadastro_106	677.63
21	cadastro_74	38.01	42	cadastro_107	32.42
				Total	**3707.2**

Leakage Belt

For defining the leakage belt, we first assessed Mapbiomas land cover Collection 07 to obtain the percentage of land cover of the area deforested between 2013 and 2021, or 90% of the historical reference period (Mapbiomas doesn't have a land cover map for 2022). Results show that within the area deforested calculated from PRODES data for this period, 83% of the pixels were classified as pasture in 2021, and 16% were classified as forest cover, reflecting that these areas had second forest regrowth cover. Even though more than 80% of deforested areas were classified as pasture, one cannot assume the main

motivation for forest clearing is generating profits from cattle ranching. Several regional studies pointed out that cattle ranching is not the main motivation behind pasture formation. Instead, this motivation is related to land speculation, with pasture formation being the way landowners validate their claims (Carrero and Fearnside 2011, Carrero et al., 2020, 2022). For instance, Carrero and Feanrside (2011) found that 30% of the studied landowners in Apuí that had pasture in their farms declared no profit from it. Their rationale is to work for other farmers or in non-rural jobs as a source of income to invest in ranching, with the expectation that the land value will increase, the actual profit they are aimed at. Additionally, Carrero et al. (2014) estimated the profitability of a cattle ranching system in Apuí, and found that the Net Present Value of the activity is negative when not considering the valorization of land prices. For those reasons, we considered Option I (Opportunity Cost Analysis) not applicable and applied Option II – Mobility Analysis.

The project area is very small (3,707 ha) and it is not likely that the project activities would generate a leakage larger than its total area. The landholders in the project will increase income from payment for ecosystem services and from agroforestry coffee. They could invest such profits in buying other lands surrounding their properties to perform deforestation, potentially displacing deforestation. The project area is within a region with a mosaic of private landholdings, and even though those areas are accessible to project participants, they are unlikely to deforest such areas unless they purchase them from current owners. Another way of displacement would be by potential buyers of the Project Area's lands. Entering the project means participants wouldn't sell their lands to others who would deforest, but others could then purchase other landholdings and displace deforestation. For delineating the Leakage belt, we consider that potential buyers would choose areas according to location, and these locations would be closer the project area.

The first criterium adopted for defining the leakage belt was a distance buffer distance of 2km from the Project Areas. Although it seems to be a very small distance, we defined it as the minimum distance suggested to create the leakage belt, as per the first draft of the proposed consolidated REDD+ methodologies being designed by VERRA. A second criterium was to use all areas with a probability of >=50% to be deforested during the first project accreditation period (2023-2032). Thus, all pixels with probability >=0.5 in the deforestation risk maps (probability maps) of 2023 and 2032 were considered (union product of all pixels =>0.5 in these two maps). The Leakage belt is defined as the intersection of the 2km buffer with the forest pixels with probability >=0.5 of being deforested between and 2023 and 2032, as shown in Figure 28. The total area of the leakage belt is 22,179.3 ha, which will be monitored from 2023 until the end of the project. All datasets are made available for the auditing process.

Leakage Management Areas

These areas will be the mosaic of anthropogenic vegetation part of the PAIs controlled by the landowners participating in the project, as shown in Figure 29. It totals an area of 3,016.15ha, and the break per PAI is shown in Table 23.

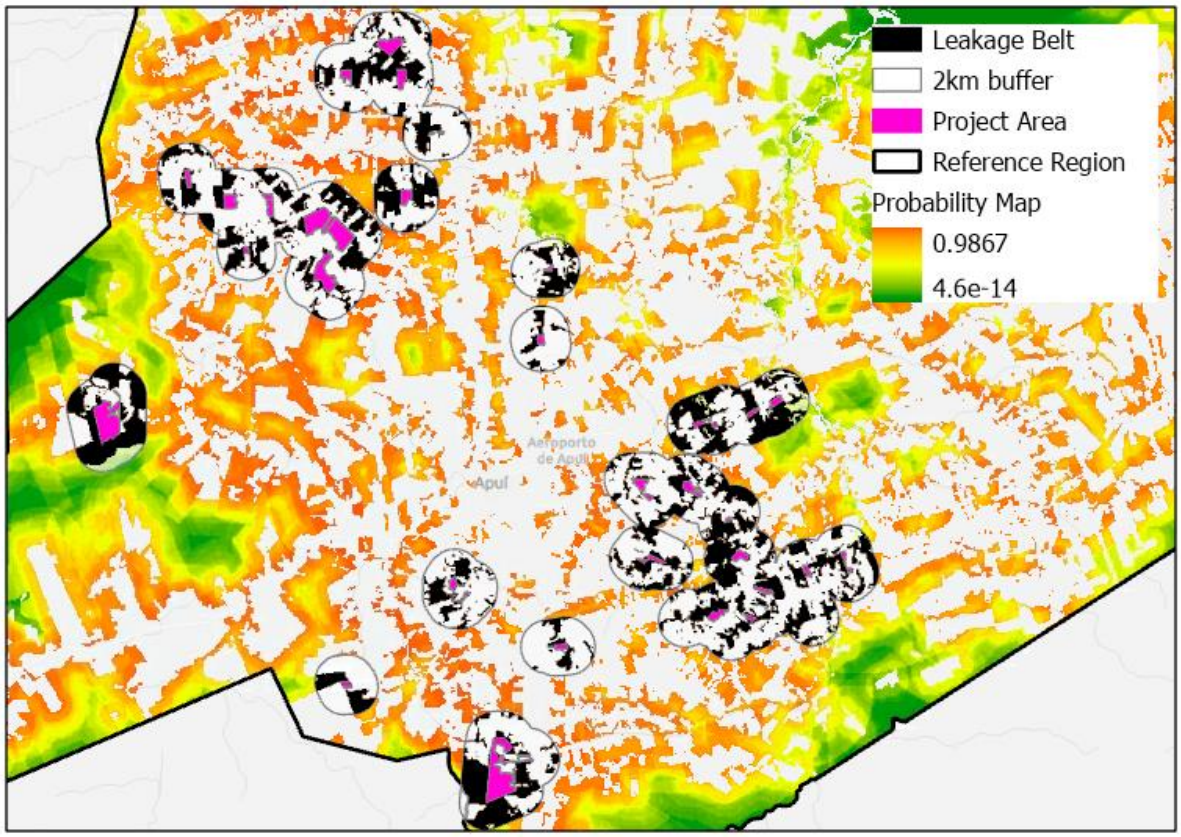

Figure 28. Leakage belt and layers used to define it.

Table 22. Leakage Management Areas per Project Activity Instance (PAI)

PAI #	Code	Area (ha)	PAI #	Code	Area (ha)
1	cadastro_04	47.31	22	cadastro_75	32.67
2	cadastro_05	46.33	23	cadastro_76	13.68
3	cadastro_06	16.42	24	cadastro_78	8.76
4	cadastro_08	15.43	25	cadastro_80	57.54
5	cadastro_14	57.36	26	cadastro_81	66.23
6	cadastro_19	110.76	27	cadastro_82	55.32
7	cadastro_21	109.25	28	cadastro_84	98.83
8	cadastro_28	55.03	29	cadastro_85	33.61
9	cadastro_29	63.29	30	cadastro_90	32.41
10	cadastro_31	20.99	31	cadastro_92	37.57
11	cadastro_53	144.91	32	cadastro_95	101.39
12	cadastro_54	115.45	33	cadastro_96	29.82
13	cadastro_56	54.85	34	cadastro_97	54.64
14	cadastro_58	100.81	35	cadastro_99	124.82
15	cadastro_59	133.12	36	cadastro_100	50.03
16	cadastro_61	72.48	37	cadastro_102	116.29
17	cadastro_64	12.92	38	cadastro_103	146.20
18	cadastro_67	29.19	39	cadastro_104	15.96
19	cadastro_71	43.15	40	cadastro_105	44.77
20	cadastro_72	61.21	41	cadastro_106	311.97
21	cadastro_74	124.51	42	cadastro_107	148.88
				Total	**3016.15**

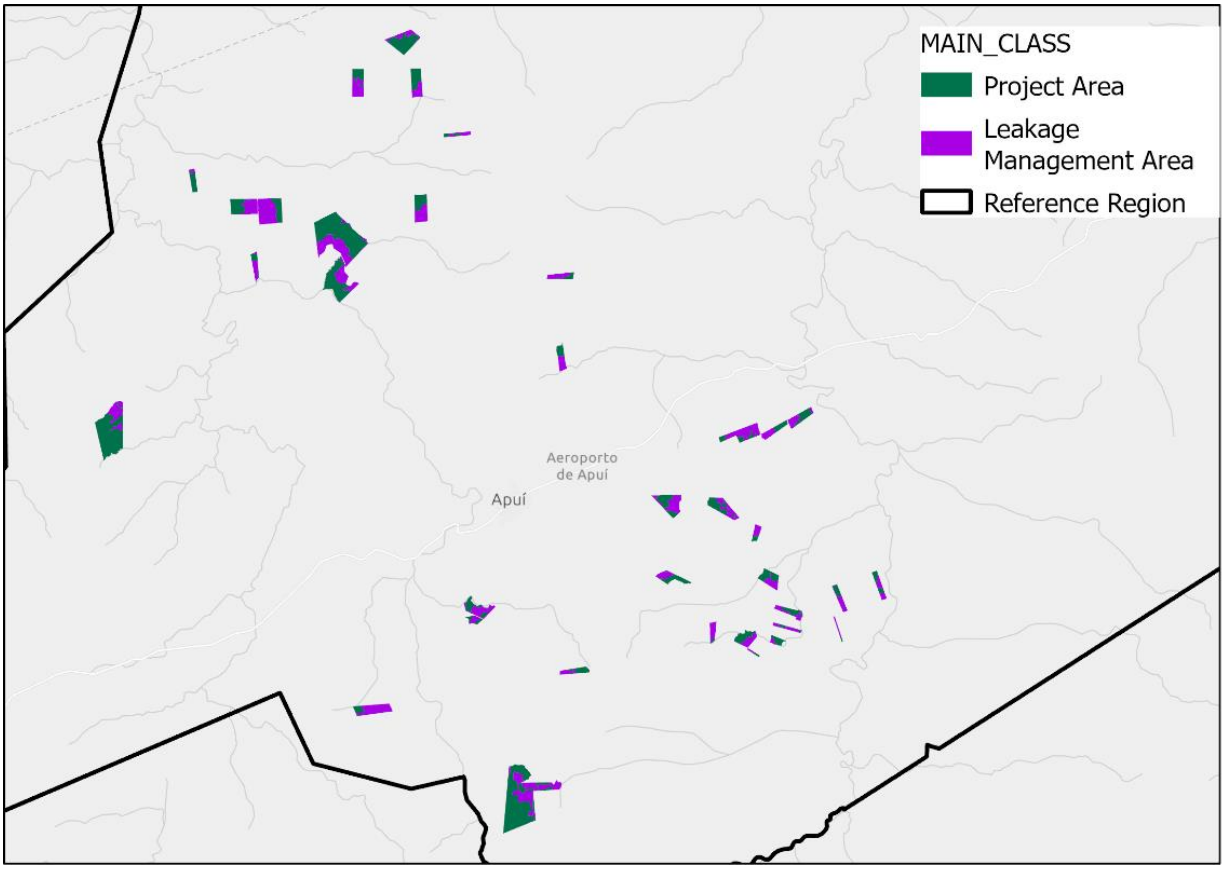

Figure 29. Leakage Management Areas and respective Project Areas for each Project Activity Instance (PAI).

GHG sources, sinks and reservoirs in the Baseline Scenario

This project only considers aboveground, below ground and dead wood biomass pools (Table 24), using the estimates of Brazil's fourth National Communication to the UNFCCC (Brazil Ministry of Science, Technology and Innovations, 2021). It excludes all GHG emissions from biomass burning and livestock emissions (Table 25).

Table 23. Carbon pools included or excluded within the boundary of the proposed AUD project activity (VM0015 v1.1, table 3)

Carbon Pools	Included/ Excluded	Justification/ Explanation of choice
Above-ground	Tree: Included	Carbon stock change in this pool is always significant
	No Tree: Excluded	Final class of land cover is not perennial, thus reservoir is excluded.
Below-ground	Included	Reservoir is significative as it represents over 5% of total emissions
Dead wood	Included	Considered significant in relation to total emissions.

Harvested wood products	Excluded	Not included, as it was not significant, as for item 3.4
Litter	Excluded	Not to be measured, according to VCS Program Update of XXX
Soil Organic Carbon	Excluded	Not to be measured when forests are not converted to pastures and perennial crop, according to VCS Program Update of XXX

Table 24. Sources and GHG included or excluded within the boundary of the proposed AUD project activity (VM0015 v1.1 Table 4)

Sources	Gas	Included/TBD[1]/ excluded	Justification / Explanation of choice
Biomass burning	CO_2	Excluded	Counted as carbon stock change
	CH_4	Excluded	Not a significant source (<5%), according to the revised document LULUCF IPCC GL 1996.
	N_2O	Excluded	Considered insignificant according to VCS Program Update of May 24th, 2010
Livestock emissions	CO_2	Excluded	Not a significant source
	CH_4	Excluded	Not a significant source
	N_2O	Excluded	Not a significant source

3.1.4 Baseline Scenario

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

Collection of appropriate data source

Data from PRODES were used for mapping land use and cover classes, available in vector format (shapefile) in the Terrabrasilis platform (http://terrabrasilis.dpi.inpe.br). Taken from the tabular data of the shapefiles, 66 satellite images were used to create PRODES maps with classes of forest, deforestation, hydrography, and non-forest natural vegetation. The images cover the historical reference period (2013 to 2022) and correspond to the following five path/row of the Landsat satellite: 229/65, 230/65, 230/64, 231/65, and 231/66 (Table 26).

Table 25. Data used for historical LU/LC change analysis (VM0015 v1.1 Table 5).

Vector (Satellite)	Sensor	Resolution		Coverage	Acquisition date	Scene or point identifier	
		Spatial	Spectral (micrometers)	(km^2)	(DD/MM/YY)	Path / Latitude	Row / Longitude
Landsat	OLI	30	0.43-2.29	34255	7/12/13	230	64
Landsat	OLI	30	0.43-2.29	34255	8/4/13	231	65
Landsat	OLI	30	0.43-2.29	34255	8/4/13	231	66
Landsat	OLI	30	0.43-2.29	34255	8/6/13	229	65
Landsat	OLI	30	0.43-2.29	34255	8/29/13	230	65
Landsat	OLI	30	0.43-2.29	34255	8/9/14	229	65
Landsat	OLI	30	0.43-2.29	34255	8/16/14	230	64
Landsat	OLI	30	0.43-2.29	34255	8/16/14	230	65
Landsat	OLI	30	0.43-2.29	34255	8/23/14	231	65

Landsat	OLI	30	0.43-2.29	34255	8/23/14	231	66
Landsat	OLI	30	0.43-2.29	34255	7/25/15	231	65
Landsat	OLI	30	0.43-2.29	34255	7/25/15	231	66
Landsat	OLI	30	0.43-2.29	34255	8/3/15	229	65
Landsat	OLI	30	0.43-2.29	34255	8/3/15	230	64
Landsat	OLI	30	0.43-2.29	34255	8/3/15	230	65
Landsat	OLI	30	0.43-2.29	34255	8/12/15	229	65
Landsat	OLI	30	0.43-2.29	34255	8/12/15	230	65
Landsat	OLI	30	0.43-2.29	34255	9/4/15	230	65
Landsat	OLI	30	0.43-2.29	34255	9/11/15	231	65
Landsat	OLI	30	0.43-2.29	34255	9/11/15	231	66
Landsat	OLI	30	0.43-2.29	34255	11/14/15	231	65
Landsat	OLI	30	0.43-2.29	34255	11/14/15	231	66
Landsat	OLI	30	0.43-2.29	34255	2/11/16	230	65
Landsat	OLI	30	0.43-2.29	34255	7/20/16	230	65
Landsat	OLI	30	0.43-2.29	34255	7/27/16	231	65
Landsat	OLI	30	0.43-2.29	34255	7/27/16	231	66
Landsat	OLI	30	0.43-2.29	34255	7/29/16	229	65
Landsat	OLI	30	0.43-2.29	34255	9/22/16	230	64
Landsat	OLI	30	0.43-2.29	34255	7/16/17	229	65
Landsat	OLI	30	0.43-2.29	34255	7/23/17	230	64
Landsat	OLI	30	0.43-2.29	34255	7/23/17	230	65
Landsat	OLI	30	0.43-2.29	34255	7/30/17	231	65
Landsat	OLI	30	0.43-2.29	34255	7/30/17	231	66
Landsat	OLI	30	0.43-2.29	34255	7/17/18	231	65
Landsat	OLI	30	0.43-2.29	34255	7/17/18	231	66
Landsat	OLI	30	0.43-2.29	34255	7/19/18	229	65
Landsat	OLI	30	0.43-2.29	34255	7/26/18	230	64
Landsat	OLI	30	0.43-2.29	34255	7/26/18	230	65
Landsat	OLI	30	0.43-2.29	34255	7/22/19	229	65
Landsat	OLI	30	0.43-2.29	34255	7/29/19	230	65
Landsat	OLI	30	0.43-2.29	34255	8/5/19	231	65
Landsat	OLI	30	0.43-2.29	34255	8/5/19	231	66
Landsat	OLI	30	0.43-2.29	34255	8/14/19	230	64
Landsat	OLI	30	0.43-2.29	34255	8/14/19	230	65
Landsat	OLI	30	0.43-2.29	34255	7/24/20	229	65
Landsat	OLI	30	0.43-2.29	34255	7/31/20	230	64
Landsat	OLI	30	0.43-2.29	34255	7/31/20	230	65
Landsat	OLI	30	0.43-2.29	34255	8/7/20	231	65
Landsat	OLI	30	0.43-2.29	34255	8/7/20	231	66
Landsat	OLI	30	0.43-2.29	34255	7/2/21	230	64
Landsat	OLI	30	0.43-2.29	34255	7/2/21	230	65
Landsat	OLI	30	0.43-2.29	34255	7/2/21	231	65
Landsat	OLI	30	0.43-2.29	34255	7/25/21	231	65
Landsat	OLI	30	0.43-2.29	34255	7/25/21	231	66
Landsat	OLI	30	0.43-2.29	34255	8/10/21	231	66
Landsat	OLI	30	0.43-2.29	34255	8/12/21	229	65
Landsat	OLI	30	0.43-2.29	34255	8/12/21	230	65
Landsat	OLI	30	0.43-2.29	34255	8/19/21	230	64
Landsat	OLI	30	0.43-2.29	34255	8/23/22	229	65
Landsat	OLI	30	0.43-2.29	34255	8/30/22	230	64
Landsat	OLI	30	0.43-2.29	34255	8/6/22	230	65
Landsat	OLI	30	0.43-2.29	34255	8/22/22	230	65
Landsat	OLI	30	0.43-2.29	34255	8/23/22	230	65
Landsat	OLI	30	0.43-2.29	34255	8/21/22	231	65
Landsat	OLI	30	0.43-2.29	34255	8/29/22	231	65
Landsat	OLI	30	0.43-2.29	34255	8/21/22	231	66

We assessed PRODES classification accuracy for the Benchmark Map of 2022 using images from the Planet Constellation. As all images used by PRODES in 2022 were from August. Thus, we used monthly mosaics (Basemaps) for the months of July and August 2022 for which was not possible to find specific details and whose guidelines for use are available at https://www.planet.com/ and https://www.planet.com/nicfi/.

Definition of land-use and land-cover classes

The definition of land cover and land use classes are shown in Table 27 below.

- **Forest**: area of ombrophyllous forest remnants at the beginning of the historical reference period (2013)
- **Anthropogenic vegetation mosaic:** deforested areas covered by a mosaic of vegetation of anthropogenic use, including pastures, crops and secondary forest regrowth.
- Hydrography: water bodies (rivers, lakes, dikes, etc.)
- **Non-forest natural vegetation:** non forest natural vegetation of grass and shrublands know, especially those ones known as *campinas*.

Table 26. Land use and land cover classes existing at the project start date within the reference region (VM0015 v.1.1 Table 6)

Class Identifier		Trend in Carbon stock	Presence in[1]	Baseline activity[2]			Description
ID_{cl}	Name			LG	FW	CP	
1	Forest	Constant	PA, LK, RR	Yes	No	No	Remaining Native Forests
2	Anthropogenic vegetation mosaic	Constant	RR, LMA	Yes	No	No	Post-deforestation vegetation mosaic (pasturelands, secondary forest, and crops).
3	Hydrography	Constant	LMA, LK	No	No	No	Water bodies, rivers, lakes, dikes
4	Non-forest natural vegetation	Constant	RR, LMA	No	No	No	Non-forest natural vegetation cover

[1]RR: Reference Region; PA: Project Area; LK Leakage Belt; LM Leakage Management Areas

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

Definition of categories of land-use and land-cover change (2.3 VM0015).

The project has two categories of land use and change that is expected to take place within the project area and the leakage belt (change of areas with forest to areas with anthropic vegetation mosaic), as shown in Table 28.

Table 27. Land-use and land-cover change categories (VM0015 v1.1, table 7b).

Idct	Name	Trend in Carbon stock	Presence in [1]	Activity in the baseline case [2]			Name	Trend in Carbon stock	Presence in	Activity in the project case		
				LG	FW	CP				LG	FW	CP

Icl1 to Fcl1	Forest	Constant	PA	No	No	No	Anthropic vegetation mosaic	Constant	RR, LM	No	No	No
Icl1 to Fcl1	Forest	Constant	LK	Yes	No	No	Anthropic vegetation mosaic	Constant	RR, LM	No	No	No

Analysis of historical land use and land cover change (VM0015 Step 2.4)

Deforestation mapping data provided by PRODES were used to analyze the history of land use change. The main methodological steps conducted by PRODES to map deforestation in the Brazilian Amazon are as follows:

Preprocessing: according to Câmara et al. (2006) the main images preprocessing procedures carried out by PRODES consist of selection images with less cloud incidence, with the acquisition date closest to the dry season in the Amazon, and with proper radiometric quality; georeferencing of the images with a spatial resolution of 30 meters with topographic maps at 1: 100,000, and NASA orthorectified images in MrSID format.

Interpretation and classification: the satellite image classification method used by PRODES follows four main steps. First, it generates a spectral mixture model identifying the images' vegetation components, soil, and shade. This technique, known as spectral linear mixture models (LMM), estimates the percentage of vegetation, soil, and shade components for each pixel in the image. The second step is the application of the segmentation technique, which identifies, in the satellite image, spatially adjacent regions (segments) with similar spectral characteristics. After segmentation, the classification of segments takes place individually to identify the forest, nonforest vegetation, hydrography, and deforestation (anthropic vegetation) classes. Finally, the result of the classified segmentation is subjected to the editing process, or classification audit, performed by a specialist.

Post-processing: The data generated in the PRODES classification were used integrally for the post-processing stage. For this analysis, we used the forest remaining in the year 2022 (representing August 2022) and the annual deforestation from 2013 to 2022, as described in the data collection stage. All analyses were carried out using Geographic Information System (GIS), and the results of the classification and subsequent analyses conducted by the project were submitted to the audit process. The results of the post-processing step are shown in Figure 30 and Table 29.

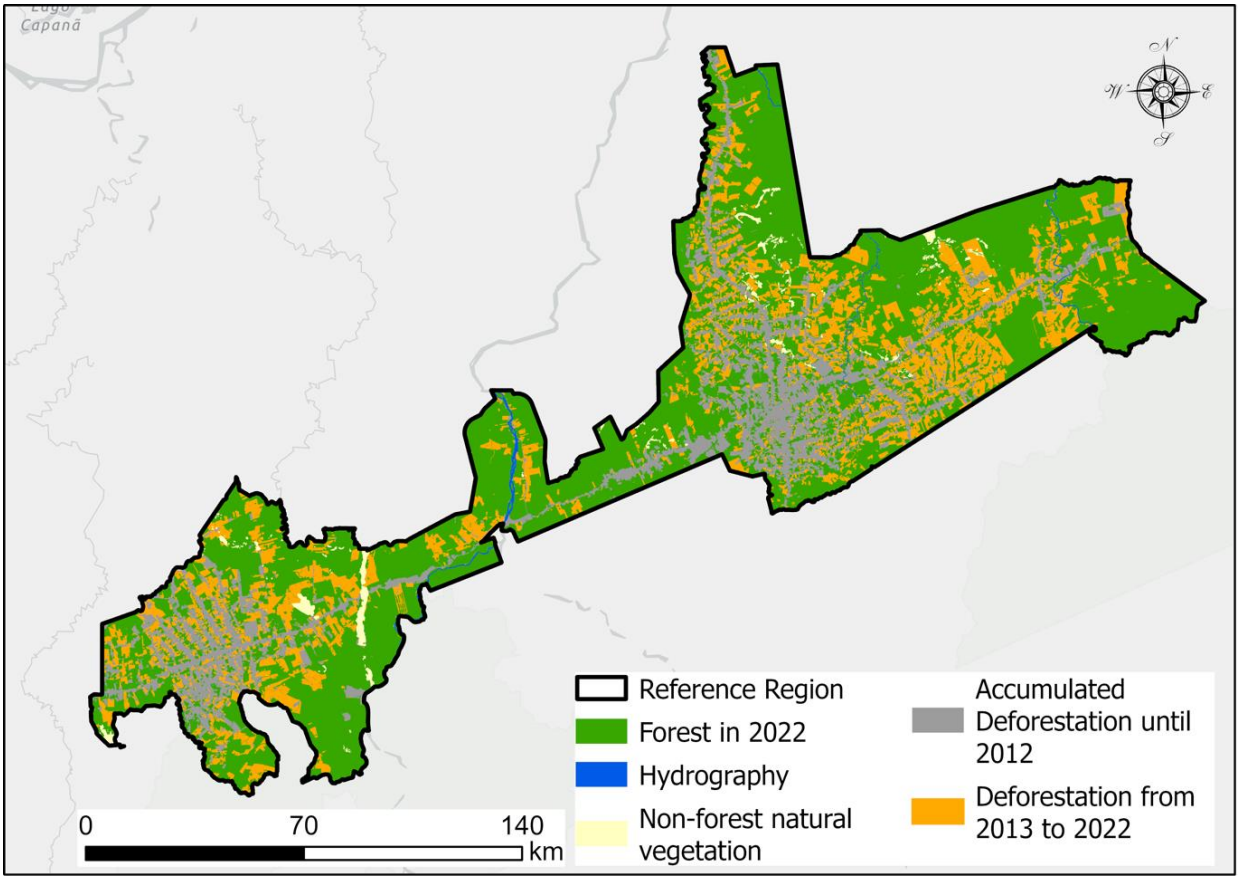

Figure 30. Land Use and Land Cover Change Map of the Reference Region. Source: PRODES 2022

Table 28. Deforestation and Forest area in the Reference Region during the Historical Reference Period.

Year	Deforestation (ha)	Forest (ha)	Deforestation rate (%)
1988 to 2013	307,426		
2013	14,813	1,623,494	0.9%
2014	12,404	1,611,090	0.8%
2015	21,305	1,589,785	1.3%
2016	35,378	1,554,406	2.2%
2017	34,510	1,519,896	2.2%
2018	34,442	1,485,454	2.3%
2019	52,125	1,433,330	3.5%
2020	40,822	1,392,508	2.8%
2021	53,997	1,338,511	3.9%
2022	111,298	1,227,213	8.3%

Map accuracy assessment

Maurano et al. (2019) assessed the PRODES classification's accuracy and found that global accuracy was 93%. Nevertheless, we performed an assessment of PRODES classification of 2022 aggregated map using a set of 1350 random points distributed throughout the reference region. We used monthly mosaic base-

maps from the Planet Constellation for the months of July and August 2022 (presented above), which present low or zero cloud cover. Through visual interpretation done at a scale of 1:25,000, two analysts independently checked the PRODES classes against Planet imagery, which has a 3-meter spatial resolution. The confusion matrix of the accuracy assessment is presented in Table 30. The overall accuracy of the mapping for the different classes of land use and cover showed values closer to or greater than 90%. The overall accuracy of the forest cover reference map was 96.2%.

Table 29. Confusion Matrix for the classification of 2022 Land Cover Map

		Reference (validation)				Total	User accuracy (UA)
	Class	Forest	Anthropic Vegetation mosaic	Non-forest Vegetation	Hydrography		
		1	2	3	4		
Classified Map	1	**840**	15	3	1	859	0.978
	2	27	**430**	2	0	459	0.937
	3	1	1	**21**	0	23	0.913
	4	1	0	0	**8**	9	0.889
Total		869	446	26	9	**1350**	
Producer accuracy (PA)		0.967	0.964	0.808	0.889	**Global Accuracy**	**0.962**

Annual deforestation rates were taken from PRODES yearly deforestation shapefile, based on the images listed in Table 26. These rates correspond to the conversion of Forest to Anthropic Vegetation mosaic.

Table 30. Land-use and land-cover change matrix in the Reference Region between 2013 and 2022 (Hectares) (Table 7a. Methodology VM0015)

		Initial LU/LC class (2013)				Final Area
		Forest	Anthropic vegetation mosaic	Hydrography	Non-forest natural vegetation	
Final LU/LC class (2022)	Forest	1,227,213				1,227,213
	Anthropic vegetation mosaic	411,094	307,426			718,520
	Hydrography			13,929		13,929
	Non-forest natural vegetation				27,772	27,772
Initial Area		1,638,307	307,426	13,929	27,772	1,987,433
Net Change		-411,094	411,094	0	0	0

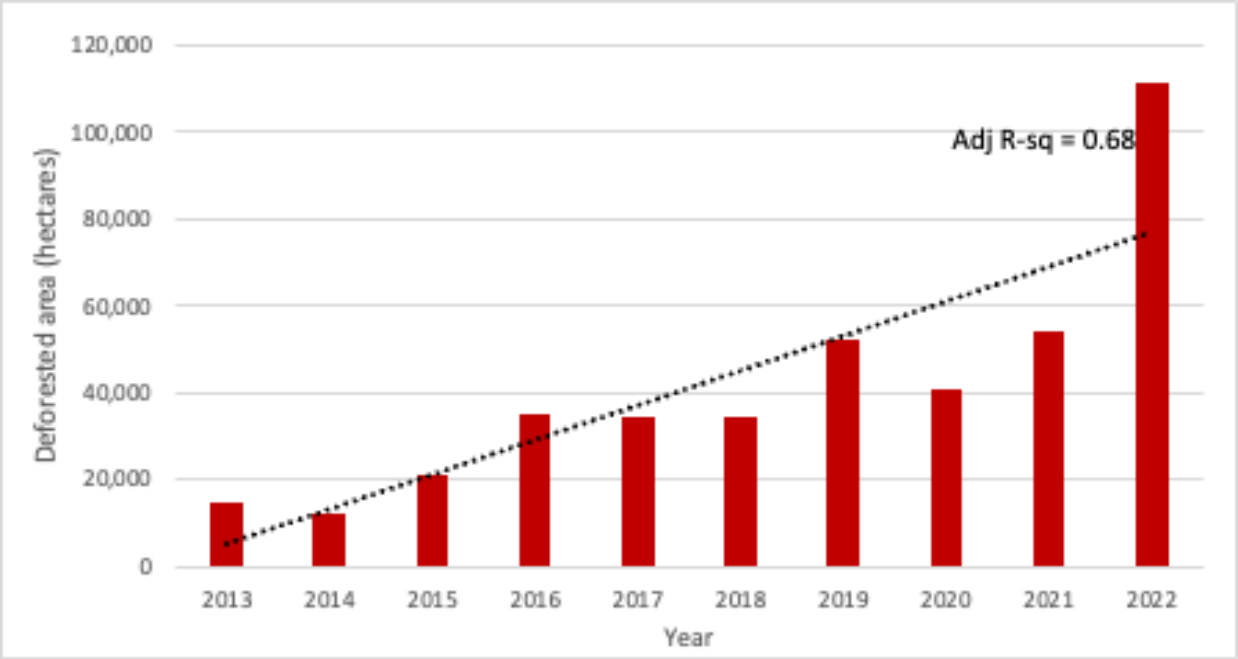

Figure 31. Historical deforestation in the Reference Region (Source: PRODES 2022).

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

Identification of Agents of Deforestation (3.1)

This section is based on the empirical and technical knowledge Idesam and Amazônia Agroflorestal staff have gained since they started working in the region in 2007 and is supported by technical and scientific evidence. The narrative here combines various sources, especially those more recent references that are specific to the reference region dynamics (*i.e.*, Carrero and Fearnside, 2011, Carrero et al., 2020, 2022, Carrero 2022, Galuch 2019, Galuch and Menezes, 2020; Silva 2012, Yanai et al. 2020, 2022).

a) Agent groups

The main agent groups of deforestation are:

Group 1 – traditional communities and families with communal land rights usufruct.

Group 2 - squatters, small and medium landholders focused on agricultural production.

Group 3 - Large ranchers and other actors engaged in speculative unplanned large deforestation.

b) Brief Description:

Group 1 – Traditional communities that live from subsistence agriculture and non-timber forest products (such as Brazil nuts, Copaiba oil, and fishing). They open very small patches of forest to produce subsistence crops (i.e., cassava, bananas, pumpkins, rice, beans), and their livelihoods are based on selling NTFPs and eventually agricultural surplus, especially flour traditionally made from cassava.

Group 2 – are small and medium farmers and ranchers (up to 2500ha) that migrated to the region since the road opened in 1974. They have been investing labor and resources into creating agricultural lands on forest lands as a main source of income, reproducing their cultural identity. These could be either

landowners that sold their lands elsewhere and are investing in lands to expand their operations, or by landless rural youth households that are seeking to acquire lands for the first time (Carrero 2022, Yanai et al. 2020, Silva, 2012). They invest mainly in forest clearing for cattle ranching but can also have a mixed production that includes annual and perennial crops.

Group 3 – these are largeholders that mainly invest in cattle ranching, sometimes with selective logging. They have been purchasing small farms that sill have forests and can perform forest clearing to scale up their operations, consolidating small and medium landholdings into large ones (> 2500ha). They have resources to invest in the acquisition of large ranches, with rapid and large clearings to establish pastures. This group also involves players involved in illegal activities that lead to direct deforestation. They are land grabbers and illegal loggers who invest in land speculation and pasture formation as a form of laundering money from illicit activities (Carrero 2022, Escada et al., 2005; Fearnside, 2008; Federal Police, 2019; Geffray et al., 2002; MPF - Ministério Público Federal, 2019). Some of them may control public lands (expelling squatters, traditional communities, and small farmers, by force or forced purchase), forge land documents in a process called *Grilagem*, or the "legalization" of public lands through forged documents, bribery, and outright violence (Ipam 2006). Although land grabbers can be considered mainly as an underlying cause associated with the land market, some have enough capital to be direct agents, first causing forest degradation with illegal logging, opening roads and trails to explore timber, and then, clearcutting forests, and sowing pastures (Carrero 2022).

c- Brief Assessment of the most likely development of the population size:

The trend in the three municipalities in Reference Region and in the Project Area is similar and is mostly represented by Group 2, which comprises almost all the rural population in the Reference Region, and all in the Project Area. The agricultural survey done in 2017 results show that 4,697 surveyed farms are under 2500ha (Small and medium landholders), which is 99% of the entire number of ranches surveyed (IBGE 2022). The trend is a steady total population growth of around 2.2% per year during 2010 to 2021, from 86,475 to 106,587 people (IBGE, 2022) in the three municipalities. Rural population in 2010 accounted for 48% of total population. Rural population trends, as of Brazil as a whole, are expected to decrease, as urban population grows, driven by land concentration performed by group 3.

Group 1 – traditional communities inhabit riverine areas and settlement projects in the Reference Region and Project Area. They are few families whose population size is small and not growing more than the natural birth rates. If their livelihoods are not supported, they can be expelled from their areas (away from the Reference Region) by Group 3 agents, that would perform deforestation to form ranches.

Group 2 – Small and medium landholders came to the region to thrive in agricultural production as an economic opportunity, reproducing their farming culture. Attracted by government plans for colonizing the Amazon, and then for lower land prices compared to other regions aided by infrastructure and economic development of the region, especially after the turn of the millennium (Carrero et al., 2020, 2022). This group is expected to be constant. Although some smallholders are expected to be displaced by the purchase of large ranches to more remote regions, some new families arrive and might acquire new subdivisions of lands of other farmers. Besides familiar labor and income from agricultural activity, they invest and finance activities with income from rural jobs provided to other farmers. There are also landholders that live in the towns in the Reference Region and have income from other sectors (Carrero, 2022).

Group 3 – Research has shown that large ranchers are increasingly having an impact on deforestation in the reference region (Carrero et al. 2022a, Yanai et al. 2022). Due to land concentration dynamics, the likelihood is that they increase in the reference region and in the PA in the baseline scenario without the

project, or that medium holders become large, expelling small and medium holders, as well as traditional communities further away into the forest edge and outside of the reference region. In more remote regions at the edge and surrounding the Reference Region, the illegal loggers and land grabbers are likely to continue operating as long as land prices are lower (compared to other regions), there are trees to be harvested, and current governmental administration keep surveillance and persecution at the same levels experienced in the historical reference period (Carrero et al. 2022a; Vale et al. 2021).

d) Statistics on historical deforestation attributable to each main group.

Group 1 agents rely on economic activities related to forest resource extraction more than agriculture, but also plant subsistence crops that use slash-and-burn technics in usually less than 2ha/year. Group 2 agents can be subdivided into two groups: smallholders, who possess up to 400ha and would have the means to deforest from 1ha up to 60ha.yr in their operations; and medium landholders, who control from over 400ha to 2500ha and would be able to perform deforestation that could go up to 400ha in a single year. Any deforestation larger than 400ha could be attributed to large landholders (Group 3).

Based on the PRODES dataset divided into classes of size of deforestation performed, Table 32 presents the deforestation from 2013 to 2022 divided by classes of size of polygon, that is, the area that was deforested in the period. Although it is impossible to determine exactly what part is attributable to each group, 80% of deforestation happened in polygons less than 400ha, deemed to be Groups 1 and 2, and represented 99% of all polygons, whereas 20.4% of it was in polygons over 400ha and only 1% of the number of deforestation polygons, attributed to Group 3.

Figure 32 shows the evolution of deforestation in the Reference Region, divided into the three classes (0-60ha.yr; 60-400ha.yr; >400ha.yr). The relative area deforested through the historical reference period analyzed has increased for all classes. However, for smallholders (<60ha.yr) the increase is not as marked for the last two years as it is for medium and large holders. This trend illustrates the process of land speculation and accumulation depicted in the literature (i.e., Carrero et al. 2020, 2022a; 2022b, Yanai et al. 2022).

Table 31. Deforestation in the Reference Region from 2013 to 2022 divided by class of polygon size.

Class of size	Number of polygons	Percentage of polygons	Average area (ha)	Total area (ha)	Percentage of area (ha)
0-60ha	10,550	86.4%	17.1	181,087.7	38.6%
60-400ha	1,532	12.5%	116.2	192,767.9	41.0%
>400ha	126	1.0%	661.1	95,830.5	20.4%
Total	12,208	100.0%	236.5	469,686.0	100.0%

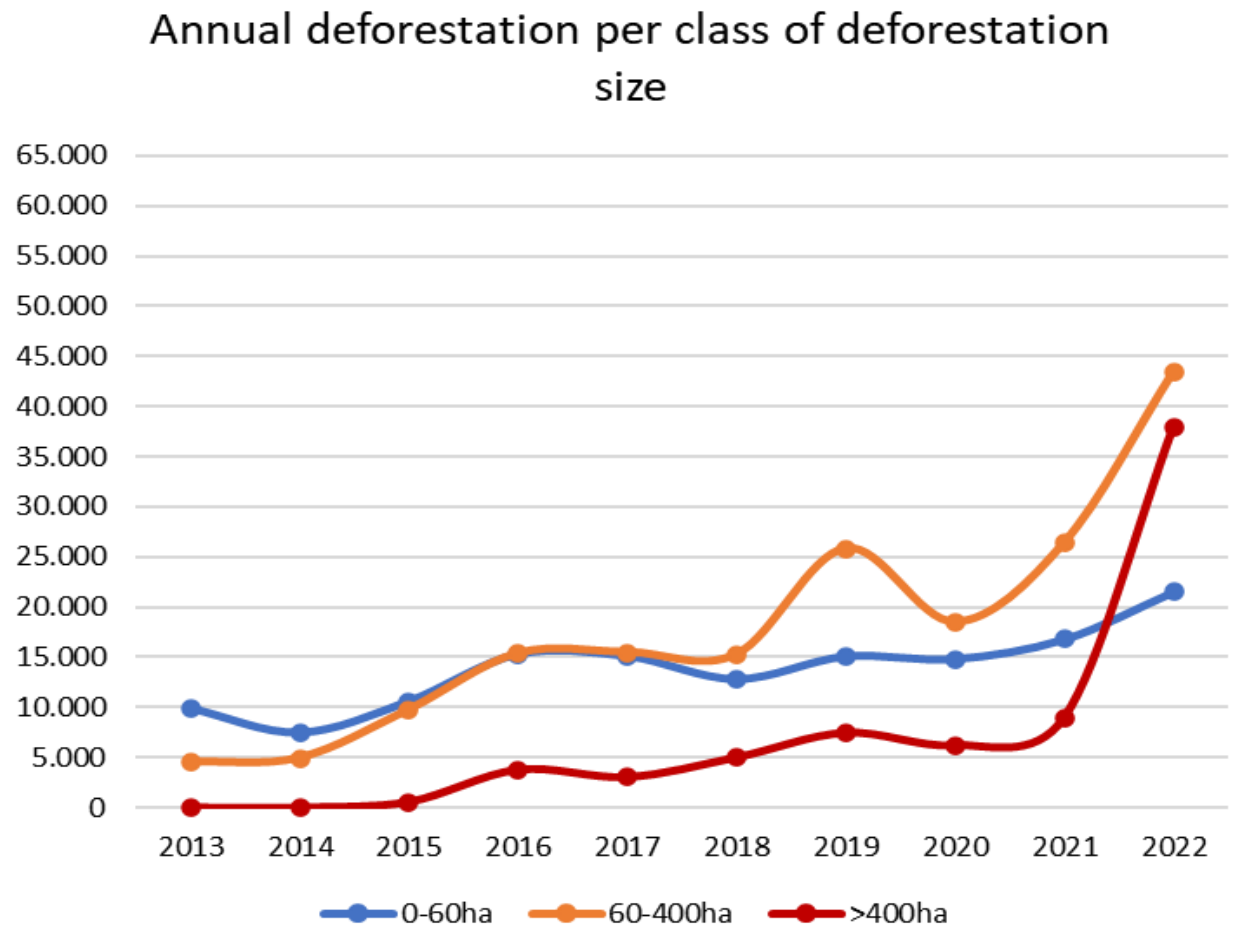

Figure 32. Annual deforestation in the Reference Region classified by area of clearing (polygon size). Source: INPE (2022) (http://www.terrabrasilis.dpi.inpe.br/app/dashboard/deforestation)

Identification of the Deforestation Drivers (3.2)

a) Driver variables for the quantity of deforestation

Although the reference regions can be considered a developing economy, with imperfect markets, what drives deforestation is the profit maximization of its agents. Thus, two main deforestation drivers are causing its intensification in the last decade.

1. Low forested land prices and undesignated public lands

2. Growing cattle economy

Low forested land prices

1. Brief Description - The comparative advantage regarding agricultural production in the Amazonas state as contrasted to other Amazonian states becomes evident by comparing land prices. In 2012, land prices in other Amazonian states were 3.5 to 11.4 times higher than in Amazonas (Table 33). The high price wedge reflects that these regions are better connected to domestic and international markets by highways, waterways, and ports, and therefore, have attracted more people to farm there. The extreme price

differential developed during the first millennial decade when land prices decreased in Amazonas as they increased in most of the other Amazonian States and continued to increase (Gasques & Bastos, 2008). Southern Amazonas prospects for development has attracted many people who chose to invest in agricultural development there, flooding the region with newcomers looking for cheap land, who arrive with capital to perform rapid deforestation (Carrero 2022). The other aspect is that the region's land tenure allocation has left undesignated public lands that have been fueling land markets there, also the target of land speculators and ranchers (Carrero et al. 2022a).

Table 32. Land prices in Brazilian currency (R$) per hectare in Amazonian states in 2012. Source: Nascimento (2012).

State	Land Price (R$/ha)	Price Proportions relative to Amazonas State
Amazonas	$356.00	---
Pará	$1,607.00	4.5
Rondônia	$3,630.00	10.2
Mato Grosso	$4,052.00	11.4
Acre	$1,260.00	3.5

2. **Impacts on agent's behavior.** Low land prices impact groups 2 and 3 to perform larger and faster forest clearing with the expectation of increased revenues. Several studies have reported the influx of peoples with enough capital to settle and expand deforestation in the region with the expectation that market prices and infrastructure will raise, therefore, generating great profit prospects (Carrero and Fearnside, 2011; Carrero et al., 2020; Carrero 2022; Galuch and Menezes, 2020; Silva, 2012). The newcomers from other regions acquire more extensive tracts of land at cheaper prices and perform rapid farm consolidation, especially groups 2 and 3. They come to the region for developing cattle ranching, and purchase landholdings or occupy public lands with considerable forest cover and invest in deforestation. Carrero (2022) found that 71% of the interviewed newcomers that migrated to Southern Amazonas after 2008 did so to acquire more extensive landholdings, and 29% to have their lands finally. 76% of them invested in forest clearing and pasture formation. By the same token, the availability of public lands open for grab has consolidated a land speculation market that has attracted powerful agents (Group 3) to conduct legal and illegal operations (Azevedo-Ramos et al. 2020; Alencar et al. 2021, Carrero et al. 2022a, 2022b). In this scenario, group 1 communal lands are also target of these group 3, and land invasions and potential expelling of communities are being reported for southern Amazonas (Carrero 2022).

3. Likely future development. From the field surveys and research in the region, land prices are increasing, as well as the availability of public lands for agricultural development is reducing and conflicts are raising, as example of other regions that developed before such as the Pará State (Carrero 2022). Nevertheless, the prospect for deforestation is to continuously increase, as the enhancements in infrastructure and stimulus for agricultural development (discussed in the underlying causes section) still keep agents actively engaged in deforestation, as profit margins remain higher than other regions that have already consolidated infrastructure and markets (Carrero et al. 2022a). Agent groups 2 and 3, especially those bringing external capital to the region, are the ones that will sustain higher deforestation rates, as there is still 63% of forest left in the Reference Region. Likewise, Group 2 agents will continue to be pressured to leave their lands or sell them, if the current scenario continues.

4. Measures to be implemented. The opportunity to sell landholdings of Group 2 project participants is related to the low-income perspectives of the related to the cattle ranching economy, especially for the smallholders, when compared to the increasing land prices. Thus, the project will support them with developing the agroforestry coffee supply chain as a strategy to increase income from sustainable production (support agroforestry implementation, technical assistance, sales and marketing), therefore reducing the need to open more forests to expand pasture areas or to sell their landholding to more capitalized agents. Furthermore, the project will support social organization, health and education, thus increasing the well-being of participants, which would, in turn, reduce the likelihood of them selling their landholdings. The small and medium holder agents of Group 2 are farmers and want to keep doing it as it is their identity. Nevertheless, they need more economic incentives, and their remaining forests don't generate income. Thus, the project will also implement a scheme of payment for environmental services related to the area of forest conserved, in which the avoided deforestation will generate extra income for the families. For group 1 agents, besides the support of NTFP supply chains and the payment for conserving forests, it will support them in a surveillance strategy to keep their areas protected from encroachment. Thus, the project activities will offer and strengthen alternatives to increase income generation to reduce the selling of landholdings to agents that would perform deforestation.

Growing cattle economy

1. Brief description: At the turn of the millennium, Amazon went through a process of supply chain globalization (Nepstad et al., 2006; Pacheco & Pocchard-Chapuis, 2012; Walker et al., 2009a, 2009b). This phase has transformed the region's economic model. Instead of only capturing land rents to supply domestic consumption, the region also became part of the global markets since 2017, with exports soaring. Beef prices have been increasing since, and have stimulating the fast growth cattle ranching in Southern Amazonas (see underlying causes section), with growing demand markets. Around 81 to 89% of total area deforested was covered by pastures in the Reference Region between 2012 and 2021, as the Figure 33 shows.

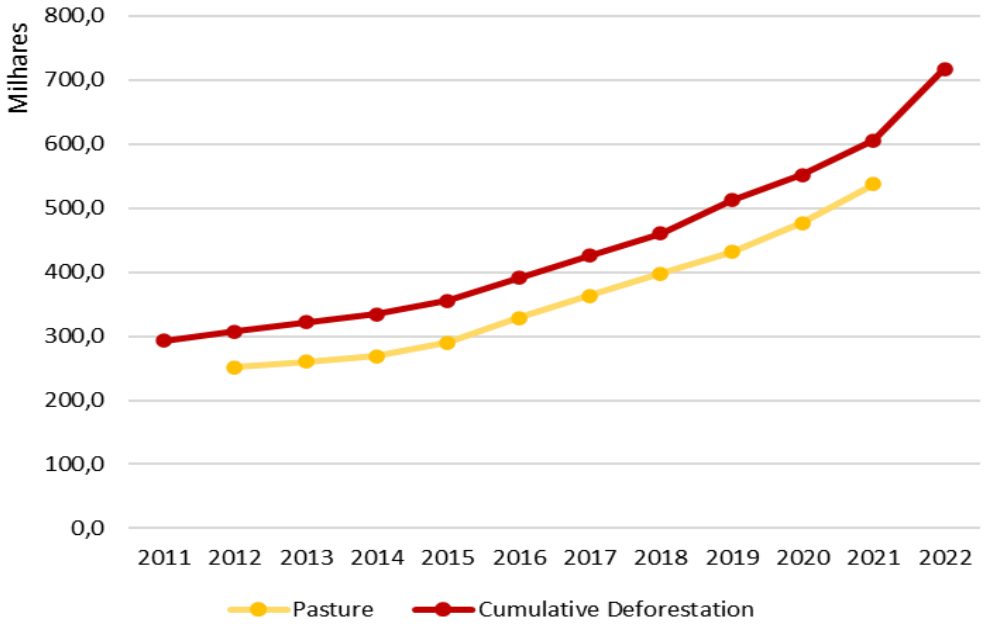

Figure 33. Cumulative deforestation and pasture area in the Reference Region. Source: Pasture area (Mapbiomas Collection 7. Land cover); Deforestation (Prodes- Inpe: Terrabrasilis platform)

The cattle economy has been facing higher levels of competition and diversity within a local agricultural supply chain, influencing local prices, information flows, and pooled market labor. The cattle herd in Southern Amazonas has grown from 100,000 heads in 1990 to over 700,000 heads in 2012 (IBGE, 2019), of which Apuí and Manicoré are top 2 and 3 state beef producers (Carrero et al. 2015), with primary economic activity in the RR being cattle ranching. Together, these two municipalities host a herd of 255,000 animals, being 16,000 dairy cows (IBGE, 2019). Although many animals are still slaughtered outside the RR, two slaughterhouses are found in Matupi district of Manicoré, one in construction and the other already built but awaiting its operation license. Each one will have the capacity to slaughter 300 animals per day. Two dairy facilities operate in Apuí and Matupi Village, with a combined capacity of 140,000 liters daily, stimulating the growth of dairy cattle (Carrero 2022). The combination of increasing land prices with support for cattle ranching economy has stimulated landholders to invest in ranching with the expectation to increase their assets, expecting to liquidate and amass profits in the future.

2. Impacts on agents' behavior: The cattle economy impacts agent's decisions. They see that the sector is thriving in the region, with retailers supplying material, research and assistance, and available buyers. Beef cattle also provides liquidity in the event of need, as animals can be sold at any time. Furthermore, ranching has a cultural status that many value in the region. Thus, the dominant behavior in the region is to expand pasturelands, as the easiest and more structured economic activity in the region, even if it does not generate profits for the farmer in the near term. This is mainly what groups 2 and 3 are part of it. However, group 2 agents, especially smallholders, also are keen to produce agricultural crops, and keep livelihoods based on other cultural values. Still, the dominating cattle economy makes it more challenging, on top of the inherent difficulties of the agricultural supply chains when compared to the cattle. Such challenges involve higher labor inputs and perishable products that must be transported to consumer markets. If not giving extra incentives, group 2 agents abandon food crops and dedicate solely to ranching (Carrero and Fearnside, 2011, Silva, 2012), which would keep deforestation rates high in a scenario of low carrying capacity, varying from 0.75 to 1.1 heads per hectare (Carrero et al. 2015). Also, group 2 agents also act as a source of demand for calves produced by group 3 agents, further stimulating the sector's growth.

3. Likely future development: the increase in deforestation in the region has been documented and deforestation rates have been on the rise since 2012 (Carrero and Fearnside 2011, Carrero et al. 2020, Yanai et al. 2012, 2020, 2022), due to the arriving of newcomers, the land turnover, with more capitalized agents of group 2 acquiring lands with forest, and deforesting to expand activities. Also, group 3 has exerted an amplification of deforestation by controlling public forest lands and clearing them for cattle ranching. In this scenario, the cattle economy will rise. As per economic of scales, intensification would contribute to increasing deforestation in the coming years, as national and global demand for beef drives it (Carrero et al. 2022a), with land and agricultural policies incentivizing deforestation (Trancoso 2021), even if profitability for farmers is questionable.

4. Measures to be implemented: while it is hard to avoid the impact of such rationale that fuels deforestation, the project will provide alternative sources of income that will be complementary to the ranching returns of landowners that have ownership rights over the PA and LM. Besides investing in coffee agroforestry supply chains and the PES payments for forest conservation, other activities developed by Idesam and Amazônia Agroflorestal include environmental education and fostering rotational and silvipastoral systems, which have successful pilots implemented in the region, two to three times more productive than conventional monoculture systems but faces financial and cultural barriers to scaling up operations (Carrero et al. 2014a; Da Silva and Carrero, 2018, Ermgassen et al. 2018). The continuous production of saplings from native tree species of ecological and economic interest (Carrero et al. 2014b)

to be planted in the agroforest areas will provide additional benefits for ecosystem resilience as well as the economy of forest restoration and silvipastoral production in the region (Da Silva and Carrero, 2018).

b) Drivers for the location

Driver variables explaining the location of deforestation used are as follows:

1. Distance to roads (Euclidian distance in meters)
2. Distance to previous deforestation (Euclidian distance in meters)
3. Distance to main rivers (Euclidian distance in meters)
4. Slope (degrees)
5. Type of soil (according to Brazilian soil classification)
6. Type of vegetation (according to Brazilian vegetation classification)
7. Settlement areas (Official settlement areas)
8. Landholding category sizes (according to size of properties registered in SIGEF and CAR registries).

All figures and details are explained in the section 4.2.2 of VM0015 v.1.1, below.

Identification of the underlying causes of deforestation (Step 3.3.)

The main underlying causes of deforestation are ubiquitous to the Amazon frontiers, and it is exacerbated by recent changes.

- Land policy
- Development policies
- Environmental law non-compliance and low surveillance

1.Brief description: Land policies in Brazil, and particularly in the Amazon, have allowed the occupation of public land that is not designated to specific use. The Amazon has been the stage of public land appropriation that is allowed by law, if it is productive (Reydon, Fernandes & Telles, 2015, Carrero et al. 2022a). Lack of land titling has been a major factor affecting the RR compared to other regions. PA Rio Juma in Apuí, reveals rapid lot turnover where 18% of properties possessed land title in 2018, and 77% have exchanged hands at least once (Carrero & Fearnside, 2011). Development policies have stimulated the colonization of the Amazon region, building a road network to occupy the and purse agricultural expansion (Hecht 1985). The rationale is to conquer wilderness to create a production economy that is based on the natural resources extraction. Although Southern Amazonas' development lagged behind other Amazonian regions, in the last decade, many policies and programs have been favoring the cattle economy to boom in this once remote region that has been now integrated to the Arc of Deforestation (Carrero et al. 2020, 2022a). Southern Amazonas was nationally recognized as free of foot-and-mouth disease with vaccination in 2017 (MAPA, 2017) and internationally without vaccination in 2021 (Rodrigues, 2021). The herd, once confined within the state, can now not only reach national but global markets, whether by providing beef or calves to be fattened in other states. This development discourse of migrants from south Brazil creating national wealth and thriving from agricultural production in the forest frontier is shared by many. In this rationale, a rancher has a high social status, as they are contributing to the nation. This discourse has been on the raise since 2019 when the ultra-right President Bolsonaro has been publicly incentivizing this discourse, including in areas allocated to conservation. Environmental policies and low

compliance and surveillance have always been underlying issues in Brazil. Landowners in the Amazon should protect 80% of its natural forest cover. However, the new Forest Code (Law 12.651 of 2012) pardoned deforestation made before 2008 for many. This pardon was due the fact that landowners seldom keep 80% of their areas under native vegetation (Sparovek et al. 2012, Soares-Filho et al., 2014). Furthermore, the self-declaration of the Rural Environmental Registry (CAR), a legal instrument for environmental monitoring, has been used as a land-grabbing instrument by registering illegal holdings and claiming (Klingler & Mack, 2020; Santos & Galeão, 2018, Alencar et al. 2021). Lastly, the environmental surveillance has never been sufficient to control deforestation, has been severely reduced along with the dismantling of environmental regulations and agencies since Bolsonaro's took power (Ferrante and Fearnside, 2019, Vale et al. 2021). All of these have favored impunity and accelerated deforestation.

2. Likely future development: According to land laws, it is allowed to appropriate public lands, if productive use is demonstrated. Thus, agents of Group 2 and 3 should clear as much forest as they can to demonstrate productive use to ensure land ownership in the future. Several recent land law changes have stimulated land appropriation followed by deforestation (Reydon, Fernandes & Telles, 2020, Fearnside 2021, Carrero et al. 2022a, 2022b). These law changes have granted amnesty to illegal land claims, which are "grandfathered in" (Carrero et al. 2022a). Although these legal maneuvers were publicized as helping peasants obtain land titles, elites exploited them effectively to accumulate vast tracts of public land (Campbell, 2015; Torres, Doblas & Alarcon, 2017). This trend will be hard to reverse, as it took several years and changes in many laws to allow for it. Development policies will likely continue to be a major driver of deforestation in the region. The state's participation in accelerating agricultural development in the Reference Region took another proportion with the launching of the AMACRO project, referring to the acronyms of the states of Amazonas, Acre, and Roraima. This project was idealized in 2019 by influent farmers of Acre State to create an agribusiness pole encompassing 32 counties (466,000km^2) on the triple-frontier of these three states, proposed to be a new development front (Wenzel & Sá, 2020b). AMACRO legitimates the agribusiness encroachment from Acre and Rondônia into southern Amazonas lands (Carvalho, 2021). With many families relying on subsistence agriculture and extractivism living for decades on lands, land conflicts have soared in recent years, affecting mostly group 1 and 2 agents suffering from land encroachment from group 3 agents (CPT, 2017; Carvalho, 2021; Carrero, 2022). Environmental law and surveillance setbacks with the dismantling of the agencies that started since 2019, when President Bolsonaro took office, will likely be reverted in the coming years with Lula government. The current president took office on January 1st 2023, and has been already reverting some setbacks. For instance, Provisory Measure 1154 of 2023 plus 31 Decree Laws that detail how each Ministry will support Environmental policy to a transversal agenda in his government[12]. Lula nominated Rodrigo Agostinho as the President of the Brazilian Environmental Agency IBAMA, who promised to reduce deforestation by half in 2023. The plans for IBAMA is almost double the personnel by hiring more agents, and will count also with funds from the Amazon Fund, IDB, and GEF funds, which reestablished relations with the Agency[13]. Thus, although land laws and cattle economy prospects are likely not changing in the coming years, a government that will invest in environmental policy and surveillance will likely succeed in reducing deforestation rates in the coming years. Thus, group 2 and 3 agents will likely continue with their decision rationale for deforesting in the coming years, but at a slower pace, and will continue to impact forests under the control of group 1 agents.

[12] https://oeco.org.br/reportagens/entenda-como-lula-pretende-tratar-a-transversalidade-ambiental-em-novo-governo/
[13] https://exame.com/Brazil/ibama-quer-reduzir-desmatamento-pela-metade-no-primeiro-ano-do-governo-lula/

4. Measures to be implemented: proposed actions will be those in line with fostering the development of alternative sustainable supply chains, with agroforestry and NTFPs and the payment for forest conservation. Furthermore, by supporting land regularization, strengthening of rural associations, and businesses that add value to the production would be done for coffee and other non-timber forest products, such as seeds, seedlings, oil resigns and fruits. In this sense, the continuous support of alternative production economies that are sustainable and create social and environmental impacts will be central to reduce the impact of underlying causes.

Analysis of chain of events leading to deforestation (3.4)

Figure 34 illustrates the chain of events leading to deforestation. Underlying causes of land law changes, environmental weakening and development policies lead to the stimulation of a cattle economy that is thriving in forest lands that are of low price and landownership security compared to other Amazon regions. These all contribute to influence the agents' behavior, whether individuals or corporations, who tuned by plans for the region and the imminent arrival of an onslaught of infrastructure projects, will translate into an enormous potential for the capture of location rents. Thus, profit maximization on low-priced lands is driving all agents to adopt deforestation intensive practices to establish cattle ranching (Carrero 2022).

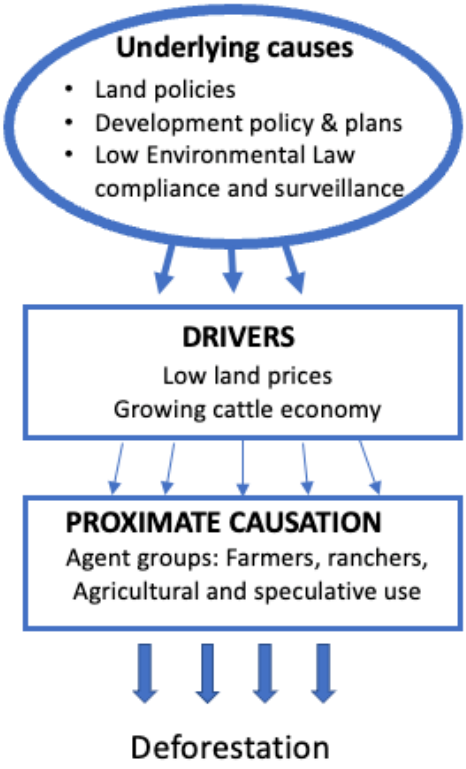

Figure 34. Chain of events leading to deforestation.

A crucial mechanism accelerating deforestation is land accumulation and consolidation. Many capitalized agents are arriving in the Reference Region, purchasing land possessions, and performing deforestation for establishing cattle ranches (Carrero et al. 2020, Carrero 2022, Yanai et al. 2020, 2022). Figure35 summarizes the process of land turnover related to speculation, where agents exchange of land parcels that go to more capitalized ones (ranchers and capitalized farmers), who have been investing in ranching that is causing high deforestation and land accumulation in the region.

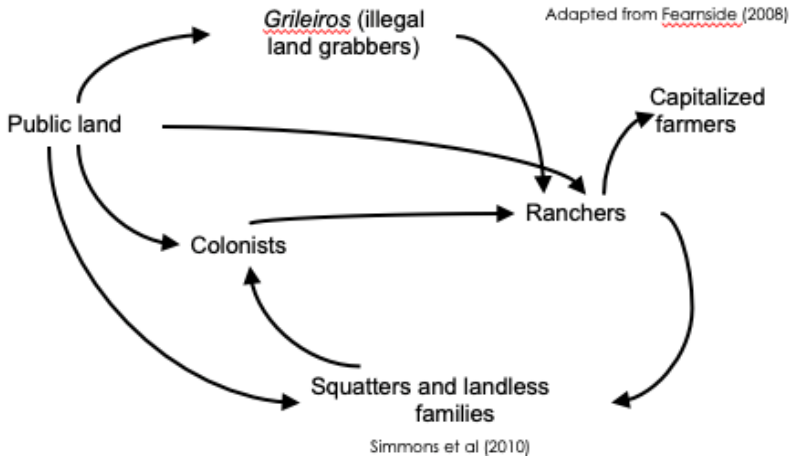

Figure 35. Land turnover among agents generation land accumulation and high deforestation.

Conclusion (3.5)

From all information and rationale exposed above, there is **conclusive evidence that deforestation** in the region is caused by agents who are expanding pasture lands in the region, in a process of land speculation and accumulation that is driven by global demand for beef, supported by public and economic policies. There has been a clear increasing trend in deforestation in the last 10 years, especially in the four years of President Bolsonaro's mandate. In the future, command and control activities are expected to increase in the new government of President Lula. Then, we expect that rates will go down to pre-Bolsonaro government levels. Even though government policies and private investments continue to stimulate the cattle ranching economy and forest clearing for pasture in the region (Carrero et al. 2022a, Yanai et al. 2022).

Projection of Future Deforestation (Step 4)

Quantitative Projection of Future Deforestation (Step 4.1)

The Reference Region does not have stratified limits, as agents, drivers, and underlying causes of deforestation are the same throughout the area.

Selection of the baseline approach (Step 4.1.1)

There was conclusive evidence on the analysis of agents and drivers that they cause deforestation, and there was an increase over the historical reference period (2013-2022). Even though there was an increase, most of it is attributable to political instability and the Bolsonaro government, notably skyrocketing in the last year of his term.

However, new evidence suggests that the future trend will change, considering the investment and proposed actions to strengthen the environmental agenda and increase environmental surveillance during the government of President Lula da Silva. Thus, we opted for using **approach "a", Historical average.**

Quantitative projection of future deforestation (Step 4.1.2)

Projection of the annual areas of baseline deforestation in the reference region (Step 4.1.2.1)

The annual deforestation of baseline in year t for the reference region was calculated as indicated in equation 03 of methodology VM0015:

ABSLRRi,t = ARRi,t-1 * RBSLRRi,t

Where:

ABSLRRi,t: Annual deforestation baseline in stratum i inside the reference region in year t (ha/yr-1);

ARRi,t-1: Area with forest cover in stratum i inside the reference region in year t; (ha);

RBSLRRi,t: Deforestation rate applied in stratum i inside the reference region in year t; (%);

t : 1, 2, 3 ... *T,* a year of the proposed project crediting period; dimensionless
i : 1, 2, 3 ... *IRR,* a stratum within the reference region; dimensionless

Thus, the deforestation rate observed between 2013 and 2022 was calculated according to equation 07 indicated by Puyravaud (2003) and the value obtained was 2.7984%. The deforestation area projected for the 30-year period (2023-2052) in the reference region, while ex-post measured deforestation for 2022 (until August 2022) was used for 1 March to 30 August 2022.

Projection o the Annual areas of baseline deforestation in the project area and leakage belt (Step 4.1.2.2)

Location of deforestation analysis was completed for the reference region (see step 4.2 of VM0015 v1.1) and area projected to be deforested within the project area and leakage belt were extracted and calculated.

Summary of projection of future deforestation (Step 4.1.2.3)

Values for projected deforestation from 1 March 2022 to 28 of February 2052 for the reference region (Table 34). It is worth noting that the deforestation area for 2022 corresponds to the relative proportion of the total area deforested in 2022 (111,298 ha) from PRODES data (which corresponds to September 2021 to August 2022), or 182 out of 365 days (0.4986) that represents the period between 1 March 2022 to 31 August 2022. Similarly, the projection year of 2051 considered only the period between 1 September 2051 to 28 February 2052, corresponding to 0.5014 of the total projected value.

Table 33. Annual areas of baseline deforestation in the Reference Region

Project year *t*	Stratum *i* of the reference region 1 $ABSLRR_{i,t}$ ha	Total annual $ABSLRR_t$ ha	Total cumulative *ABSLRR* ha
2022	55,496.6	55,496.6	55,496.6
2023	34,341.7	34,341.7	34,341.7
2024	33,380.7	33,380.7	67,722.4
2025	32,446.6	32,446.6	100,169.1
2026	31,538.6	31,538.6	131,707.7
2027	30,656.1	30,656.1	162,363.8
2028	29,798.2	29,798.2	192,162.0
2029	28,964.4	28,964.4	221,126.3
2030	28,153.8	28,153.8	249,280.2
2031	27,366.0	27,366.0	276,646.2
2032	26,600.2	26,600.2	303,246.4
2033	25,855.8	25,855.8	329,102.2
2034	25,132.3	25,132.3	354,234.5

2035	24,429.0	24,429.0	378,663.5
2036	23,745.4	23,745.4	402,408.9
2037	23,080.9	23,080.9	425,489.8
2038	22,435.0	22,435.0	447,924.8
2039	21,807.2	21,807.2	469,732.0
2040	21,197.0	21,197.0	490,929.0
2041	20,603.8	20,603.8	511,532.8
2042	20,027.2	20,027.2	531,560.0
2043	19,466.8	19,466.8	551,026.8
2044	18,922.1	18,922.1	569,948.9
2045	18,392.5	18,392.5	588,341.4
2046	17,877.9	17,877.9	606,219.3
2047	17,377.6	17,377.6	623,596.9
2048	16,891.3	16,891.3	640,488.1
2049	16,418.6	16,418.6	656,906.8
2050	15,959.2	15,959.2	672,865.9
2051	15,512.6	15,512.6	688,378.5
2052	7,559.9	7,559.9	695,938.4

The area of projected deforestation in the project area was extracted by the simulated maps done in step 4.2 of the VM0015 v1.1. It is worth mentioning that the area of 2022 was not projected, but the actual area deforested in the project area from 1 March 2022 to 31 August 2022, as described in section 3.1.3 Spatial limits.

Table 34. Annual areas of baseline deforestation in the project area (Table 9b VM0015)

Project year *t*	Stratum *i* of the reference region in the project area 1 $ABSLPA_{i,t}$ ha	Total annual $ABSLPA_t$ ha	Total cumulative *ABSLPA* ha
2022	30.5	30.5	30.5
2023	610.3	610.3	610.3
2024	391.0	391.0	1,001.3
2025	506.5	506.5	1,507.8
2026	351.0	351.0	1,858.9
2027	364.3	364.3	2,223.1
2028	231.6	231.6	2,454.8
2029	184.0	184.0	2,638.8
2030	209.6	209.6	2,848.4
2031	129.3	129.3	2,977.7
2032	191.2	191.2	3,168.8
2033	32.7	32.7	3,201.5
2034	94.1	94.1	3,295.7
2035	134.7	134.7	3,430.4
2036	66.0	66.0	3,496.4
2037	61.6	61.6	3,558.0
2038	27.7	27.7	3,585.7
2039	22.0	22.0	3,607.7
2040	9.7	9.7	3,617.4
2041	6.8	6.8	3,624.2

2042	13.1	13.1	3,637.3
2043	6.4	6.4	3,643.7
2044	4.4	4.4	3,648.1
2045	0.9	0.9	3,649.0
2046	3.5	3.5	3,652.5
2047	1.0	1.0	3,653.5
2048	6.3	6.3	3,659.9
2049	1.5	1.5	3,661.4
2050	0.0	0.0	3,661.4
2051	1.7	1.7	3,663.0
2052	2.3	2.3	3,665.3

The area of projected deforestation in the leakage belt was extracted by the simulated maps done in step 4.2 of the VM0015 v1.1, as shown in Table 36. No projected deforestation was simulated for 2022, as the input for the simulation was the forest in the reference region in August 2022.

Table 35. Annual areas of baseline deforestation in the leakage belt (table 9c VM0015)

Project year *t*	**Stratum *i* of the reference region in the Leakage Belt 1 $ABSLLK_{i,t}$ ha**	**Total annual $ABSLLK_t$ ha**	**Total cumulative *ABSLLK* ha**
2022	0.0	0.0	0.0
2023	2,504.1	2,504.1	2,504.1
2024	2,259.3	2,259.3	4,763.5
2025	2,578.9	2,578.9	7,342.4
2026	1,887.8	1,887.8	9,230.2
2027	1,744.3	1,744.3	10,974.6
2028	1,475.7	1,475.7	12,450.3
2029	1,536.7	1,536.7	13,987.0
2030	1,423.7	1,423.7	15,410.7
2031	1,091.5	1,091.5	16,502.2
2032	917.3	917.3	17,419.5
2033	880.1	880.1	18,299.6
2034	531.3	531.3	18,830.9
2035	659.3	659.3	19,490.2
2036	429.4	429.4	19,919.5
2037	335.6	335.6	20,255.1
2038	360.2	360.2	20,615.4
2039	319.7	319.7	20,935.1
2040	255.8	255.8	21,191.0
2041	111.5	111.5	21,302.5
2042	171.3	171.3	21,473.8
2043	104.5	104.5	21,578.3
2044	102.6	102.6	21,680.9
2045	71.5	71.5	21,752.4
2046	97.7	97.7	21,850.0
2047	75.0	75.0	21,925.1
2048	58.6	58.6	21,983.7
2049	24.2	24.2	22,007.9

2050	23.1	23.1	22,031.0
2051	8.4	8.4	22,039.3
2052	24.6	24.6	22,063.9

Projection of the location of future deforestation (Step 4.2)

We used Dinamica EGO (version 7.2.0) to project the location of future deforestation. Dinamica EGO is an environmental modeling platform appropriate to modeling REDD+ project baseline scenarios and accepted by the VM0015 methodology. Several studies used Dinamica EGO to simulate land use and land cover change (https://csr.ufmg.br/dinamica/publications/). Some of these studies were developed in areas with deforestation dynamics similar to the reference region of this project in the Brazilian Amazon (e.g., Vitel et al., 2013; Roriz, Yanai & Fearnside 2017; Yanai et al., 2012).

Dinamica EGO allows users to design different models, from very simple to very complex land use and land cover models, with distinct parameters through the projected space and time. The landscape structure is simulated based on the cellular automata transition functions (i.e., patcher and expander functions). These functions allow the definition of the size and form of patches of change (CSR/UFMG, 2022). In the case of deforestation, for example, these functions replicate the process of deforested areas expansion (with the expander function) and the formation of new deforestation patches (with the patcher function).

A diversity of landscape processes (e.g., deforestation, regrowth, urbanization expansion) can be calibrated by the Weights of Evidence (WoE), a Bayesian approach in which the effect of a variable on a specific transition is calculated independently or as a combined form. The WoE represents the influence of bio-geophysical and land categories variables on the change (e.g., forest to deforestation). As a result, the model produces an integrated transition potential map known as the transition probability map (CSR/UFMG, 2022). Thus, if the transition in the model is from forest to deforestation, then the probability map will show which forest pixels have a higher probability to be cleared in the future. In the VM0015 methodology, the transition probability map is called the deforestation risk map.

The variables in Dinamica EGO can become dynamic by receiving feedback from model elements. For modeling the spatial location of deforestation in for the Reference Region, the “distance to deforestation” was a dynamic variable since it was updated at each time-step of the simulation based on the increase of area deforested.

The main steps to project the location of future deforestation were: (i) create the input dataset; (ii) model calibration; (iii) model validation; and (iv) simulation of the baseline scenario. This project used a 100 m of spatial resolution, with a total of 3598 columns and 2416 lines.

The creation of the input dataset refers to the elaboration of landscape map (2012, 2017 and 2022), biophysical and land categories variable maps used to explain the deforestation (see 4.2.1 for more details), calculation of deforestation patch size, calculation of WoE coefficients and the correlation analysis between each pair of variables. The deforestation patch size and WoE coefficients were calculated based on the landscape change between 2013 and 2017 (i.e., calibration time). By observing the deforestation dynamic in the reference region and through several run in the calibration step, the parameters defined by the patcher and expander transition functions were: 70% of the deforestation area simulated by the model were by the expansion of previously cleared areas, and 30% were used by patcher function. The mean patch size and patch size variance were 30 ha and 56 ha, respectively. These values were obtained by calculating the mean patch size and the standard deviation of deforestation patches per year between 2013 to 2017 in reference region.

The input landscape maps were based on PRODES (Amazon Deforestation Monitoring Project) data from 2012 and 2017. In the validation model, the spatial accuracy is assessed by comparing the similarity between the observed and simulated maps of 2022. To confirm the quality of the model output it was used the Figure of Merit (FOM) assessment technique and the fuzzy similarity test described in the step 4.2.3.

The baseline scenario for the reference region was elaborated by running the model with the input landscape map of 2012 (Figure 36). Thus, the simulated maps from 2023 to 2052 were used to spatialize the location of future deforestation and to obtain the annual areas of baseline deforestation within the project area and the leakage belt.

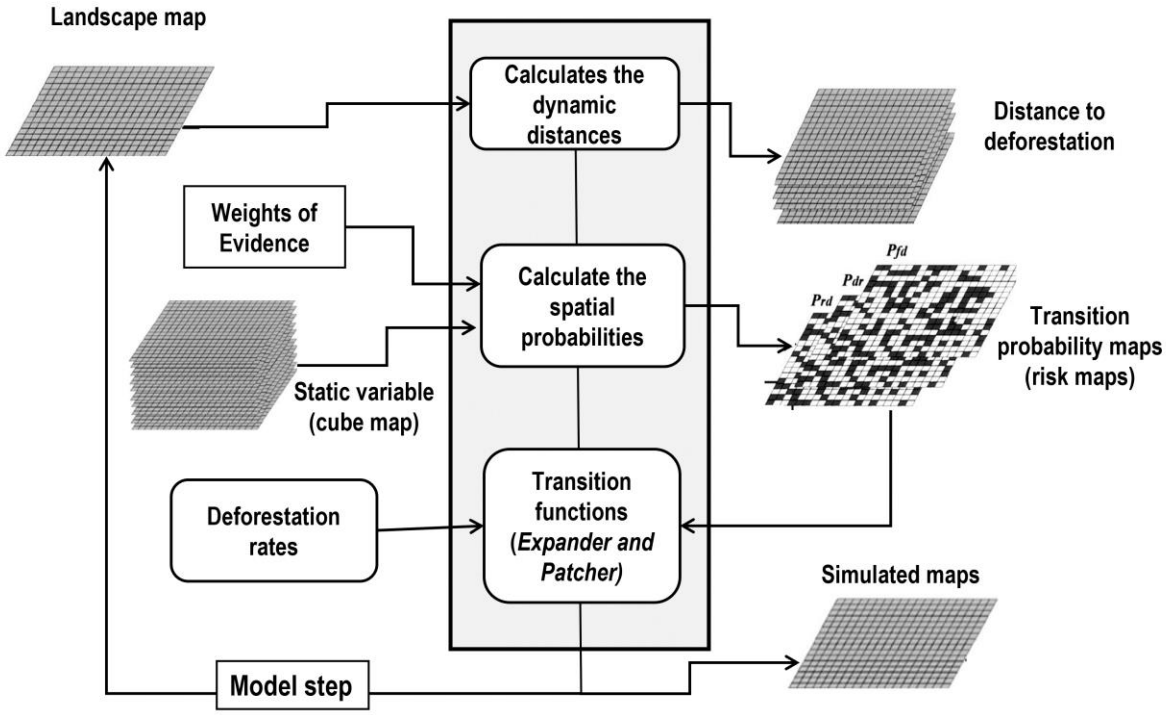

Figure 36. Flowchart of deforestation model in Dinamica EGO. (Adapted from Soares-Filho et al. 2002).

Preparation of factor maps (Step 4.2.1)

The factor maps were created using empirical approach. The factor maps of distance to roads, distance to hydrography, landholdings categories, settlement projects, type of vegetation, types of soils and slope were compiled in a raster cube map of static variable (Table 37). The factor map of distance to deforestation was a dynamic variable. In this case, for each year of simulation this map was updated based on the deforestation increment simulated. The factor maps for the reference region were elaborated using a 100m of spatial resolution, which represent a total of 3598 columns and 2416 lines.

Table 36. List of variables, maps and factor maps (Table 10 VM0015)

Factor Map		Source	Variable represented		Meaning of the categories or pixel value		Other Maps and Variables used to create the Factor Map		Algorithm or Equation used	Comments
ID	File Name		Unit	Description	Range	Meaning	ID	File Name		
1	Distance to roads	Imazon	Meters	Proximity of main and secondary roads.	0 - 7600	Values close to zero indicate high proximity to roads	1	Main and secondary roads	Calc Distance Map function (Dinamica EGO)	Euclidean distance. The road map was updated from 2019 by using Landsat satellite images and visual interpretation method.
2	Distance to deforestation	INPE (PRODES)	Meters	Dynamic deforestation distance map	0 - 3800	Values close to zero indicate high proximity to cleared areas	2	Land use and cover map	Calc Distance Map function (Dinamica EGO)	Euclidean distance. This map was updated for each year in the simulation model.
3	Distance to hydrography	INPE (PRODES)	Meters	Proximity to rivers	0 - 39700	Values close to zero indicate high proximity to rivers	3	Land use and cover map	Calc Distance Map function (Dinamica EGO)	The distance was calculated based on the Euclidean distance.
4	Landholdings categories	Carrero (2022)	Categorical	Categories of size of landholdings	1 to 4	Each class represent an interval of landholding size	4	Private property boundaries dataset from INCRA and declared private properties from Rural Environmental Registry (CAR: *Cadastro Ambiental Rural*)	Hierarchical approach following the priority: SIGEF > SNCI > Terra Legal > CAR (Reydon, Fernandes & Siqueira, 2018).	Hierarchical approach used to eliminate overlaps between the property boundaries. See Carrero (2022) for more details of the methodology applied. Categories presented in the Figure.
5	Settlement projects	INCRA	Categorical	Categories settlements	1, 2	Each class is one type of settlement	5		Official data	Categories presented in the Figure.
6	Types of vegetation	IBGE	Categorical	Major vegetation categorie	1 to 9	Each class indicate one type of vegetation	6		Official data	Categories presented in the Figure.
7	Types of soils	EMBRAPA	Categorical	Soil categories	1 to 5	Each class represents a type of soil	7		Official data	Categories presented in the Figure.
8	Slope	TOPODATA	Degree	Declivity	0 to 5	High values mean high slope areas	8	Derived from SRTM (Shuttle Radar Topographic Mission)	Slope (Spatial Analyst) ArcGIS Pro	

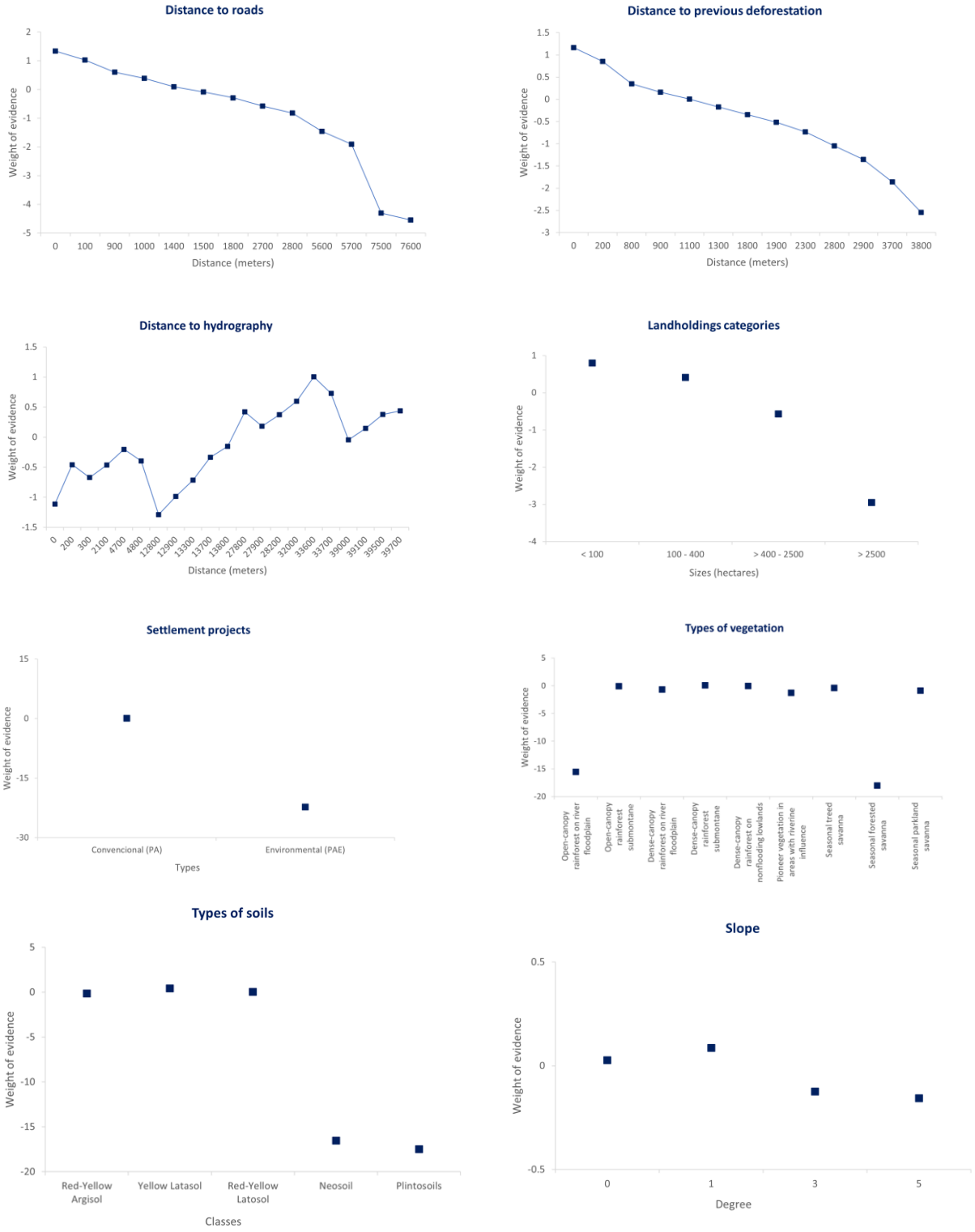

Figure 37. Weights of Evidence for the variables used in the model

The factor maps contributed to calculate the WoE coefficients and to produce the deforestation risk maps. One important step before running the model is to analyze factor maps correlation. It is because the premise of WoE method is that all input maps are spatially independent. For this purpose, Dinamica EGO has a model that performs a pairwise tests for the maps to assess the independence assumption (Cramer test and Joint-Uncertainty Information). Thus, values ≥ 0.50 indicated more correlation than less, and one of the factor maps must be eliminated or both factor maps should be combined into one. All factor maps showed low correlation (≤ 0.49 for Cramer test and ≤ 0.24 for Joint-Uncertainty Information). Thus, all variables (factors) were used to produce the deforestation risk maps.

Preparation of deforestation risk maps (Step 4.2.2)

Deforestation risk map was produced for each time step of the simulation based on the factor maps, WoE coefficients (Figure 37 above), landscape map, and distance of deforestation map of the current year. In the deforestation risk map, forest pixels with values close to 1 indicate high probability to be deforested. In contrast, forest pixels with values close to 0 indicate low probability to be deforested. Table 37 shows the description of variables used as factor map in this project.

The Figure 37 shows the WoE for each variable or factor map analyzed in this project. Positive values of WoE indicate that the forest in a certain distance range or inside of the specific category has high probability of being deforested based on the deforestation dynamic analyzed between 2013 to 2017. Values close to zero indicate that a specific distance range or factor map category has no effect on deforestation occurrence. Negative values indicate an inhibitory effect on deforestation occurrence. The Figure 38 shows the deforestation risk map for the year of 2023 (first year of baseline simulation).

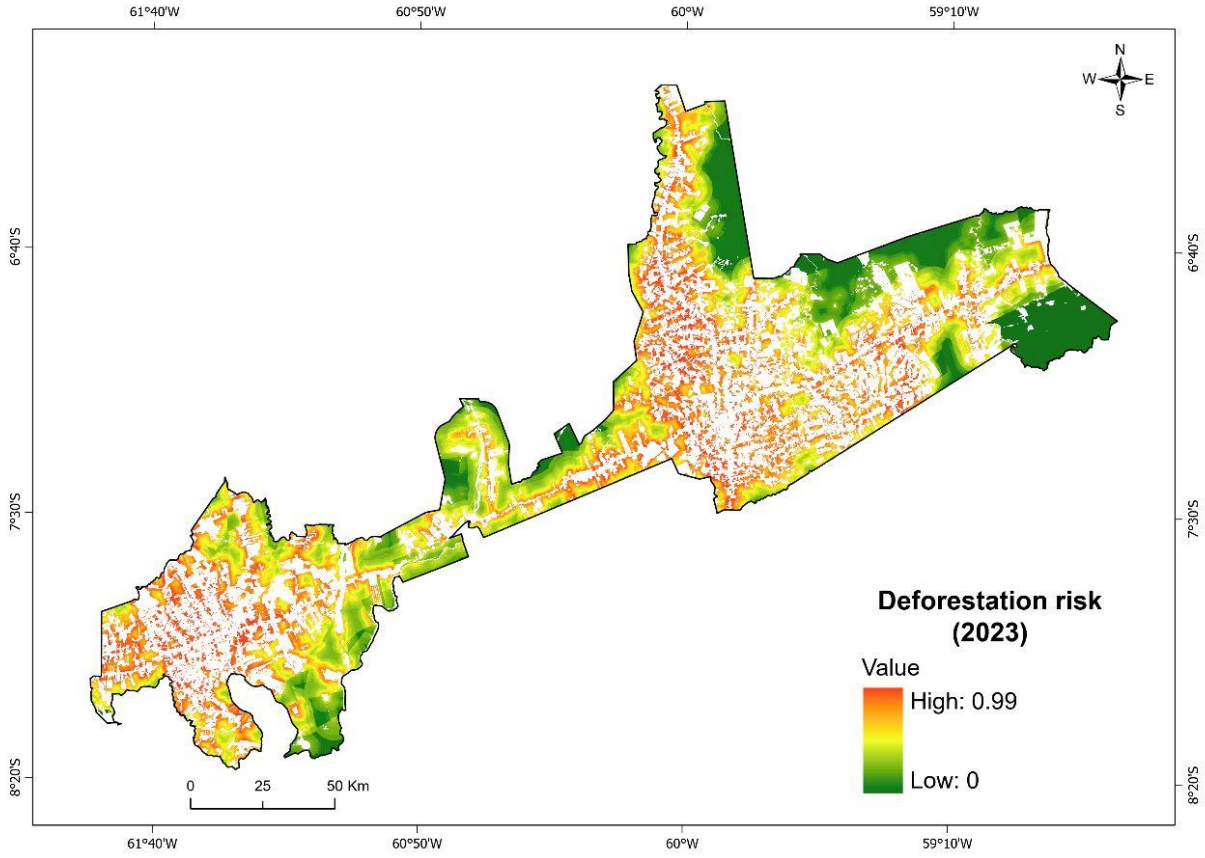

Figure 38. Reference region deforestation risk map in 2023.

Selection of the most accurate deforestation risk map (Step 4.2.3)

The quality of the model output was confirmed by applying the option (a) of the VM0015 methodology (p. 53), which refers to calibration and confirmation using two historical sub-periods. Thus, the landscape change (i.e., deforestation) that occurred from 2013 to 2017 was used to calibrate the model, while the deforestation map accumulated by 2022 was used for the confirmation (validation) process. For this, changes observed from 2013 to 2017 were used to simulate the deforestation dynamics by 2022 (Figure 39).

Two assessment techniques were applied to evaluate the map accuracy simulated in 2022: (i) Figure of Merit (FOM) technique suggested by the VM0015 methodology (p. 54) and (ii) Fuzzy similarity test model available in Dinamica EGO. Although the model could not simulate some large geometric patches of deforestation created in most recent years due model limitation (Figure 39), both assessment techniques showed an acceptable accuracy to project the future deforestation in the reference region as detailed below.

Figure of Merit – FOM: The FOM (equation 9 in the VM0015 methodology, p. 54) refers to the ratio of the intersection from observed change and simulated change to the union of the observed change and the predicted change. In Apuí REDD+ project the observed change refers to a change occurred between 2013 (reference landscape map in time 1) and 2022 (reference landscape map in time 2). The predicted change refers to a change occurred between reference landscape map in 2013 (time 1) and the simulated map by 2022 (time 2). The FOM result obtained for the reference region was 0.25. This value exceeded the net

observed change in the reference region (0.21). Based on this result, it is not necessary to test the other two models since FOM value is higher or at least equivalent to the net observed change demonstrates an acceptable accuracy.

Fuzzy similarity test: The fuzzy similarity test model available in Dinamica EGO is based on the concept of fuzziness of location and category within a cell neighborhood (Hagen, 2003). A specific functor (operator) known as “Calc Reciprocal Similarity Map” calculates the fuzzy similarity between the maps. First, areas of landscape maps of “no change” were masked to remove the bias in overestimating the similarity between the observed and simulated maps. Then, the assessment of the spatial fitness between observed change (2013 to 2022) and simulated change between 2013 and 2022 map using multiple-sized neighborhood windows was performed. For this purpose, a constant decay function was applied, where if deforestation pixels were found within the window, the fill was equal to 1 or 100% (full similarity) no matter the deforestation pixels location in relation to the central cell (observed change) of the corresponding window in the reference map. The result showed a minimum similarity of 54% in the 5 × 5 window cell size which is equivalent to an area of 25 ha. This result was similar to found in Suruí REDD+ project (53% in the 5 × 5 window cell size) using a 250 m of spatial resolution.

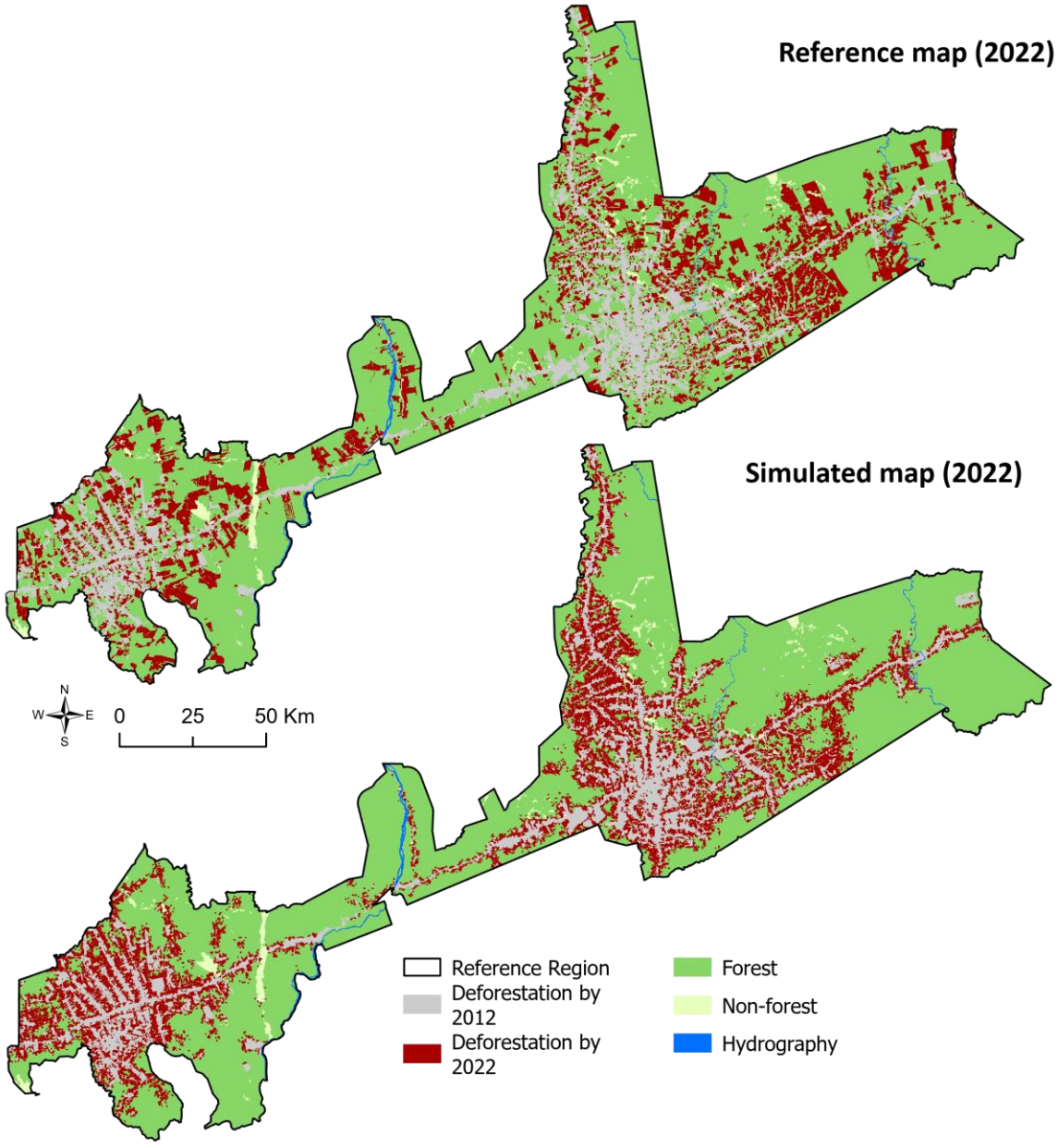

Figure 39. Landscape map of reference map (above) and simulated landscape (below) showing changes from 2013 to 2022 (10 years of simulation). The gray color represents accumulated deforestation by 2012.

Mapping the locations of future deforestation (Step 4.2.4)

The spatial location of future deforestation was projected on a time horizon of 30 years from 2023 to 2052. The input landscape map used was based on observed changes by 2022 (i.e., accumulated deforestation by 2022 mapped by PRODES). For each time step of model, new patches of deforestation are allocated based on the most favorable areas identified by the deforestation risk map. The Figure 40 and Figure 41 showed the increment of simulated deforestation for 10 years (2023-2032) and 30 years (2023-2052).

The deforestation risk map was updated in each model time step based on the deforestation increment in the landscape. In the reference region, most of the future deforestation was allocated in forest areas near previously cleared areas by expanding the current deforestation patches. This pattern shows that the remaining forest close to deforestation was more susceptible to being cleared than forest areas located more distant.

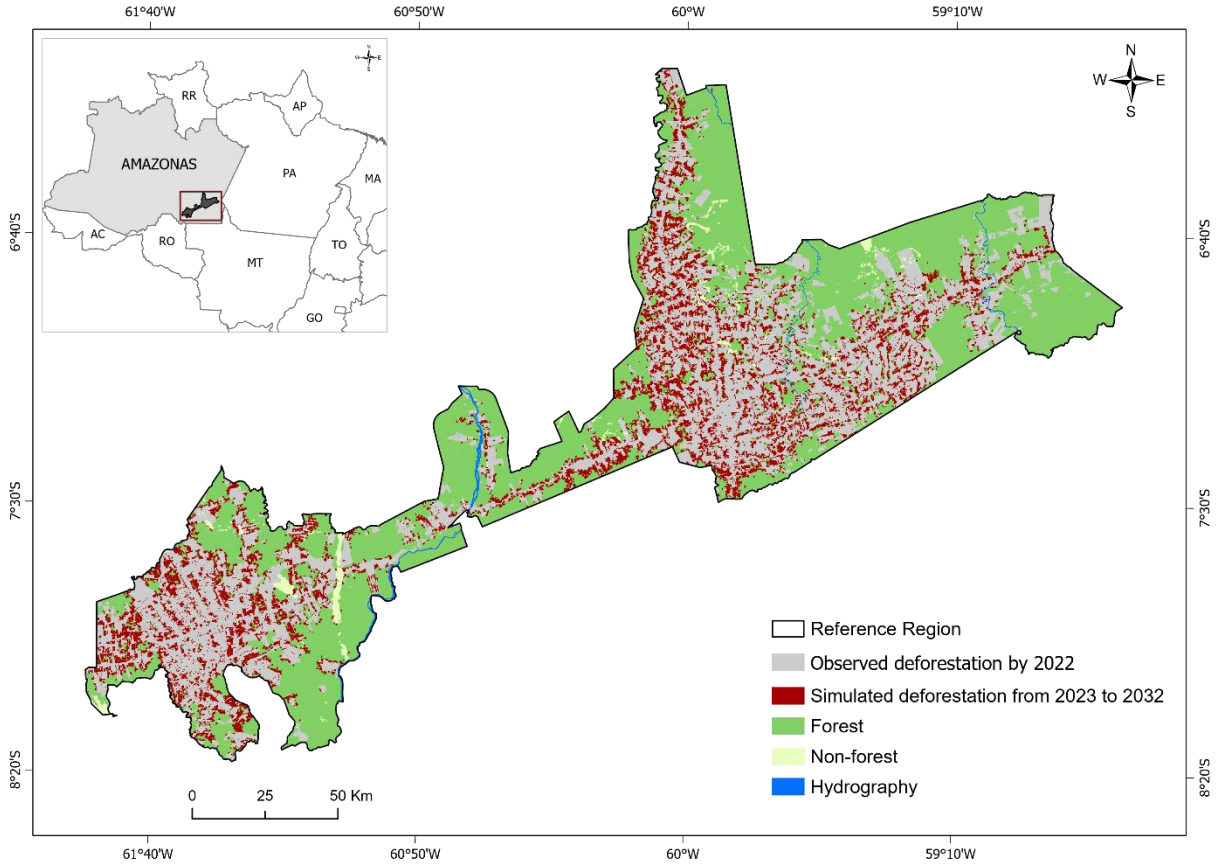

Figure 40. Reference Region simulated Deforestation from 2023 to 2032

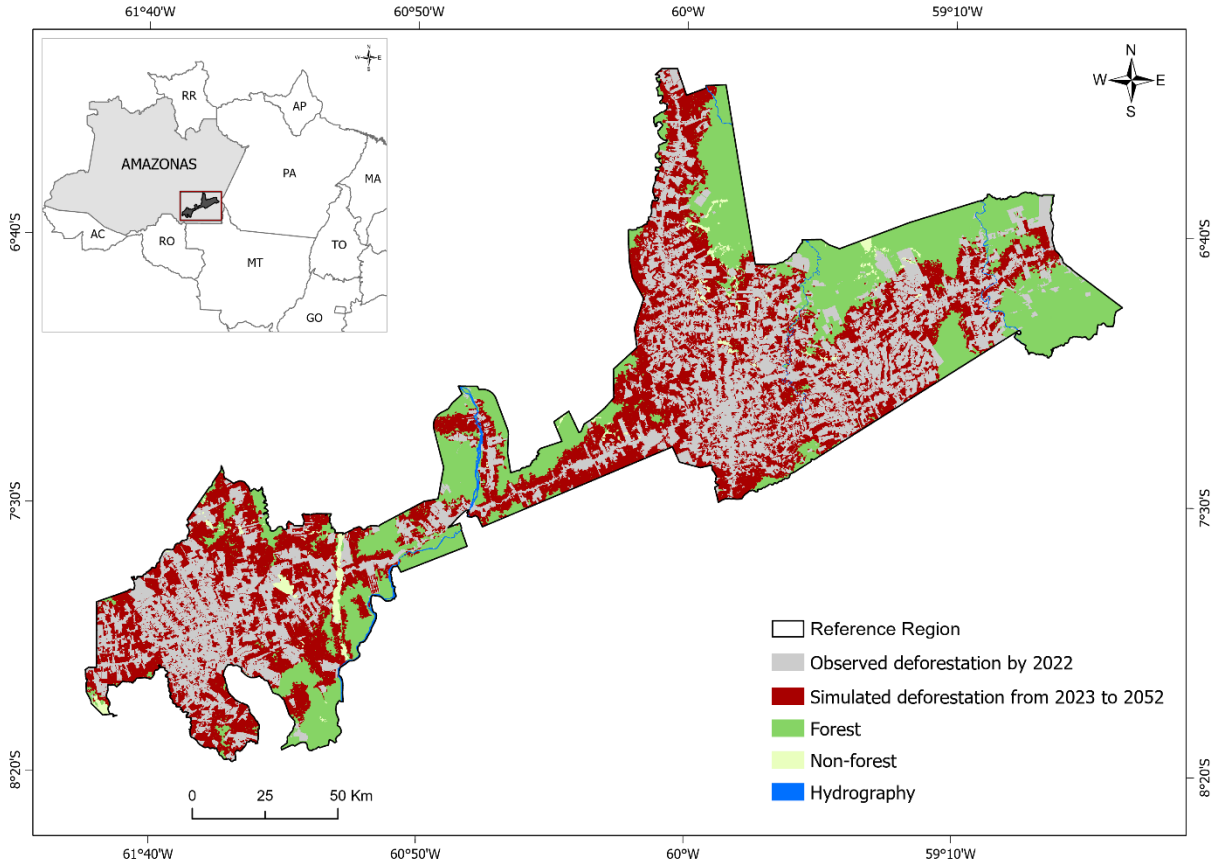

Figure 41. Reference Region simulated Deforestation from 2023 to 2052

3.1.5 Additionality

The project's additionality was analyzed according to the tool approved by VCS "VT0001 - Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities", version 3.0, of February 1, 2012.

The tool's applicability conditions are met because:

The AFOLU activities are equal or similar to the design of the proposed activities within their respective limits or registered as Project VCS AFOLU, and do not lead to a breach of any applicable law even if this law is not applied; and

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

Step 1. Identification of alternative scenarios of land uses proposed by the VCS AFOLU project activity

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

Realistic and credible land-use scenarios that would have occurred on the land within the proposed project boundary in the absence of the AFOLU project activity under the VCS include:

Scenario *1*: *Deforestation expansion is reduced without proposed REDD activities and related revenues and benefits.* This scenario could theoretically happen as a result of:

- Voluntary efforts of landowners to avoid deforestation and carrying out the expansion of agroforestry coffee within the project boundary without revenue from the sales of GHG credits
- A dramatic increase of strict law enforcement on environmental damage and/or government support to changing agricultural policies and programs that rewards sustainability and disincentives extensive cattle ranching.

The former would require a drastic behavioral change of the landowners, who would find ways to keep conserving their forests without economic return, assume all costs for agroforestry implementation and not to sell those to capitalized agents that would deforest to form cattle ranches.

The latter set of circumstances would imply massive government investments in law enforcement and environmental prosecution including agencies such as IBAMA, SEMA, SFB, MPF (Federal Prosecution Ministry) to avoid deforestation and illegal natural resource extraction. It would also require several law changes in the National Congress chambers that would improve environmental, agriculture, land, and social policies, programs and regulations to reduce cattle ranching expansion and stimulate forest conservation and agroforestry, and provide better basic services such as transportation, health, education, communication access, among others.

Scenario 2: Continuation of the pre-project land use, with forest clearing in rural possessions for cattle ranching expansion. This scenario is described in detail in section 3.4 above. In synthesis, the baseline scenario is driven by cheap land demand (when compared to other regions) as a factor of production in the cattle ranching economy, which represent the dominant economic activity in the region, with established human and capital resources, benefiting from economies of scale. In this scenario, if the landowner does not engage in pasture expansion, they would sell their land to capitalized agents (be it family farmers or companies) that would explore the opportunity cost.

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

Scenario 1 (conservation and agroforestry without carbon revenue, as a result of voluntary measures and increased law enforcement) is consistent with enforced mandatory applicable laws and regulations.

Scenario 2 (forest clearing in rural possessions for cattle ranching expansion) does not comply with all mandatory and applicable legislation and regulations. There are many laws and regulations in this case, but it suffices to explore one law, the Forest Code law 12,651 of 2012, and two articles. First, Article 12, I, a, says that rural properties in the Amazon should keep 80% of the native vegetation cover, named Legal Reserve (LR). Brazil's non-compliance with Legal Reserve is so widespread, and more intense in Amazonia, that even the revision of the Forest Code in 2012 provided amnesty for illegal deforestation in LR deforested before 2008, forgiving small landowners (around 400ha in the Reference Region) to reforest what they have cleared, which represented an area of around 23 Million hectares (Soares-Filho et al. 2014). In the case of Rio Juma Settlement project, which represented over 60% of all deforestation in Apuí in 2010 (Cenamo & Carrero, 2012), 64% of the 4023 properties analyzed by Rosado (2013) weren't in compliance with the Legal Reserve requirement, a deficit of over 55,350 ha of forest. Second, Article 26 says that the area allowed to deforest (20% in properties in the Amazon biome) needs to get a permit authorizing the native vegetation suppression (i.e., deforestation) and requires landowners to be registered in the Rural Environmental Registry (*Cadastro Ambiental Rural – CAR*), created in Article 29 of this law. CAR is a national public registry, mandatory for all rural properties, aimed at integrating environmental information

from those lands as a dataset used for environmental and economic control, monitoring, and planning. For the authorization suppression permit, almost all forest loss in Brazil does not comply with the law, as demonstrated by Azevedo et al. (2020) for 2019 where they found that over 99% of the deforested area didn't have a permit. Thus, despite there are laws that regulate deforestation in the Reference Region, non-compliance is widespread in the region, evidenced by 99% of areas deforested lacking permits and around 64% of properties in the largest deforestation cluster in the Reference Region have deforested in excess to what the Forest law allows. Surveillance operations that were already insufficient to control environmental illegality (Schmitt, 2015) have been drastically reduced in recent years (Vale et al. 2021), non-forest land use activities that were supposed to cease after infraction still occurs in 85% of embargoed areas (Silva et al. 2022).

Thus, both Scenarios 1 and 2 are plausible scenarios to the project, in compliance or partially complying with legislation and regulations, and their present enforcement, as demonstrate above that the non-compliance and lack of enforcement are prevalent in the Amazon, as well as in the municipalities of the Reference Region.

Sub-step 1c. Selection of the baseline scenario

The baseline scenario selected for this project is the Scenario 2, where forest clearing in rural possessions expands cattle ranching. This scenario is described in detail in section 3.1 of this document, following Steps 2 to 4 of VM0015, v.1.1., and although great part of forest clearing is not in compliance with the law, the law is not enforced, and cattle ranching is rapidly expanding in the region.

Step 2. Investment Analysis

Sub-step 2a. Determine the appropriate analysis method

This project does not generate financial benefits for all participants other than the VCS-related income from avoiding deforestation. Although it may provide financial benefits for part of the participants via increased income from agroforestry coffee, this activity faces many barriers in a scenario without the VCS AFOLU project activity. Thus, the barrier analysis was selected to demonstrate additionality and determine whether the proposed activity faces barriers, including some financial barriers.

Step 3. Barrier Analysis

Below are listed the main barriers that would prevent the implementation of forest conservation and agroforestry implementation.

- Investment barriers
    - For both forest conservation and successful agroforestry implementation, the scale of these activities has been only implemented with grants and other non-commercial finance terms. Idesam has been working to promote forest conservation in the region since 2007, including fostering forest restoration, sustainable practices such as non-timber forest products extraction, silvipastoral and agroforestry systems via donors funding (Carrero et al. 2014, Figueiredo et al. 2015, 2016; da Silva and Carrero, 2017). Still, funding from donors was available only for pilots, and investment for the project activity isn't available at this scale, thus hindering scenario 1.
    - Lack of access to credit for implementation: There is no credit available for keeping standing forests conserved, a barrier to Scenario 1. For agroforestry, Brazil has the Plano Safra, which plans to offer R$341 Billion in 2022/2023 year. Still, only 13% is destined to family farmers in a program called PRONAF (Programa Nacional de Fortalecimento da

Agricultura Familiar) (MAPA, 2022), of which the *PRONAF agroecologia* credit line is an option for promoting agroecological transitions for family farmers. However, studies have shown that it is rarely accessed, corresponding to 0.01% of all credit concessions in Brazil (Ferrari and Abraão, ND, table 4.), being only 981 credit contracts signed from 2005 to 2012 (Schneider et al. 2020). These authors pointed out many barriers to successfully get credits, among which was technical and operational constraints from both farmers and credit operators whose result in the few number credit grants. This hinders scenario 1 and favors scenario 2, with most of the credit being for ranching.

- Institutional barriers
    - Risks related to changes in government policies and laws: This barrier hinders alternative scenario 2, as non-compliance with environmental laws is not followed. Thus, it has no reward for those who are complying. In fact, land laws and policies favor more land speculation and ranching (Reydon, Fernandes & Telles, 2020, Carrero et al. 2022a), as discussed in the underlying causes in the previous section.
    - Lack of land and environmental law enforcement: Relative remoteness of such areas, and low personal and logistic capacity of law enforcement also favor Scenario 2, much more recently when law enforcement operations were drastically reduced (Valle et al. 2021, Trancoso 2021). Agents conducting deforestation activities are not prosecuted, a disincentive that is a strong barrier for Scenario 1, as agents who follow the law are at a great economic disadvantage.
- Barriers related to local tradition
    - Strong social status related to cattle ranching: ranching is the dominant land use in the region, with high social status citizens being ranchers (Campbell, 2015, Carrero et al. 2020, Yanai et al. 2020). This act as a strong social barrier for Scenario 1 while enables Scenario 2.
    - Local tradition is that family farmers often get agricultural inputs from suppliers (or advanced payments) in exchange of their harvested products. Thus, the price paid for the producer is usually low, with contributes to hinder Scenario 1 income opportunities from agriculture and agroecological practices.
- Barriers due to social conditions and land-use practices
    - Widespread illegal practices (e.g. deforestation, logging, land grabbing, grazing). This barrier hinders the occurrence of scenario 1. As shown in Substep 1b, illegal practices lead to unfair competition from a great portion of regional producers that want to conserve forests. For logging, in the case of Matupi District in the Reference region, one of the logging poles in late 2000s with over 50 sawmills operating, three surveillance operations conducted between 2009 and 2013 apprehended 160 trucks with illegal logs in one of these operations, and only 9 operations were conducted between 2013 and 2019 (Wenzel and Sá, 2022a).
    - Land speculation is a strong factor that is promoting land accumulation in the region (Reydon, Fernandes & Telles, 2020). Landholders are facing many offers to sell their land to capitalized farmers to expand cattle ranching (Carrero et al. 2020, Carrero 2022) and have no economic options to stick with scenario 1. This project has engaged with over 100 landowners, and many of them have declined to participate because they have plans to

deforest or would sell their land possessions. Thus, even in a scenario with the project and its payments for avoided deforestation, some still preferred to keep within Scenario 2. This is one of the largest barriers to Scenario 1.

- Barriers relating to land tenure, ownership, inheritance, and property rights
    - Lack of suitable land tenure legislation and regulation to support the security of tenure. Titled lands in the Reference Region are rare, with only 18% of lands titled in Apuí (Carrero and Fearnside, 2011) and 17% in the Matupi District in Manicoré (Silva, 2012). Such barriers include low government budget and personnel to conduct field surveys and issuing titles and high land turnover (Carrero and Fearnside, 2011), which hinders the alternative use of Scenario 1, as it represents land ownership insecurity and difficult long-term conservation and investment plans, incentivizing land grabbers (IPAM, 2006) and large ranchers to accumulate land possessions from family farmers to implement cattle ranching (Carrero et al. 2020), therefore, enabling Scenario 2 to continue.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternative land use scenarios (except the proposed project activity):

All the barriers presented do not prevent Scenario 2, as this scenario is the product of these barriers.

Step 4. Common practice analysis

There are no registered similar activities to those proposed in the project in terms of similar scale and temporality.

i) Payments for forest conservation

The Brazilian Government, with funds from the Green Climate Fund, created the Project Floresta+(https://www.florestamaisamazonia.org.br/sobre-o-projeto/#conservacao), which offers payment for promoting forest conservation in rural properties of up to 400ha. Among the eligibility criteria is that landowners should have at least 1ha more than what is expected to be protected by law (80% of natural cover in the Amazon biome), which make ineligible over 95% the project's properties. Also, this project is still in the pilot stage, has many other requirements that make participation harder for these regions, especially related to documentation, submission and landowners capacity. A short-term similar activity rewards only 14 large landowners with titled lands in Mato Grosso State that possess more forests than what is expected by law, Conserv+(https://conserv.org.br), but has resources for only a few years. Thus, these programs are not suited for promoting forest conservation in the region and wouldn't be available for most of the project participants without AFOLU.

ii) Agroecological and agroforest implementation

There have been pilot initiatives that used donor resources to implement agroforest systems in the region, by both government and NGOS. However, none of these have been able to make it at the scale of the proposed project.

One initiative was conducted by the State Amazonas, a project that received a grant from the Amazon Fund[14] (to implement agroforest systems in four municipalities between 2013 and 2015 (two of which are part of the reference region - Apuí and Novo Aripuanã). Although around 656 areas were planted in these four municipalities out of the 1400 planned[15], several issues contributed to the abandonment of most of the

[14] https://www.fundoamazonia.gov.br/pt/projeto/Reflorestamento-no-Sul-do-Estado-do-Amazonas/)
[15] http://meioambiente.am.gov.br/proresaf/

implanted areas. In the assessment of the IDAM (Stage Agency responsible for its implementation, in Apuí trees were only planted 25% of properties and there was a high level of abandonment (Idesam, 2015, pg. 7) with poor quality seedlings provided and a top-down approach in the selection of species, with insufficient or no technical assistance (8 technicians to attend 350 properties) that in fact didn't have agroecological training, resulting in soil erosion due to tilling and high mortality. No further assessment was made in these areas, but the report pointed out that without continuous technical assistance specific to agroforestry and support for processing and selling products, most of these systems would be abandoned.

Another initiative has been promoted by Idesam, which is being fostering agroforestry supply chains in Southern Amazonas since 2011, created a network of seed collectors and partnered with a local greenhouse to store seeds and produce seedlings used in agroforestry coffee, silvipastoral systems and restoration activities. With donor funding, it managed to support the implementation and technical assistance of 50ha until 2021.

Although there are some initiatives in the reference region that would offer payment for ecosystem services, they are not an option for farmers who haven't forest in excess of what the law requires, even though these forests are at risk of being chopped down. Even though there has been agroforestry coffee production in the landscape, avoided deforestation and the expansion of 600ha of agroforestry implementation in 10 years is a scenario that cannot be achieved without the carbon credits.

Finally, the central component of the project is to scale up agroecological transition, providing technical assistance, capacity building, commercialization and premium prices for agroforestry and organic products. This is not a common practice in the region, cannot be supported infinitely with donor money and wouldn't happen without the project activities proposed.

Therefore, the conclusion is that the proposed VCS AFOLU project activities are not the baseline scenario; hence, the project is additional.

3.1.6 Methodology Deviations

There are no deviations from the methodology.

3.2 Quantification of GHG Emission Reductions and Removals

3.2.1 Baseline Emissions

Calculation of baseline activity data per forest class (Step 5.1 VM0015 v1.1)

The baseline projections obtained with the spatial allocation model indicated that 3,695.8ha is projected to be deforested in the project area until 2052, as shown in Table 38.

Table 37. Annual areas deforested per forest class icl within the project area in the baseline case (baseline activity data per forest class) (Table 11b Methodology VM0015 v1.0)

Area deforested per forest class *icl* within the project area		**Total baseline deforestation in the project area**	
IDicl> **Name >**	**Icl1**		
	Forest	***ABSLPA*$_t$** **annual**	***ABSLPA*** **cumulative**
Project year *t*	**ha**	**ha**	**ha**
2022	30.5	30.5	30.5

2023	610.3	610.3	640.8
2024	391.0	391.0	1,031.7
2025	506.5	506.5	1,538.3
2026	351.0	351.0	1,889.3
2027	364.3	364.3	2,253.6
2028	231.6	231.6	2,485.3
2029	184.0	184.0	2,669.2
2030	209.6	209.6	2,878.9
2031	129.3	129.3	3,008.1
2032	191.2	191.2	3,199.3
2033	32.7	32.7	3,232.0
2034	94.1	94.1	3,326.2
2035	134.7	134.7	3,460.9
2036	66.0	66.0	3,526.9
2037	61.6	61.6	3,588.5
2038	27.7	27.7	3,616.2
2039	22.0	22.0	3,638.2
2040	9.7	9.7	3,647.9
2041	6.8	6.8	3,654.7
2042	13.1	13.1	3,667.8
2043	6.4	6.4	3,674.2
2044	4.4	4.4	3,678.6
2045	0.9	0.9	3,679.5
2046	3.5	3.5	3,683.0
2047	1.0	1.0	3,684.0
2048	6.3	6.3	3,690.3
2049	1.5	1.5	3,691.8
2050	0.0	0.0	3,691.8
2051	1.7	1.7	3,693.5
2052	2.3	2.3	3,695.8

For the leakage belt, the projected deforestation was 22,063.9 ha as shown in Table 39.

Table 38. Annual areas deforested per forest class icl within the Leakage belt area in the baseline case (baseline activity data per forest class) (Table 11c Methodology VM0015)

Area deforested per forest class *icl* within the leakage belt		**Total baseline deforestation in the project area**	
IDicl>	**Icl 1**		
Name >	**Forest**	***ABSLLK$_t$*** **annual**	***ABSLLK*** **cumulative**
Project year *t*	**ha**	**ha**	**ha**
2022	0.0	0.0	0.0
2023	2,504.1	2,504.1	2,504.1
2024	2,259.3	2,259.3	4,763.5
2025	2,578.9	2,578.9	7,342.4
2026	1,887.8	1,887.8	9,230.2

2027	1,744.3	1,744.3	10,974.6
2028	1,475.7	1,475.7	12,450.3
2029	1,536.7	1,536.7	13,987.0
2030	1,423.7	1,423.7	15,410.7
2031	1,091.5	1,091.5	16,502.2
2032	917.3	917.3	17,419.5
2033	880.1	880.1	18,299.6
2034	531.3	531.3	18,830.9
2035	659.3	659.3	19,490.2
2036	429.4	429.4	19,919.5
2037	335.6	335.6	20,255.1
2038	360.2	360.2	20,615.4
2039	319.7	319.7	20,935.1
2040	255.8	255.8	21,191.0
2041	111.5	111.5	21,302.5
2042	171.3	171.3	21,473.8
2043	104.5	104.5	21,578.3
2044	102.6	102.6	21,680.9
2045	71.5	71.5	21,752.4
2046	97.7	97.7	21,850.0
2047	75.0	75.0	21,925.1
2048	58.6	58.6	21,983.7
2049	24.2	24.2	22,007.9
2050	23.1	23.1	22,031.0
2051	8.4	8.4	22,039.3
2052	24.6	24.6	22,063.9

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

The method used to define the final post-clearing class was Method 1: Historical LU/LC-change. We are using only one post-deforestation class (IDfcl 4) and one zone, which represents an Anthropic Vegetation Mosaic at equilibrium composed of pastures (degraded and not), crops, and secondary vegetation regrowth obtained from a matrix of transition probabilities between categories of land use obtained with the Markov Matrix method (Fearnside, 1996).

Table 40 shows the zone 1 area, which encompasses the project area, leakage belt, and leakage management areas, and the corresponding area of the class of use and cover after deforestation. There is only one post-deforestation class for this project, which represents a mosaic of anthropic vegetation that replaces forests, as described in the land use classes section. Table 41 presents the area within the project area and Table 42 the area of this final class within the Leakage Belt.

Table 39. Reference region zones covering post-deforestation classes (VM0015 Table 12)

Zone		**Name**		**Total of all other LU/LC classes present in the zone**		**Total area of each zone**	
		Zone 1					
		IDfcl	**1**				
		Area (ha)	% of zone	Area (ha)	% of Zone	Area (ha)	% of Zone
IDz	Zone 1	25,886	100	25,729	99.4%	25,886	100

Total area per class Fcl	25,886	100	25,729	99.4%	25,886	100

Table 40. Annual deforested area in each zone within the project area in the baseline case (Table 13b VM0015 v1.1)

Area established after deforestation per zone within the project area		**Total baseline deforestation in the project area**	
Idz	**1**		
Name >		***ABSLPA*$_t$**	***ABSLPA***
	Zone 1	**annual**	**cumulative**
Project year *t*	**ha**	**ha**	**ha**
2022	30.5	30.5	30.5
2023	610.3	610.3	640.8
2024	391.0	391.0	1,031.7
2025	506.5	506.5	1,538.3
2026	351.0	351.0	1,889.3
2027	364.3	364.3	2,253.6
2028	231.6	231.6	2,485.3
2029	184.0	184.0	2,669.2
2030	209.6	209.6	2,878.9
2031	129.3	129.3	3,008.1
2032	191.2	191.2	3,199.3
2033	32.7	32.7	3,232.0
2034	94.1	94.1	3,326.2
2035	134.7	134.7	3,460.9
2036	66.0	66.0	3,526.9
2037	61.6	61.6	3,588.5
2038	27.7	27.7	3,616.2
2039	22.0	22.0	3,638.2
2040	9.7	9.7	3,647.9
2041	6.8	6.8	3,654.7
2042	13.1	13.1	3,667.8
2043	6.4	6.4	3,674.2
2044	4.4	4.4	3,678.6
2045	0.9	0.9	3,679.5
2046	3.5	3.5	3,683.0
2047	1.0	1.0	3,684.0
2048	6.3	6.3	3,690.3
2049	1.5	1.5	3,691.8
2050	0.0	0.0	3,691.8
2051	1.7	1.7	3,693.5
2052	2.3	2.3	3,695.8

Table 41. Annual deforested area in each zone within the Leakage belt in the baseline case (Table 13c VM0015 v1.1)

Area established after deforestation per class *fcl* within the leakage belt		**Total baseline deforestation in the leakage belt**	
IDz	***1***		
Name >	**Zone 1**	**$ABSLLK_t$ annual**	**$ABSLLK$ cumulative**
Project year *t*	**ha**	**ha**	**ha**
2022	0.0	0.0	0.0
2023	2,504.1	2,504.1	2,504.1
2024	2,259.3	2,259.3	4,763.5
2025	2,578.9	2,578.9	7,342.4
2026	1,887.8	1,887.8	9,230.2
2027	1,744.3	1,744.3	10,974.6
2028	1,475.7	1,475.7	12,450.3
2029	1,536.7	1,536.7	13,987.0
2030	1,423.7	1,423.7	15,410.7
2031	1,091.5	1,091.5	16,502.2
2032	917.3	917.3	17,419.5
2033	880.1	880.1	18,299.6
2034	531.3	531.3	18,830.9
2035	659.3	659.3	19,490.2
2036	429.4	429.4	19,919.5
2037	335.6	335.6	20,255.1
2038	360.2	360.2	20,615.4
2039	319.7	319.7	20,935.1
2040	255.8	255.8	21,191.0
2041	111.5	111.5	21,302.5
2042	171.3	171.3	21,473.8
2043	104.5	104.5	21,578.3
2044	102.6	102.6	21,680.9
2045	71.5	71.5	21,752.4
2046	97.7	97.7	21,850.0
2047	75.0	75.0	21,925.1
2048	58.6	58.6	21,983.7
2049	24.2	24.2	22,007.9
2050	23.1	23.1	22,031.0
2051	8.4	8.4	22,039.3
2052	24.6	24.6	22,063.9

Calculation of baseline activity data per LU/LC change category (Step 5.2)

Not applicable

Estimation of baseline carbon stock changes and non-CO2 emissions (Step 6)

Estimation of baseline carbon stock changes (Step 6.1)

Estimation of the average carbon stocks of each LU/LC class (6.1.1 VM0015 v1.1)

Average carbon stocks for the above-ground biomass used for the project area and leakage belt, used the data of Brazil's LULUCF 4th National Communication to UNFCC (Brazil, 2020), with values obtained from the Estimating Biomass in the Amazon (EBA)[16] Project. This project used forest inventories (174 properties) of the main forest classes, and allometric equations from Chave et al. (2014), Goodman (2013), and Schnitzer, Dewalt & Chave (2006) for trees, palms, and lianas, respectively. Field data were used to validate LiDAR data surveys (836 transects of 12.5km x 0.3km each) randomly distributed in the region (More details in Brazil, 2020, Box 5, pg. 108-109). From the first campaign of LiDAR surveys of the 417 transects, 27% were in Ombrophyllous Open Forest, and 57% on Ombrophyllous Dense Forest, forest types that compose virtually the entire project area and leakage belt (Figure 42)

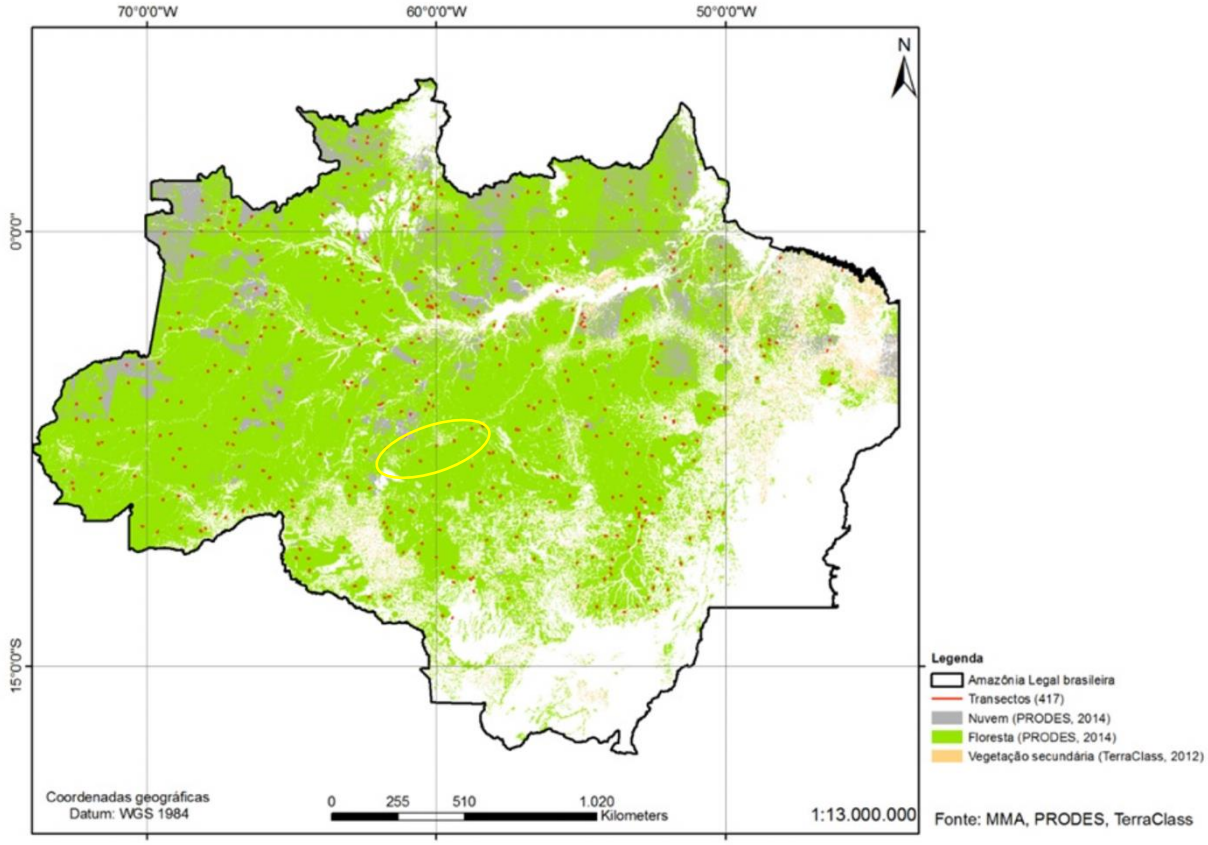

Figure 42. Distribution of the 417 transects of the first campaign of LiDAR and an ellipse where the reference region is.

Uncertainty for the Reference Region is between zero and 10tC at 95% of confidence interval, as shown in Figure 43 (Fig 81 of Brazil, 2020).

[16] Available at: www.ccst.inpe.br/projetos/eba-estimativa-de-biomassa-na-amazonia

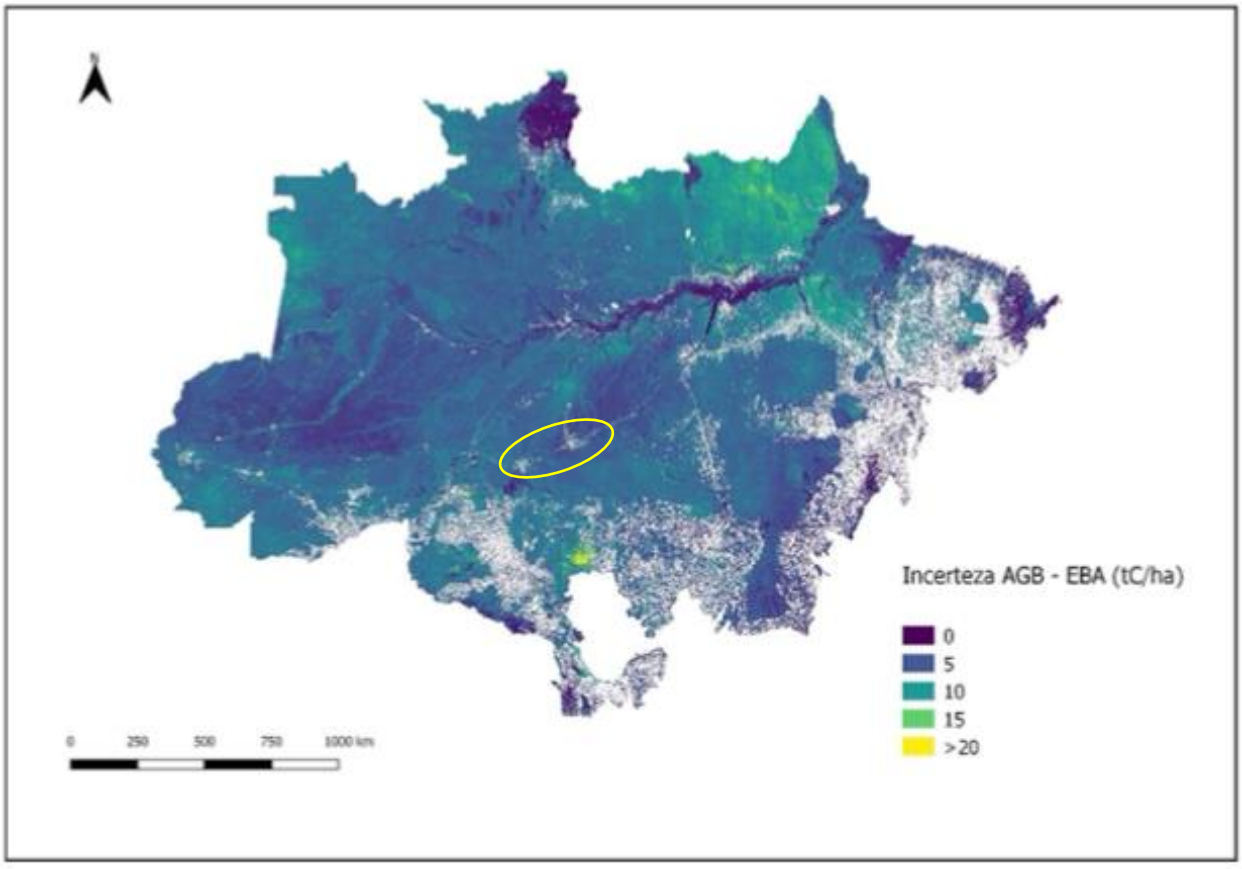

Figure 43. Uncertainty of Above Ground Biomass of carbon stocks in the Amazon biome showing an ellipse in the reference region.

With the explained above, it fulfills the criteria set in item a) of section 6.1.1, as follows:

- The data are less than 10 years old;
- The data are derived from multiple measurement properties;
- All species above a minimum diameter are included in the inventories;
- The minimum diameter for trees included is 30 cm or less at breast height (DBH);
- Data are sampled from good coverage of the classes over which they will be extrapolated.

Expansion factors below-ground and deadwood biomass were taken from Nogueira et al. (2008) and Barbosa and Fearnside (2005), as reported in table 23 of the 4th LULUCF National Communication to the UNFCC (Brazil, 2020), and carbon density per dry biomass in aboveground, belowground, and dead wood pools used was 0.47 (IPCC 2006, vol 4., Cap. 4, tab 4.3), resulting in average carbon pools reported for main forest classes within the project area and leakage belt shown in Table 43. Below ground root to shoot ratio for Forests used data from Nogueira et al. (2008) (0.31 for Dense forests and 0.1 for Open forests) and for savanna (3.34) from Miranda et al. (2014).

Table 42. Carbon pools of main forest types in the Leakage Belt and Project Area (Source: tab 23, Brazil 2020).

Main Forest Type	ABG	BGB	DW	Litter	Total
Ds (Dense Submontane Forest)	139.30	43.18	13.09	5.71	201.10
As (Open Submontane Forest)	106.50	10.65	8.63	6.28	132.00
Sp (Savana Parque)	25.70	85.80	0.80	1.80	114.00

We performed a weighted area average of carbon stocks per pool related to the main forest sub-types in the project area, as shown in Table 44.

Table 43. Weighted mean carbon stock (tons of C per ha) per pool and total within the Forest subtypes of initial Forest class 1 (Icl1) in the project área.

Main Forest sub-type	Project Area		Weighted Means per area (tC)			
	Area (ha)	Percent	ABG	BGB	DW	Total C/ha
Ds (Dense Submontane Forest)	2767.30	75%	103.98	32.23	9.77	145.99
As (Open Submontane Forest)	928.88	25%	26.69	2.67	2.16	31.52
Sp (Savana Parque)	11.00	0.3%	0.08	0.25	0.00	0.33
Total			**130.74**	**35.16**	**11.94**	**177.84**

For transforming the carbon stocks from tons of C to tons of CO_2e we multiplied by 44/12 (3.6667) as 1 kg of C corresponds to 3.6667 kg of CO2 (mass of CO2 = 44 and the mass of C = 12; 44/12 = 3.6667). The average carbon values per hectare for each initial class of land use and cover considered for the baseline scenario present in the area of the project and Leakage Belt can be seen in the Table 45. Note that uncertainty at 95% of CI was below 10 tC per ha. Thus, no discount for uncertainty was applied.

Table 44. Average carbon stock per hectare of all LU/LC classes present in the project area, leakage belt and leakage management area (Table 15b Methodology VM0015 v1.0).

Initial Forest class *icl* **Name: Forest** **ID *icl* 1** **Average carbon stock per hectare ± 95% CI**							
***Cab*$_{cl}$**		***Cbb*$_{cl}$**		***Cdw*$_{cl}$**		***Ctot*$_{cl}$**	
C stock t CO_2e ha^{-1}	**± 95% CI** t CO_2e ha^{-1}	***C stock*** t CO_2e ha^{-1}	**± 95% CI** t CO_2e ha^{-1}	***C stock*** t CO_2e ha^{-1}	**± 95% CI** t CO_2e ha^{-1}	***C stock*** t CO_2e ha^{-1}	**± 95% CI** t CO_2e ha^{-1}
479.4	0.0	128.9	0.0	43.8	0.0	652.1	

t C ha^{-1}	CI 5%	t C ha^{-1}	CI 5%	t C ha^{-1}	CI 5%	t C ha^{-1}	CI 5%
130.74	<5%	35.16	<5%	11.94	<5%	177.84	<5%

Cab$_{cl}$: Average carbon stock per hectare in the above-ground biomass carbon pool of class cl; tCO2-e ha-1

Cbb$_{cl}$: Average carbon stock per hectare in the below-ground biomass carbon pool of class cl; tCO2-e ha-1

Cdw$_{cl}$: Average carbon stock per hectare in the dead wood biomass carbon pool of class cl; tCO2-e ha-1

$Ctot_{cl}$: Average carbon stock per hectare n all accounted carbon pools cl; tCO2-e ha-1

Calculation of area-weighted average cabon stocks of the post-deforestation LU/LC classes existing within each zone.

Methodology VM0015 allows using estimates from local studies for post-deforestation carbon stocks. We used data from Fearnside (1996), which presents values for the total biomass and carbon stocks in vegetation replacing forests in the Amazon, defined using a classification based on a Markov matrix. His estimates are that 46.9% of the area would be covered by secondary forest regeneration at various ages and that 47.8% would be covered by pastures (productive and degraded). In contrast, only 4% would be covered by farmland or crops (Fearnside, 1996, table 4, p.28). The total carbon stocks for this Anthropic Vegetation mosaic at equilibrium were reported to be 12.8 tC/ha, or 46.94 tCO_2e/ha. We used the value of **60tCO_2e/ha** (which was augmented by 30%, as per VM0015 suggested on pg. 63).

It is worth noting that this value is very conservative because Mapbiomas collection 7 land cover data for all deforested areas between 2012 and 2021 in the Reference Region, resulted in 83% of the area being covered by pastures, 16% by secondary forests and 0.9% by a mosaic of crops.

Calculation of carbon stock change factors (6.1.2 VM0015 v1.1)

The baseline scenario of the Project considers the changes in forest carbon stock replaced by a type of vegetation that is an anthropic vegetation mosaic composed of pastures, crops and secondary forest regrowth. VM0015 v.1.1 assumes that 100% of aboveground biomass C stock is released at the year of deforestation, whereas belowgrownd and deadwood biomass are released 1/10 at the year of deforestation and extends to another nine years at a 1/10 per year. For post-deforestation classes, in this case only one, a linear increase of 1/10 until year ten should be used (pg. 69). Table 46 shows the carbon stock change factor for initial forest class and Table 47 the carbon stock changes for the final class (Fcl 1) anthropic vegetation mosaic.

Table 45. Carbon stock change factor for initial forest class (IDcl1) Table 20a of VM0015).

Year after deforestation		ΔCabicl,t	ΔCbbicl,t	ΔCdwicl,t	ΔCtotcl,t
1	t	479.4	12.9	4.38	496.7
2	t + 1		12.9	4.38	17.3
3	t + 2		12.9	4.38	17.3
4	t + 3		12.9	4.38	17.3
5	t + 4		12.9	4.38	17.3
6	t + 5		12.9	4.38	17.3
7	t + 6		12.9	4.38	17.3
8	t + 7		12.9	4.38	17.3
9	t + 8		12.9	4.38	17.3
10	t + 9		12.9	4.38	17.3
11	t + 10				
12	t + i				

Table 46. Carbon stock change factor for final classes flc or zones z (Table 20b of VM0015).

Year after deforestation		ΔCtot*cl,t*
1	t	6.0
2	t + 1	6.0
3	t + 2	6.0
4	t + 3	6.0
5	t + 4	6.0

6	t + 5	6.0
7	t + 6	6.0
8	t + 7	6.0
9	t + 8	6.0
10	t + 9	6.0
11	t + 10	
12	t + i	

For the calculation of the baseline changes in carbon stock in the Project Area (Table 48) and Leakage Belt (Table 49) for year *t* we used Method 1 of VM0015 version 1.1, according to Equation 10 on page 72 of VM0015 version 1.1, as follows:

$$\Delta CBSLPA_t = \sum_{p=1}^{P}\left(\sum_{icl=1}^{Icl} ABSLPA_{icl,t} * \Delta Cp_{icl,t=t*} - \sum_{z=1}^{Z} ABSLPA_{z,t} * \Delta Cp_{z,t=t*} + \sum_{icl=1}^{Icl} ABSLPA_{icl,t-1} * \Delta Cp_{icl,t=t*+1} - \sum_{z=1}^{Z} ABSLPA_{z,t-1} * \Delta Cp_{z,t=t*+1} + \sum_{icl=1}^{Icl} ABSLPA_{icl,t-2} * \Delta Cp_{icl,t=t*+2} - \sum_{z=1}^{Z} ABSLPA_{z,t-2} * \Delta Cp_{z,t=t*+2} + \cdots + \sum_{icl=1}^{Icl} ABSLPA_{icl,t-19} * \Delta Cp_{icl,t=t*+19} - \sum_{z=1}^{Z} ABSLPA_{z,t-19} * \Delta Cp_{z,t=t*+19}\right) \quad (10)$$

Where:

ΔCBSLPAt: Total baseline carbon stock change within the project area at year t (tCO2-e)

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

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

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

ΔCpicl,t=t*: Average carbon stock change factor for carbon pool pin the initial forest class *icl* applicable at time *t* (as per Table 20.a) (tCO2-e.ha^{-1});

ΔCpicl,t=t*+19: Average carbon stock change factor for carbon pool pin the initial forest class *icl* applicable at time t=t*+19 (20thyear after deforestation, (as per Table 20.a) (tCO2-e.ha^{-1});

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

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

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

ΔCpz,t=t*: Average carbon stock change factor for carbon pool pin zone *z* applicable at time *t* = *t** (as per Table 20.b) (tCO2-e.ha^{-1});

ΔCpz,t=t+1: Average carbon stock change factor for carbon pool pin zone *z* applicable at time *t* = *t**+1 ((=2nd year after deforestation, as per Table 20.b) (tCO2-e.ha^{-1});

ΔCpz,t=t*+19: Average carbon stock change factor for carbon pool pin zone *z* applicable at time *t* = *t**+19 ((=20th year after deforestation, as per Table 20.b) (tCO2-e.ha^{-1}).

Table 47. Baseline carbon stock changes in the above-groud biomass in the Project Area (Table 21b of VM0015).

Above-groud biomass per initial forest class *icl*		Total carbon stock change in the above-groud biomass of the initial forest classes in the Project Area	Carbon stock changes in above-groud biomass per post-deforestation zone Z	Total carbon stock change in the above-groud biomass of post-deforestation zones in the Project Area	Total net carbon sock change in the above-groud biomass of the Project Area	
IDicl>	1	ΔCBSLPAicl	1	ΔCBSLPAz	ΔCBSLPAt	ΔCBSLPA
Name>	Forest	cumulative	Zone 1	cumulative	annual	cumulative
Project yeart	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO2-e
2022	15,138	15,138	0	0	15,138	15,138
2023	313,662	328,800	183	183	313,479	328,617
2024	207,680	536,479	3,845	4,028	203,835	532,452
2025	277,832	814,311	6,190	10,218	271,641	804,093
2026	198,605	1,012,917	9,230	19,448	189,376	993,469
2027	212,375	1,225,292	11,336	30,784	201,039	1,194,508
2028	139,056	1,364,348	13,522	44,305	125,534	1,320,042
2029	113,616	1,477,964	14,912	59,217	98,705	1,418,747
2030	133,081	1,611,045	16,015	75,232	117,065	1,535,812
2031	84,300	1,695,345	17,273	92,506	67,027	1,602,839
2032	124,659	1,820,004	18,049	110,554	106,611	1,709,450
2033	21,339	1,841,343	19,013	129,567	2,326	1,711,776
2034	61,384	1,902,727	15,547	145,115	45,837	1,757,613
2035	87,850	1,990,577	13,767	158,881	74,083	1,831,696
2036	43,024	2,033,601	11,536	170,417	31,489	1,863,185
2037	40,190	2,073,791	9,825	180,242	30,364	1,893,549
2038	18,086	2,091,877	8,009	188,251	10,076	1,903,625
2039	14,321	2,106,197	6,786	195,037	7,535	1,911,160
2040	6,341	2,112,538	5,814	200,851	527	1,911,687
2041	4,411	2,116,949	4,614	205,465	-203	1,911,484
2042	8,533	2,125,482	3,879	209,344	4,654	1,916,137
2043	4,185	2,129,667	2,811	212,155	1,374	1,917,512
2044	2,896	2,132,562	2,653	214,808	243	1,917,755
2045	592	2,133,155	2,115	216,923	-1,523	1,916,232
2046	2,278	2,135,432	1,312	218,234	966	1,917,198
2047	651	2,136,083	937	219,171	-286	1,916,912
2048	4,124	2,140,207	573	219,745	3,551	1,920,463
2049	974	2,141,181	445	220,189	529	1,920,992
2050	0	2,141,181	322	220,511	-322	1,920,670
2051	1,080	2,142,261	264	220,775	816	1,921,487
2052	1,476	2,143,737	233	221,008	1,243	1,922,729

Table 48. Baseline carbon stock change in the aboveground biomass in the Leakage Belt (Table 21c of VM0015).

Abovegroud biomass per initial forest class *icl*		Total carbon stock change in the above-groud biomass of the initial forest classes in the Leakage Belt	Carbon stock changes in above-groud biomass per post-deforestation zone Z	Total carbon stock change in the above-groud biomass of post-deforestation zones in the Leakage Belt	Total net carbon sock change in the above-groud biomass of the Leakage Belt	
IDicl>	1	ΔCBSLLKicl	1	ΔCBSLLKz	ΔCBSLLKt	ΔCBSLLK
Name>	Forest	cumulative	Zone 1	cumulative	annual	cumulative
Project yeart	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO2-e
2022	0	0	0	0	0	0
2023	1,286,980	1,286,980	0	0	1,286,980	1,286,980
2024	1,200,183	2,487,163	15,025	15,025	1,185,158	2,472,138
2025	1,414,487	3,901,650	28,581	43,606	1,385,906	3,858,044
2026	1,068,032	4,969,682	44,054	87,660	1,023,977	4,882,021
2027	1,016,985	5,986,667	55,381	143,041	961,604	5,843,626
2028	885,866	6,872,533	65,847	208,889	820,019	6,663,645
2029	948,994	7,821,528	74,702	283,590	874,292	7,537,937
2030	903,803	8,725,330	83,922	367,512	819,881	8,357,818
2031	711,793	9,437,123	92,464	459,976	619,329	8,977,147
2032	598,141	10,035,264	99,013	558,990	499,127	9,476,274
2033	573,915	10,609,179	104,517	663,506	469,398	9,945,672
2034	346,468	10,955,646	94,773	758,279	251,695	10,197,367
2035	429,913	11,385,560	84,404	842,683	345,509	10,542,876
2036	279,992	11,665,552	72,887	915,570	207,105	10,749,982
2037	218,857	11,884,408	64,136	979,706	154,721	10,904,703
2038	234,916	12,119,324	55,684	1,035,389	179,232	11,083,935
2039	208,506	12,327,830	48,991	1,084,380	159,515	11,243,450
2040	166,829	12,494,659	41,689	1,126,069	125,140	11,368,590
2041	72,696	12,567,355	34,682	1,160,751	38,014	11,406,604
2042	111,735	12,679,090	28,801	1,189,552	82,934	11,489,538
2043	68,134	12,747,225	24,326	1,213,878	43,808	11,533,347
2044	66,886	12,814,111	19,672	1,233,550	47,214	11,580,561
2045	46,624	12,860,735	17,100	1,250,650	29,524	11,610,085
2046	63,697	12,924,433	13,573	1,264,224	50,124	11,660,209
2047	48,925	12,973,358	11,583	1,275,807	37,342	11,697,551
2048	38,233	13,011,591	10,019	1,285,826	28,213	11,725,765
2049	15,777	13,027,368	8,210	1,294,036	7,567	11,733,332
2050	15,061	13,042,428	6,436	1,300,472	8,624	11,741,956
2051	5,449	13,047,877	5,040	1,305,512	409	11,742,365
2052	16,018	13,063,895	4,421	1,309,934	11,597	11,753,961

Baseline non-CO2 emissions from forest fires (Step 6.2 of VM0015)

Non-CO_2 emissions were not included and accounted for in this project.

3.2.2 Project Emissions

Ex ante estimation of actual carbon stock changes and non-CO2 emissions in the Project Area (Step 7 of VM0015)

Ex ante estimation of actual carbon stock changes (Step 7.1)

Planned deforestation (Step 7.1.1)

Furthermore, low-impact selective logging (called sustainable forestry management in Brazil) is planned to occur in four of the Project Activity Instances (PAI) that encompass the project area, according to current regulations. Maps of the farms were provided to the auditing team. The management plans will be developed to ensure that logging in the areas is done in a planned and sustainable manner. The regulation supporting the management plan development are IBAMA's Normative Instruction No. 4 (2002), the main regulatory instrument for forest management in the Brazilian Amazon, and Resolution/CEMAAM N. 35 of January 19, 2022, which deals with the general technical procedures for management plans in native forests in the State of Amazonas. The Management Plans will have a minimum exploitation cycle of 25 years with maximum exploitation intensity of 25m³ per hectare. Table 50 shows the details of the four PAI with planned sustainable logging, the area of Legal Reserve (forest measured), the area of Permanent Preservation Areas (APP) within the Legal Reserve, and the Forest Production Unit (UPF) or area to be explored, which consists of the area of Legal Reserve outside Permanent Preservation Areas protected by law. The trees to be logged will be species of economic potential with a diameter at breast height (DBH) greater than 40 cm previously identified with a wall-to-wall forest inventory in the UPFs. At least 10% of the individuals of tree species to be explored should remain in the area, and at least three individuals of that species per 100ha.

Table 49. PAIs with planned sustainable forest management plans for logging.

PAI #	Code	Farm name	Total area (ha)	Legal Reserve - LR (ha)	APP in LR (ha)	UPF (ha)
15	cadastro_59	Fazenda Pareão	387.3	254.0	29.2	224.8
17	cadastro_64	Fazenda Konoha	60.1	51.2	7.2	44.1
14	cadastro_58	Sítio Águas Claras	374.3	275.7	18.8	256.9
11	cadastro_53	Fazenda Paredão	413.2	271.3	33.8	237.6
Total			1,234.9	852.3	88.9	763.4

Planned deforestation for this logging operation will be less than 1.75% of the UPF area for trails, and 0,75% of the area for log storage areas, as Article 13, paragraphs I and II of CEMAAN Resolution n 35/2022, totaling 2.5% of the UPF area, or 19.09ha. Nevertheless, the total area for these infrastructures, based on Forest Engineer specialists, would be 1.25% or 11.45 ha (ex-ante estimate). The four PAI to be logged will conduct forest inventories throughout 2024, and plans to open infrastructure in 2025, to explore in the year 2026. The deforestation resulting from logging infrastructure will be monitored and measured in the ex-post scenario using the information from the post-exploratory reports and discounting the value in hectares of areas impacted.

Table 50. Ex ante estimated actual carbon stock decrease due to planned deforestation in the Project Area (Table 25a of VM0015)

Project Year	Areas of planned deforestation x Carbon stock change (decrease) in the Project Area	Total carbon stock decrease due to planned deforestation

	ID Icl	1	annual	Cumulative
	APDPAicl,t	Ctoticl,t	ΔCPDdPAt	ΔCPDdPAt
	ha	tCO2eha-1	tCO2e	tCO2e
2022	0.0	0.0	0.0	0.0
2023	0.0	0.0	0.0	0.0
2024	11.5	7,466.5	7,466.5	7,466.5
2025	0.0	0.0	0.0	7,466.5
2026	0.0	0.0	0.0	7,466.5
2027	0.0	0.0	0.0	7,466.5
2028	0.0	0.0	0.0	7,466.5
2029	0.0	0.0	0.0	7,466.5
2030	0.0	0.0	0.0	7,466.5
2031	0.0	0.0	0.0	7,466.5
2032	0.0	0.0	0.0	7,466.5
2033	0.0	0.0	0.0	7,466.5
2034	0.0	0.0	0.0	7,466.5
2035	0.0	0.0	0.0	7,466.5
2036	0.0	0.0	0.0	7,466.5
2037	0.0	0.0	0.0	7,466.5
2038	0.0	0.0	0.0	7,466.5
2039	0.0	0.0	0.0	7,466.5
2040	0.0	0.0	0.0	7,466.5
2041	0.0	0.0	0.0	7,466.5
2042	0.0	0.0	0.0	7,466.5
2043	0.0	0.0	0.0	7,466.5
2044	0.0	0.0	0.0	7,466.5
2045	0.0	0.0	0.0	7,466.5
2046	0.0	0.0	0.0	7,466.5
2047	0.0	0.0	0.0	7,466.5
2048	0.0	0.0	0.0	7,466.5
2049	11.5	7,466.5	7,466.5	14,933.1
2050	0.0	0.0	0.0	14,933.1
2051	0.0	0.0	0.0	14,933.1
2052	0.0	0.0	0.0	14,933.1

Planned logging.

The planned logging activity following CEMAAM Resolution n.35/2022 can be considered reduced impact logging as the activities are planned to minimize environmental impacts and waste. Such techniques will minimize damage to the forest. The legislation applied to this practice allows a logging intensity of 25 m^3 per ha, but according to specialists, the average is usually lower than that (see, for instance, Jari/Pará REDD+ Project, VCS Project ID 1811), which reported exploration of 21.30m^3 per ha. Local forest engineers estimated the total logging intensity in these properties would be around 18m^3 per ha, with 2 individuals explored per hectare on average, similar to those reported in Barros & Veríssimo (2002), which would damage around 13 individuals with DBH over 10cm. West et al. (2014) studied this type of logging (same regulated by the CEMAAM) where 4.5 trees per ha were extracted, totaling 38.6m^3 per ha, and found that this logging recovered 100% of its above-ground biomass within 16 years after the area is logged. Based on this study, we assume that the 25-year exploration cycle will not change the long-term average carbon stocks for the forests in the project.

Fuel-wood collection and charcoal production

No fuel-wood collection or charcoal production is expected in the project area, as the survey with project participants pointed out.

Table 52 presents the the ex-ante estimate of carbon stock reductions due to planned activities by the project.

Table 51. Total ex ante carbon stock decrease due to planned activities in the Project Area (Table 25d of VM0015).

Project year *t*	Total carbon stock decrease due to planned deforestation		Total carbon stock decrease due to planned logging activities		Total carbon stock decrease due to planned fuel-wood and charcoal activities		Total carbon stock decrease due to planned activities	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$DCPDdPA_t$	$DCPDdPA$	$DCPLdPA_t$	$DCPLdPA$	$DCPFdPA_t$	$DCPFdPA$	$DCPAdPA_t$	$DCPAdPA$
	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2022	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2023	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2024	7,466.5	7,466.5	0.0	0.0	0.0	0.0	7,466.5	7,466.5
2025	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2026	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2027	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2028	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2029	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2030	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2031	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2032	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2033	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2034	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2035	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2036	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2037	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2038	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2039	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2040	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2041	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2042	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2043	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2044	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2045	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2046	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2047	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2048	0.0	7,466.5	0.0	0.0	0.0	0.0	0.0	7,466.5
2049	7,466.5	14,933.1	0.0	0.0	0.0	0.0	7,466.5	14,933.1
2050	0.0	14,933.1	0.0	0.0	0.0	0.0	0.0	14,933.1
2051	0.0	14,933.1	0.0	0.0	0.0	0.0	0.0	14,933.1
2052	0.0	14,933.1	0.0	0.0	0.0	0.0	0.0	14,933.1

Optional accounting of significant carbon stock increase

The ex-ante estimate of the increase in carbon stock by regeneration after management activities was not considered.

Ex ante estimation of carbon stock changes due to unavoidable unplanned deforestation within the Project Area (Step 7.1.2)

The project expects no significant unavoidable unplanned deforestation in the project scenario, as project activities and effective monitoring have already been implemented. Nevertheless, unplanned deforestation might happen in the project area despite of the project's efforts, but this can't be estimated ex-ante. Ex-post measures will be assessed according to the Monitoring Report. The level at which deforestation will be reduced in the project depends on the effectiveness of the proposed activities, which cannot be measured ex-ante. The ex-post measurements described in the Monitoring Reports will be important to determine the actual emission reductions.

The project had 30.48 ha of unavoidable unplanned deforestation within the project area of year 1, between 1 March and 31 August 2022, as explained in the project area definition in Section 3.1.3 Project Spatial Limits (Step 1.1 of VM0015). To allow ex-ante projections for the subsequent years, we conservatively assumed the effectiveness of the proposed project activities to define the Effectiveness Index (EI) to be 0.95 for project years 2 to 5. From year 6 afterward, effectiveness is expected to be 0.97. The estimated value of EI is used to multiply the baseline projections by the factor (1 - EI). The result was considered to be the ex-ante estimated emissions from unplanned deforestation in the project case. To calculate the ex-ante actual carbon stock change due to unavoidable unplanned deforestation, equation 16 of Methodology of VM0015 version 1.1 was used.

Ex-ante estimated net actual carbon stock changes in the Project Area (Step 7.1.3 of VM0015).

All ex-change expected changes in carbon stocks related to planned activities, unavoidable unplanned deforestation, and the project's effectiveness are presented in Table 53.

Table 52. Ex ante estimated net carbon stock change in the project area under the project scenario (Table 27 of VM0015).

Project year *t*	Total carbon stock decrease due to planned activities		Total carbon stock increase due to planned activities[51]		Total carbon stock decrease due to unavoided unplanned deforestation		Total carbon stock change in the project case	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$DCPAdPA_t$	DCPAdPA	DCPAiPAt	DCPAiPA	$DCUDdPA_t$	DCUDdPA	$DCPSPA_t$	DCPSPA
	tCO_2-e	tCO_2-e	tCO2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2022	0.0	0.0	0.0	0.0	15,138.1	15,138.1	15,138.1	15,138.1
2023	0.0	0.0	0.0	0.0	15,673.9	30,812.1	15,673.9	30,812.1
2024	7466.5	7466.5	0.0	0.0	10,191.7	41,003.8	17,658.3	48,470.3
2025	0.0	7466.5	0.0	0.0	13,582.1	54,585.9	13,582.1	62,052.4
2026	0.0	7466.5	0.0	0.0	9,468.8	64,054.7	9,468.8	71,521.2
2027	0.0	7466.5	0.0	0.0	6,031.2	70,085.8	6,031.2	77,552.4
2028	0.0	7466.5	0.0	0.0	3,766.0	73,851.9	3,766.0	81,318.4
2029	0.0	7466.5	0.0	0.0	2,961.1	76,813.0	2,961.1	84,279.5
2030	0.0	7466.5	0.0	0.0	3,512.0	80,325.0	3,512.0	87,791.5
2031	0.0	7466.5	0.0	0.0	2,010.8	82,335.8	2,010.8	89,802.3
2032	0.0	7466.5	0.0	0.0	3,198.3	85,534.1	3,198.3	93,000.6
2033	0.0	7466.5	0.0	0.0	69.8	85,603.9	69.8	93,070.4
2034	0.0	7466.5	0.0	0.0	1,375.1	86,979.0	1,375.1	94,445.5
2035	0.0	7466.5	0.0	0.0	2,222.5	89,201.5	2,222.5	96,668.0
2036	0.0	7466.5	0.0	0.0	944.7	90,146.1	944.7	97,612.7
2037	0.0	7466.5	0.0	0.0	910.9	91,057.1	910.9	98,523.6
2038	0.0	7466.5	0.0	0.0	302.3	91,359.4	302.3	98,825.9
2039	0.0	7466.5	0.0	0.0	226.0	91,585.4	226.0	99,051.9
2040	0.0	7466.5	0.0	0.0	15.8	91,601.2	15.8	99,067.7
2041	0.0	7466.5	0.0	0.0	-6.1	91,595.1	-6.1	99,061.6
2042	0.0	7466.5	0.0	0.0	139.6	91,734.7	139.6	99,201.3
2043	0.0	7466.5	0.0	0.0	41.2	91,775.9	41.2	99,242.5

2044	0.0	7466.5	0.0	0.0	7.3	91,783.2	7.3	99,249.8
2045	0.0	7466.5	0.0	0.0	-45.7	91,737.6	-45.7	99,204.1
2046	0.0	7466.5	0.0	0.0	29.0	91,766.5	29.0	99,233.1
2047	0.0	7466.5	0.0	0.0	-8.6	91,757.9	-8.6	99,224.5
2048	0.0	7466.5	0.0	0.0	106.5	91,864.5	106.5	99,331.0
2049	7466.5	14933.1	0.0	0.0	15.9	91,880.4	7,482.4	106,813.4
2050	0.0	14933.1	0.0	0.0	-9.7	91,870.7	-9.7	106,803.8
2051	0.0	14933.1	0.0	0.0	24.5	91,895.2	24.5	106,828.3
2052	0.0	14933.1	0.0	0.0	37.3	91,932.5	37.3	106,865.5

Ex-ante estimation of actual non-CO2 emissions from forest fires (Step 7.2 of VM0015)

Non-CO2 emissions were not considered and accounted for in this project.

Total ex-ante estimations for the project area (Step 7.3 of VM0015)

Table 54 presents the project area's expected net changes and non-CO2 emissions. Ex-post project emissions will be monitored and reported during the project lifetime.

Table 53. Total ex-ante estimated actual net carbon stock changes and emissions of non-CO2 gasses in the project area (Table 29 of VM0015).

Project year *t*	Total carbon stock decrease due to planned activities		Total carbon stock increase due to planned activities[51]		Total carbon stock decrease due to unavoided unplanned deforestation		Total carbon stock change in the project case		Total ex-ante estimated actual non-CO2 emissions from forest fires in the project area	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$DCPAdPA_t$	$DCPAdPA$	DCPAiPAt	$DCPAiPA$	$DCUDdPA_t$	$DCUDdPA$	$DCPSPA_t$	$DCPSPA$	$EBBPSPA_t$	$EBBPSPA$
	tCO_2-e	tCO_2-e	tCO2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2022	0.0	0.0	0.0	0.0	15,138.1	15,138.1	15,138.1	15,138.1	0.0	0.0
2023	0.0	0.0	0.0	0.0	15,673.9	30,812.1	15,673.9	30,812.1	0.0	0.0
2024	7,466.5	7,466.5	0.0	0.0	10,191.7	41,003.8	17,658.3	48,470.3	0.0	0.0
2025	0.0	7,466.5	0.0	0.0	13,582.1	54,585.9	13,582.1	62,052.4	0.0	0.0
2026	0.0	7,466.5	0.0	0.0	9,468.8	64,054.7	9,468.8	71,521.2	0.0	0.0
2027	0.0	7,466.5	0.0	0.0	6,031.2	70,085.8	6,031.2	77,552.4	0.0	0.0
2028	0.0	7,466.5	0.0	0.0	3,766.0	73,851.9	3,766.0	81,318.4	0.0	0.0
2029	0.0	7,466.5	0.0	0.0	2,961.1	76,813.0	2,961.1	84,279.5	0.0	0.0
2030	0.0	7,466.5	0.0	0.0	3,512.0	80,325.0	3,512.0	87,791.5	0.0	0.0
2031	0.0	7,466.5	0.0	0.0	2,010.8	82,335.8	2,010.8	89,802.3	0.0	0.0
2032	0.0	7,466.5	0.0	0.0	3,198.3	85,534.1	3,198.3	93,000.6	0.0	0.0
2033	0.0	7,466.5	0.0	0.0	69.8	85,603.9	69.8	93,070.4	0.0	0.0
2034	0.0	7,466.5	0.0	0.0	1,375.1	86,979.0	1,375.1	94,445.5	0.0	0.0
2035	0.0	7,466.5	0.0	0.0	2,222.5	89,201.5	2,222.5	96,668.0	0.0	0.0
2036	0.0	7,466.5	0.0	0.0	944.7	90,146.1	944.7	97,612.7	0.0	0.0
2037	0.0	7,466.5	0.0	0.0	910.9	91,057.1	910.9	98,523.6	0.0	0.0
2038	0.0	7,466.5	0.0	0.0	302.3	91,359.4	302.3	98,825.9	0.0	0.0
2039	0.0	7,466.5	0.0	0.0	226.0	91,585.4	226.0	99,051.9	0.0	0.0
2040	0.0	7,466.5	0.0	0.0	15.8	91,601.2	15.8	99,067.7	0.0	0.0
2041	0.0	7,466.5	0.0	0.0	-6.1	91,595.1	-6.1	99,061.6	0.0	0.0
2042	0.0	7,466.5	0.0	0.0	139.6	91,734.7	139.6	99,201.3	0.0	0.0
2043	0.0	7,466.5	0.0	0.0	41.2	91,775.9	41.2	99,242.5	0.0	0.0
2044	0.0	7,466.5	0.0	0.0	7.3	91,783.2	7.3	99,249.8	0.0	0.0
2045	0.0	7,466.5	0.0	0.0	-45.7	91,737.6	-45.7	99,204.1	0.0	0.0
2046	0.0	7,466.5	0.0	0.0	29.0	91,766.5	29.0	99,233.1	0.0	0.0
2047	0.0	7,466.5	0.0	0.0	-8.6	91,757.9	-8.6	99,224.5	0.0	0.0
2048	0.0	7,466.5	0.0	0.0	106.5	91,864.5	106.5	99,331.0	0.0	0.0
2049	7,466.5	14,933.1	0.0	0.0	15.9	91,880.4	7,482.4	106,813.4	0.0	0.0
2050	0.0	14,933.1	0.0	0.0	-9.7	91,870.7	-9.7	106,803.8	0.0	0.0
2051	0.0	14,933.1	0.0	0.0	24.5	91,895.2	24.5	106,828.3	0.0	0.0
2052	0.0	14,933.1	0.0	0.0	37.3	91,932.5	37.3	106,865.5	0.0	0.0

3.2.3 Leakage

Ex ante estimation of the decrease in carbon stocks and increase in GHG emissions due to leakage prevention measures (Step 8.1 of VM0015)

We expect that the leakage prevention measures implemented within the Project Area and Leakage Management Area, would prevent leakage. Income from expanding ranching activities will be replaced by coffee agroforestry production and payment for forest conservation. Environmental awareness will be increased with environmental education, activities fostering agroecological supply chains, and promoting women and youth entrepreneurship.

Leakage prevention measures will not use fertilization as activities being implemented are organic, relying on composting from materials from the harvests. Thus, no significant GHG emissions is expected to happen in the project scenario, and therefore leakage must not be accounted and ex-post monitoring will not be necessary. Also, leakage presention activities are not associated to other VCS or UNFCCC registered project activities.

Therefore, Steps 8.1.1, 8.1.2, 8.1.3 of VM0015 and associated tables are not applicable to this project.

Ex-ante estimation of the decrease in carbon stocks and increase in GHG emissions due to activity displacement leakage (Step 8.2 of VM0015).

Activities that will cause deforestation within the project area in the baseline case could be displaced outside the project boundary due to the implementation of the project. If carbon stocks in the leakage belt area will decrease more during project implementation than projected in the baseline case, this will be an indication that leakage due to displacement of baseline activities has occurred.

The ex-ante activity displacement leakage for this project is expected to be 0, as all project participants, owners of the 42 PAIs, participate in leakage prevention activities and project activities. All PAIs with forests will get compensation for conserving carbon stocks in their landholdings. Furthermore, most of them are adopting or extending their agroforest areas with the project implementation and would get extra income from it. Also, all areas within the leakage belt are not under the control of the project landowners, and it is highly unlikely that they will encroach into other forest areas elsewhere they do not control.

Even though leakage prevention activities are implemented in 100% of the baseline agents estimated (project participants), we assume the project's ex-ante estimated activity displacement leakage shall be equal to the factor of unavoidable unplanned deforestation reported above (Step 7.1.2), that is, 5% of total emissions of the baseline deforestation in the project area from year 2 to 5, and then 3%, as shown in Table CC. This displacement can occur when capitalized agents purchase nearby farms and perfom deforestation that could be done in the project area in the absence of the project. Ex-ante baseline assessment of the leakage belt was reported above in Table 54. (Table 29 of VM0015).

Nevertheless, the project will map project landowners' acquisition of new properties, and these will be included in the land use monitoring of the project. If it is the case that project participants acquire new lands and perform deforestation, these leakage displacement emissions will be calculated ex-post and reported in the Monitoring events.

Table 54. Ex-ante estimated leakage due to activity displacement (Table 34 of VM0015).

Project Year *t*	Total ex ante estimated decrease in carbon stocks due to displaced deforestation		Total ex ante estimated increase in GHG emissions due to displaced forest fires	
	annual	cumulative	annual	cumulative
	ΔCADLK*t*	ΔCADLK	EADLK*t*	EADLK
	tCO2e	tCO2e	tCO2e	tCO2e
2022	15,138.1	15,138.1	0.0	0.0
2023	15,673.9	30,812.1	0.0	0.0
2024	10,191.7	41,003.8	0.0	0.0
2025	13,582.1	54,585.9	0.0	0.0
2026	9,468.8	64,054.7	0.0	0.0
2027	6,031.2	70,085.8	0.0	0.0
2028	3,766.0	73,851.9	0.0	0.0
2029	2,961.1	76,813.0	0.0	0.0
2030	3,512.0	80,325.0	0.0	0.0
2031	2,010.8	82,335.8	0.0	0.0
2032	3,198.3	85,534.1	0.0	0.0
2033	69.8	85,603.9	0.0	0.0
2034	1,375.1	86,979.0	0.0	0.0
2035	2,222.5	89,201.5	0.0	0.0
2036	944.7	90,146.1	0.0	0.0
2037	910.9	91,057.1	0.0	0.0
2038	302.3	91,359.4	0.0	0.0
2039	226.0	91,585.4	0.0	0.0
2040	15.8	91,601.2	0.0	0.0
2041	-6.1	91,595.1	0.0	0.0
2042	139.6	91,734.7	0.0	0.0
2043	41.2	91,775.9	0.0	0.0
2044	7.3	91,783.2	0.0	0.0
2045	-45.7	91,737.6	0.0	0.0
2046	29.0	91,766.5	0.0	0.0
2047	-8.6	91,757.9	0.0	0.0
2048	106.5	91,864.5	0.0	0.0
2049	15.9	91,880.4	0.0	0.0
2050	-9.7	91,870.7	0.0	0.0
2051	24.5	91,895.2	0.0	0.0
2052	37.3	91,932.5	0.0	0.0

Ex-ante estimation of total leakage (Step 8.3 of VM0015)

Ex-ante estimation resulting from all sources of leakage are shown in Table DD.

Table 55. Ex-ante estimated total leakage (Table 35 of VM0015).

Project year *t*	Total *ex ante* GHG emissions from increased grazing activities		Total *ex ante* increase in GHG emissions due to displaced forest fires		Total *ex ante* decrease in carbon stocks due to displaced deforestation		Carbon stock decrease due to leakage prevention measures		Total net carbon stock change due to leakage		Total net increase in emissions due to leakage	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$EgLK_t$	$EgLK_t$	$EADLK_t$	$EADLK$	$DCADLK_t$	$DCADLK$	$DCLPMLKt$	$DCLPMLK$	$DCLK_t$	$DCLK$	ELK_t	ELK
	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2022	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0	0	0.0	0.0
2023	0.0	0.0	0.0	0.0	15,673.9	30,812.1	0.0	0.0	15,673.9	30,812.1	0.0	0.0
2024	0.0	0.0	0.0	0.0	10,191.7	41,003.8	0.0	0.0	10,191.7	41,003.8	0.0	0.0
2025	0.0	0.0	0.0	0.0	13,582.1	54,585.9	0.0	0.0	13,582.1	54,585.9	0.0	0.0
2026	0.0	0.0	0.0	0.0	9,468.8	64,054.7	0.0	0.0	9,468.8	64,054.7	0.0	0.0
2027	0.0	0.0	0.0	0.0	6,031.2	70,085.8	0.0	0.0	6,031.2	70,085.8	0.0	0.0
2028	0.0	0.0	0.0	0.0	3,766.0	73,851.9	0.0	0.0	3,766.0	73,851.9	0.0	0.0
2029	0.0	0.0	0.0	0.0	2,961.1	76,813.0	0.0	0.0	2,961.1	76,813.0	0.0	0.0
2030	0.0	0.0	0.0	0.0	3,512.0	80,325.0	0.0	0.0	3,512.0	80,325.0	0.0	0.0
2031	0.0	0.0	0.0	0.0	2,010.8	82,335.8	0.0	0.0	2,010.8	82,335.8	0.0	0.0
2032	0.0	0.0	0.0	0.0	3,198.3	85,534.1	0.0	0.0	3,198.3	85,534.1	0.0	0.0
2033	0.0	0.0	0.0	0.0	69.8	85,603.9	0.0	0.0	69.8	85,603.9	0.0	0.0
2034	0.0	0.0	0.0	0.0	1,375.1	86,979.0	0.0	0.0	1,375.1	86,979.0	0.0	0.0
2035	0.0	0.0	0.0	0.0	2,222.5	89,201.5	0.0	0.0	2,222.5	89,201.5	0.0	0.0
2036	0.0	0.0	0.0	0.0	944.7	90,146.1	0.0	0.0	944.7	90,146.1	0.0	0.0
2037	0.0	0.0	0.0	0.0	910.9	91,057.1	0.0	0.0	910.9	91,057.1	0.0	0.0
2038	0.0	0.0	0.0	0.0	302.3	91,359.4	0.0	0.0	302.3	91,359.4	0.0	0.0
2039	0.0	0.0	0.0	0.0	226.0	91,585.4	0.0	0.0	226.0	91,585.4	0.0	0.0
2040	0.0	0.0	0.0	0.0	15.8	91,601.2	0.0	0.0	15.8	91,601.2	0.0	0.0
2041	0.0	0.0	0.0	0.0	-6.1	91,595.1	0.0	0.0	-6.1	91,595.1	0.0	0.0
2042	0.0	0.0	0.0	0.0	139.6	91,734.7	0.0	0.0	139.6	91,734.7	0.0	0.0
2043	0.0	0.0	0.0	0.0	41.2	91,775.9	0.0	0.0	41.2	91,775.9	0.0	0.0
2044	0.0	0.0	0.0	0.0	7.3	91,783.2	0.0	0.0	7.3	91,783.2	0.0	0.0
2045	0.0	0.0	0.0	0.0	-45.7	91,737.6	0.0	0.0	-45.7	91,737.6	0.0	0.0
2046	0.0	0.0	0.0	0.0	29.0	91,766.5	0.0	0.0	29.0	91,766.5	0.0	0.0
2047	0.0	0.0	0.0	0.0	-8.6	91,757.9	0.0	0.0	-8.6	91,757.9	0.0	0.0
2048	0.0	0.0	0.0	0.0	106.5	91,864.5	0.0	0.0	106.5	91,864.5	0.0	0.0
2049	0.0	0.0	0.0	0.0	15.9	91,880.4	0.0	0.0	15.9	91,880.4	0.0	0.0
2050	0.0	0.0	0.0	0.0	-9.7	91,870.7	0.0	0.0	-9.7	91,870.7	0.0	0.0
2051	0.0	0.0	0.0	0.0	24.5	91,895.2	0.0	0.0	24.5	91,895.2	0.0	0.0
2052	0.0	0.0	0.0	0.0	37.3	91,932.5	0.0	0.0	37.3	91,932.5	0.0	0.0

3.2.4 Net GHG Emission Reductions and Removals

Significance assessment (Step 9.1 of VM0015)

Following the EB-CDM Approved Tool for testing significance of GHG emissions, we concluded that aboveground biomass contributes to 73.52%, belowground biomass to 0 19.77% and deadwood biomass to 6.75%, all significant and included in the GHG emission reductions.

Calculation of ex ante estimation of total net GHG emissions reductions (Step 9.2 of VM0015).

The Equation 19 suggested by VM0015, presented below, was used for the ex-ante estimation of the project emissions reductions, and the results are presented in Table 57.

$$\Delta REDD_t = (\Delta CBSLPA_t + EBBBSLPA_t) - (\Delta CPSPA_t + EBBPSPA_t) - (\Delta CLK_t + ELK_t) \quad (19)$$

Where:

$\Delta REDD_t$	*Ex ante* estimated net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year *t*; tCO_2e
$\Delta CBSLPA_t$	Sum of baseline carbon stock changes in the project area at year *t*; tCO_2e
	Note: The absolute values of $\Delta CBSLPA_t$ shall be used in equation 19.
$EBBBSLPA_t$	Sum of baseline emissions from biomass burning in the project area at year *t*; tCO_2e
$\Delta CPSPA_t$	Sum of *ex ante* estimated actual carbon stock changes in the project area at year *t*; tCO_2e
	Note: If $\Delta CPSPA_t$ represents a net increase in carbon stocks, a negative sign before the absolute value of $\Delta CPSPA_t$ shall be used. If $\Delta CPSPA_t$ represents a net decrease, the positive sign shall be used.
$EBBPSPA_t$	Sum of (*ex ante* estimated) actual emissions from biomass burning in the project area at year *t*; tCO_2e
ΔCLK_t	Sum of *ex ante* estimated leakage net carbon stock changes at year *t*; tCO_2e
	Note: If the cumulative sum of ΔCLK_t within a fixed baseline period is > 0, ΔCLK_t shall be set to zero.
ELK_t	Sum of *ex ante* estimated leakage emissions at year *t*; tCO_2e
t	1, 2, 3 … *T,* a year of the proposed project crediting period; dimensionless

Calculation of ex ante Verified Carbon Units (VCUs) (Step 9.3 of VM0015).

Equation 20 of VM0015 was applied to estimate the number of VCUs, as shown in Table 57. The non-permanence risk factor used obtained in the AFOLU Non-Permanence Risk Tool v4.0 was 12%.

Table 56. Ex ante estimated net anthropogenic GHG emissions reductions (DREDDt) and Verified Carbon Units (VCUt) (Table 36 of VM0015).

Project year *t*	Baseline carbon stock changes		Baseline GHG emissions		*Ex ante* project carbon stock changes		*Ex ante* project GHG emissions		*Ex ante* leakage carbon stock changes		*Ex ante* leakage GHG emissions		*Ex ante* net anthropogenic GHG emission reductions		*Ex ante* VCUs tradable		*Ex ante* buffer credits (12%)	
	annual	cum.	annual	cum.	annual	cum.	annual	cum.	annual	cum.	annual	cum.	annual	cum.	annual	cum.	annual	cum.
	DCBSLPAt	*DCBSLPA*	*EBBBSLPA$_t$*	*EBBBSLPA*	*DCPSPA$_t$*	*DCPSPA*	*EBBPSPA$_t$*	*EBBPSPA*	*DCLK$_t$*	*DCLK*	*ELK$_t$*	*ELK*	*DREDDt*	*DREDD*	*VCU$_t$*	*VCU*	*VBC$_t$*	*VBC*
	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2022	15,138	15,138	0	0	15,138	15,138	0	0	0	0	0	0	0	0	0	0	0	0
2023	313,479	328,617	0	0	15,674	30,812	0	0	15,674	30,812	0	0	282,131	282,131	246,394	246,394	35,737	35,737
2024	203,835	532,452	0	0	17,658	48,470	0	0	10,192	41,004	0	0	175,985	458,116	153,644	400,038	22,341	58,078
2025	271,641	804,093	0	0	13,582	62,052	0	0	13,582	54,586	0	0	244,477	702,593	213,510	613,548	30,967	89,045
2026	189,376	993,469	0	0	9,469	71,521	0	0	9,469	64,055	0	0	170,438	873,031	148,849	762,397	21,589	110,634
2027	201,039	1,194,508	0	0	6,031	77,552	0	0	6,031	70,086	0	0	188,977	1,062,008	165,576	927,973	23,401	134,035
2028	125,534	1,320,042	0	0	3,766	81,318	0	0	3,766	73,852	0	0	118,002	1,180,010	103,390	1,031,363	14,612	148,647
2029	98,705	1,418,747	0	0	2,961	84,280	0	0	2,961	76,813	0	0	92,782	1,272,792	81,293	1,112,656	11,489	160,136
2030	117,065	1,535,812	0	0	3,512	87,791	0	0	3,512	80,325	0	0	110,042	1,382,834	96,415	1,209,071	13,626	173,762
2031	67,027	1,602,839	0	0	2,011	89,802	0	0	2,011	82,336	0	0	63,005	1,445,839	55,203	1,264,275	7,802	181,564
2032	106,611	1,709,450	0	0	3,198	93,001	0	0	3,198	85,534	0	0	100,214	1,546,053	87,804	1,352,079	12,409	193,974
2033	2,326	1,711,776	0	0	70	93,070	0	0	70	85,604	0	0	2,187	1,548,240	1,916	1,353,995	271	194,245
2034	45,837	1,757,613	0	0	1,375	94,446	0	0	1,375	86,979	0	0	43,086	1,591,326	37,751	1,391,746	5,335	199,580
2035	74,083	1,831,696	0	0	2,222	96,668	0	0	2,222	89,201	0	0	69,638	1,660,964	61,015	1,452,761	8,623	208,203
2036	31,489	1,863,185	0	0	945	97,613	0	0	945	90,146	0	0	29,599	1,690,564	25,934	1,478,695	3,665	211,869
2037	30,364	1,893,549	0	0	911	98,524	0	0	911	91,057	0	0	28,543	1,719,107	25,008	1,503,703	3,534	215,403
2038	10,076	1,903,625	0	0	302	98,826	0	0	302	91,359	0	0	9,472	1,728,578	8,299	1,512,002	1,173	216,576
2039	7,535	1,911,160	0	0	226	99,052	0	0	226	91,585	0	0	7,083	1,735,661	6,206	1,518,208	877	217,453
2040	527	1,911,687	0	0	16	99,068	0	0	16	91,601	0	0	495	1,736,156	434	1,518,642	61	217,514
2041	-203	1,911,484	0	0	-6	99,062	0	0	-6	91,595	0	0	-191	1,735,965	-168	1,518,474	-24	217,491
2042	4,654	1,916,137	0	0	140	99,201	0	0	140	91,735	0	0	4,375	1,740,340	3,833	1,522,307	542	218,032
2043	1,374	1,917,512	0	0	41	99,242	0	0	41	91,776	0	0	1,292	1,741,631	1,132	1,523,439	160	218,192
2044	243	1,917,755	0	0	7	99,250	0	0	7	91,783	0	0	228	1,741,860	200	1,523,639	28	218,221
2045	-1,523	1,916,232	0	0	-46	99,204	0	0	-46	91,738	0	0	-1,431	1,740,428	-1,254	1,522,385	-177	218,043
2046	966	1,917,198	0	0	29	99,233	0	0	29	91,767	0	0	908	1,741,337	796	1,523,181	112	218,156
2047	-286	1,916,912	0	0	-9	99,224	0	0	-9	91,758	0	0	-269	1,741,067	-236	1,522,945	-33	218,122
2048	3,551	1,920,463	0	0	107	99,331	0	0	107	91,864	0	0	3,338	1,744,405	2,925	1,525,870	413	218,536
2049	529	1,920,992	0	0	7,482	106,813	0	0	16	91,880	0	0	-6,969	1,737,436	-6,135	1,519,735	-834	217,701
2050	-322	1,920,670	0	0	-10	106,804	0	0	-10	91,871	0	0	-303	1,737,134	-265	1,519,470	-37	217,664
2051	816	1,921,487	0	0	24	106,828	0	0	24	91,895	0	0	768	1,737,901	672	1,520,142	95	217,759
2052	1,243	1,922,729	0	0	37	106,866	0	0	37	91,932	0	0	1,168	1,739,069	1,023	1,521,166	145	217,904

3.3 Monitoring

3.3.1 Data and Parameters Available at Validation

The data parameters presented below will remain fixed throughout the first 10 years of the project crediting period, unless changes in the REDD+ AUD methodologies require recalculation.

Table 57. Parameter aboveground carbon stock in forest class Icl 1

Data / Parameter	Cab_{icl}
Data unit	$tCO2\text{-}e.ha^{-1}$
Description	Aboveground carbon stock in forest class Icl 1
Source of data	4th LULUCF National Communication to the UNFCC., table 23. (Brazil, 2020)
Value applied	479.4 $tCO2\text{-}e.ha^{-1}$
Justification of choice of data or description of measurement methods and procedures applied	This data is recent and uses forest Inventories and LIDAR mapping to determine average forest aboveground biomass for Amazonian Forests. The value was obtained applying a weighted area mean for the main subtypes of forest within the Project Area using IBGE Vegetation classes. Requirement of VM0015 v.1.1. of existing appropriate data
Purpose of data	-Calculation of baseline emissions -Calculation of project emissions -Calculation of leakage belt emissions
Comments	

Table 58. Parameter belowground carbon stock in forest class Icl 1

Data / Parameter	Cbb_{icl}
Data unit	$tCO2\text{-}e.ha^{-1}$
Description	Belowground carbon stock in forest class Icl 1
Source of data	4th AFOLU National Communication to the UNFCC, table 23. Using expansion factor (root-to-shoot biomass) of Nogueira et al. (2008), and Miranda et al. (2014). The value was obtained applying a weighted area mean for the main subtypes of forest within the Project Area using IBGE Vegetation classes.
Value applied	128.9 $tCO2\text{-}e.ha^{-1}$
Justification of choice of data or description of measurement methods and procedures applied	Requirement of VM0015 v.1.1. of existing appropriate data
Purpose of data	-Calculation of baseline emissions

	-Calculation of project emissions -Calculation of leakage belt emissions
Comments	

Table 59. Parameter dead wood carbon stock in forest class Icl 1

Data / Parameter	Cdw_{icl}
Data unit	$tCO2\text{-}e.ha^{-1}$
Description	Dead wood carbon stock in forest class Icl 1
Source of data	4th AFOLU National Communication to the UNFCC., table 23. Using expansion factor of Nogueira et al. (2008), and Barbosa and Fearnside (2005). The value was obtained applying a weighted area mean for the main subtypes of forest within the Project Area using IBGE Vegetation classes.
Value applied	$43.8\ tCO2\text{-}e.ha^{-1}$
Justification of choice of data or description of measurement methods and procedures applied	Requirement of VM0015 v.1.1. of existing appropriate data
Purpose of data	-Calculation of baseline emissions -Calculation of project emissions -Calculation of leakage belt emissions
Comments	

Table 60. Parameter average carbon stock of all accounted carbon pools in zone z

Data / Parameter	Ctotz
Data unit	$tCO2\text{-}e.ha^{-1}$
Description	Average carbon stock of all accounted carbon pools in zone z
Source of data	Fearnside 1996, augmented by 30% according to the methodology VM0015.
Value applied	$60\ tCO2\text{-}e.ha^{-1}$
Justification of choice of data or description of measurement methods and procedures applied	Requirement of VM0015 v.1.1. of existing appropriate data
Purpose of data	-Calculation of baseline emissions -Calculation of project emissions -Calculation of leakage belt emissions
Comments	

Table 61. Parameter cumulative area of forest cover converted into non-forest cover areas within the reference region in the baseline case

Data / Parameter	ABSLRR
Data unit	Hectares (ha)
Description	Cumulative area of forest cover converted into non-forest cover areas within the reference region in the baseline case
Source of data	Spatial location of deforestation modeling exercise, described in Step 4.2 of Methodology.
Value applied	*332,142.7 ha (years 2022 to 2031)*
Justification of choice of data or description of measurement methods and procedures applied	Requirement of VM0015 v.1.1. for defining the spatial location of future deforestation.
Purpose of data	Determination of the baseline scenario in the Reference Region
Comments	ABSLRR,t was applied for each time t.

Table 62. Parameter cumulative area of forest cover converted into non-forest cover areas within the project area in the baseline case

Data / Parameter	ABSLPA
Data unit	Hectares (ha)
Description	Cumulative area of forest cover converted into non-forest cover areas within the project area in the baseline case
Source of data	Spatial location of deforestation modeling exercise, described in Step 4.2 of Methodology.
Value applied	*3,008,01 ha (years 2022 to 2031)*
Justification of choice of data or description of measurement methods and procedures applied	Requirement of VM0015 v.1.1. for defining the spatial location of future deforestation.
Purpose of data	Determination of the baseline scenario in the Project area
Comments	ABSLPA,t was applied for each time t. according to table 9b of VM0015

Table 63. Parameter cumulative area of forest cover converted into non-forest cover areas within the leakage belt in the baseline case

Data / Parameter	ABSLLK
Data unit	Hectares (ha)
Description	Cumulative area of forest cover converted into non-forest cover areas within the leakage belt in the baseline case

Source of data	Spatial location of deforestation modeling exercise, described in Step 4.2 of Methodology.
Value applied	*16,502.2 ha (years 2022 to 2031)*
Justification of choice of data or description of measurement methods and procedures applied	Requirement of VM0015 v.1.1. for defining the spatial location of future deforestation.
Purpose of data	Determination of the baseline scenario in the leakage belt
Comments	ABSLLKicl,t was applied for each time t. according to table 9c of VM0015

3.3.2 Data and Parameters Monitored

Table 64. Parameter area deforested in forest class Icl 1 converted to non-forest within the project area at year *t*

Data / Parameter	ABSLPAicl,t
Data unit	Hectares (ha)
Description	Area deforested in forest class Icl 1 converted to non-forest within the project area at year *t*
Source of data	Calculated using remote sensing techniques of satellite imagery and collecting of ground points using GPS devices
Description of measurement methods and procedures to be applied	Calculated through remote sensing satellite images and field confirmation. When PRODES systems data or other VCS activity data are not available, monitoring will be done via supervised classification techniques that follow all methodological requirements set by VM0015 v.1.1.
Frequency of monitoring/recording	At each verification period
Value applied	Annual average deforestation within the PA was estimated to be 300.8ha for the first 10 years.
Monitoring equipment	Satellite images, GIS softwares ,GPS devices, and Photographic devices.
QA/QC procedures to be applied	Satellite images of spatial resolution from 10 to 30m will be used at a minimum mapping unit of 1ha. Supervised classification will be assessed via collecting ground control points with GPS devices and higher resolution imagery provided by Planet Constellation. The

	minimum global accuracy shall be 90% and each class shall be 80%.
Purpose of data	Calculation of project emissions reductions
Calculation method	Remote Sensing: Supervised classification using satellite imagery and control points, providing accuracy assessment
Comments	

Table 65. Parameter area deforested in forest class Icl 1 converted to non-forest within the leakage belt at year *t*

Data / Parameter	ABSLLKicl,t
Data unit	Hectares (ha)
Description	Area deforested in forest class Icl 1 converted to non-forest within the leakage belt at year *t*
Source of data	Calculated using remote sensing techniques of satellite imagery and collecting of ground points using GPS devices
Description of measurement methods and procedures to be applied	Calculated through remote sensing satellite images and field confirmation. When PRODES systems data or other VCS activity data are not available, monitoring will be done via supervised classification techniques that follow all methodological requirements set by VM0015 v.1.1.
Frequency of monitoring/recording	At each verification period
Value applied	Annual average deforestation within the LK was estimated to be 1650.2 for the first 10 years.
Monitoring equipment	Satellite images, GIS softwares ,GPS devices, and Photographic devices.
QA/QC procedures to be applied	Satellite images of spatial resolution from 10 to 30m will be used at a minimum mapping unit of 1ha. Supervised classification will be assessed via collecting ground control points with GPS devices and higher resolution imagery provided by Planet Constellation. The minimum global accuracy shall be 90% and each class shall be 80%.
Purpose of data	Calculation of project emissions reductions

Calculation method	Remote Sensing: Supervised classification using satellite imagery and control points, providing accuracy assessment
Comments	

Table 66. Parameter Area deforested in forest class Icl 1 for construction of storage areas, and trails for selective logging within the project area at year t

Data / Parameter	APDPAicl,t
Data unit	Hectares (ha)
Description	Area deforested in forest class Icl 1 for construction of storage areas, and trails for selective logging within the project area at year *t*
Source of data	Calculated using remote sensing techniques of satellite imagery and collecting of ground points using GPS devices
Description of measurement methods and procedures to be applied	Calculated through remote sensing satellite images and field confirmation. When PRODES systems data or other VCS activity data are not available, monitoring will be done via supervised classification techniques that follow all methodological requirements set by VM0015 v.1.1.
Frequency of monitoring/recording	At each verification period
Value applied	Total deforestation within the PA for this planned deforestation was estimated to be 11.5ha for the first 10 years.
Monitoring equipment	Satellite images, GIS softwares ,GPS devices, and Photographic devices.
QA/QC procedures to be applied	Satellite images of spatial resolution from 10 to 30m will be used at a minimum mapping unit of 1ha. Supervised classification will be assessed via collecting ground control points with GPS devices and higher resolution imagery provided by Planet Constellation. The minimum global accuracy shall be 90% and each class shall be 80%.
Purpose of data	Calculation of project emissions reductions
Calculation method	Remote Sensing: Supervised classification using satellite imagery and control points, providing accuracy assessment
Comments	

3.3.3 Monitoring Plan

Monitoring changes in carbon stocks and GHG emissions for periodic verification

- Monitoring actual changes in carbon stocks and GHG emission in the project area;
- Monitoring leakage;
- Ex-post calculation of GHG emission reductions
- Monitoring the impacts of natural disturbances and other catastrophic events.

1.Monitoring actual changes in carbon stocks and GHG emissions in the project area.

1.1.Monitor the implementation of the project.

This task will be the responsibility of Idesam and Amazônia Agroflorestal..

The activities implemented within the project area will be monitored continuously. Financial and technical reports will be submitted for project activities. Of particular importance is the implementation monitoring of fire and forest cover, the agroforestry production and the training and operations of the fire brigades.

Maps, reports and records will be available to VCS/CCB VVB auditors at each validation event. For information on QA / QC, please see the Supplementary Material.

1.2. Monitoring change and land use within the project area.

This will be the responsibility of Idesam, conducting a plan according to the description of deforestation monitoring outlined above, and will generate the corresponding parameters contained in Appendix V of the Methodology VM0015 v1.1.

The project will use LANDSAT and Sentinel imagery to generate annual deforestation data throughout the Project Zone, using the supervised imagery classification. This analysis will generate deforestation and forested areas, updated every two years, and will be compared with previous years. Deforestation estimates obtained from this analysis will be compared with the projected deforestation maps described in section 3, and differences between projected and observed values will be presented for each the verification period.

1.3. Forested areas carbon stocks.

Monitoring of forest carbon stocks are not planned to be monitored in the first ten years of the project.

However, if the project decides to do so, this task will be the responsibility of Idesam. The carbon stocks monitoring plan. This phase will take place in conjunction with the training of field workers. Idesam will provide technical assistance for monitoring and benchmark data as well as technical assistance for continued monitoring if the service is done by a third part.

It will not be necessary to monitor changes in carbon stock of non-CO2 gases from forest fires as this will not change during the project period and it is not expected to be a significant reduction in carbon stocks it is not expected in the project scenario. In the event of significant losses due to forest fires or catastrophic events, these areas will be monitored.

It is expected that the leakage management areas will increase their stock of carbon during the project but, as the area and the stock would be insignificant, these areas are not monitored.

1.4. Monitoring of the impacts of natural disturbances and other catastrophic events.

If there are catastrophic events during the project, these will be evaluated and reported for the project area if they are significant. Monitoring will follow tables 20.e, 20.f, 20.g to report reductions except in case of forest fires, where tables 18 and 19 of the VM0015 v1.1 will be used.

2. Monitoring leakage

Following the methodology, the following will be monitored

2.1.Reduction of carbon stocks and GHG emissions due to activity shifting leakage.

This project is not expected to cause any kind of leakage. In any case, deforestation will be monitored annually throughout the leakage belt. If some deforestation occurs in excess of the baseline values in the leakage belt during the project period, the loss of carbon stocks will be accounted for using the current values of carbon stock per hectare of the forest class, and will be deducted from the non- permanence buffer.

3. Total estimates ex-post leakage.

Results are presented in the same way as the ex-ante estimation of leakage.

4. Anthropogenic GHG reductions ex post.

As per the methodology VM0015 v1.1, the same procedure will be used as to calculate ex-ante emissions, except the ex-post estimates of changes in carbon stocks and GHG emissions should be used in the case of leakage in the project scenario.

Increases or reductions of GHG associated with preventive measures for leakage will not be monitored since stocks contained in the leakage management area are not significant.

3.3.4 Dissemination of Monitoring Plan and Results (CL4.2)

The Project will be continuously monitored according to the standards used, and always in line with provisions discussed in a horizontal and participatory manner, through the Advisory Board, and the Project Management Committee. Project participants and stakeholders will have continuous access to all the information and data related to the monitoring of the Project's actions and environmental, land tenure and socio-economic indicators, receiving, as described in sections 2.3.14 – Worker Training and 2.3.15 – Community Employment, continuous training.

The plan and monitoring of project activities related to the climate, presented in section 3.3.3 - Monitoring Plan, will be available to the communities involved and project stakeholders through the communication channels described in section 2.3.2 - Dissemination of Summary Project Documents.

To facilitate the access of rural family farmers to the material, the monitoring plan of all project activities will be available at Idesam's headquarters in Apuí, and will be presented by project technicians during periodic meetings about the project, as scheduled in section 2.3 .8 - Continued Consultation and Adaptive Management.

Details on monitoring plan and monitoring plan dissemination for community and biodiversity are presented in sections 4.4 – Community Impact Monitoring and 5.4 – Biodiversity Monitoring.

3.4 Optional Criterion: Climate Change Adaptation Benefits

Agroforestry recover of degraded pastures, adapting to climate change and effects of droughts.

3.4.1 Regional Climate Change Scenarios (GL1.1)

Climate change has a significant impact on the Amazon rainforest, leading to changes in land use. Rising temperatures and changes in precipitation patterns are causing shifts in the distribution of plant and animal species, as well as changes in the structure and function of the forest. Drought and increased frequency of fires are also major concerns, as they can lead to deforestation and degradation of the forest. Near-surface air temperatures are projected to raise 2 to 6 degrees Celsius by 2100, according to RCP2.6 and RCP8.5, respectively (Magrin et al, 2014, Fig 27-2).

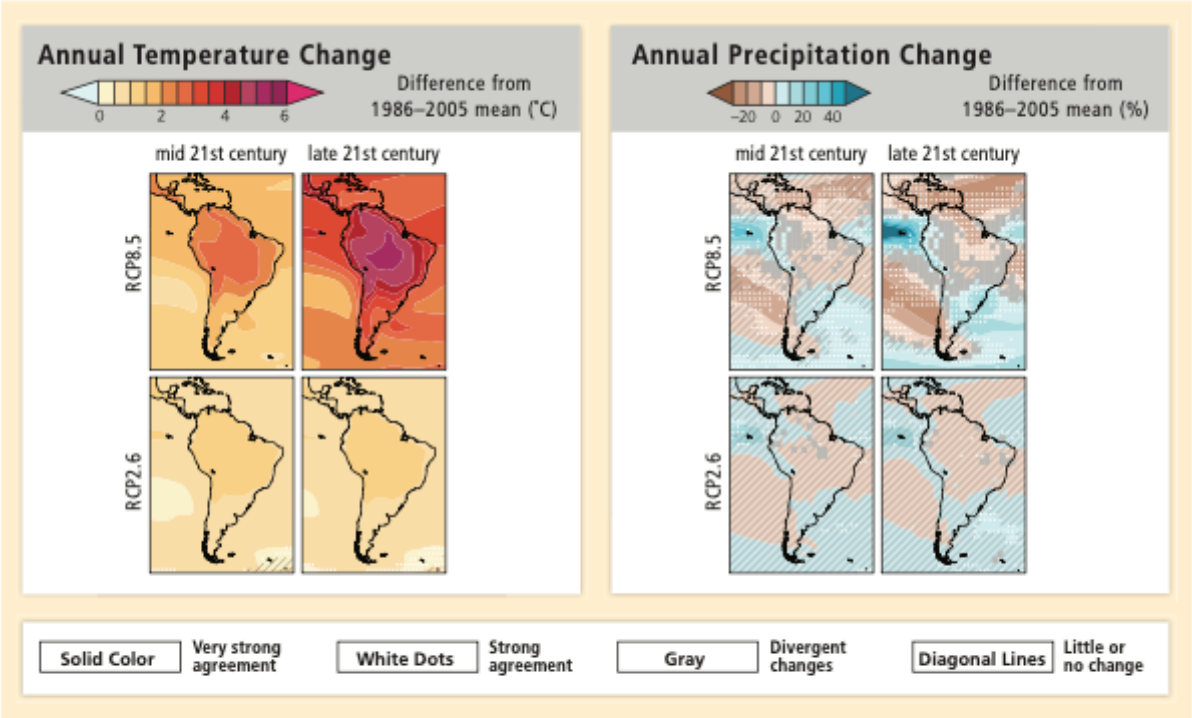

Figure 27-2 | Projected changes in annual average temperature and precipitation. CMIP5 multi-model mean projections of annual average temperature changes (left panel) and average percent changes in annual mean precipitation (right panel) for 2046–2065 and 2081–2100 under RCP2.6 and 8.5, relative to 1986–2005. Solid colors indicate areas with very strong agreement, where the multi-model mean change is greater than twice the baseline variability (natural internal variability in 20-yr means) and ≥90% of models agree on sign of change. Colors with white dots indicate areas with strong agreement, where ≥66% of models show change greater than the baseline variability and ≥66% of models agree on sign of change. Gray indicates areas with divergent changes, where ≥66% of models show change greater than the baseline variability, but <66% agree on sign of change. Colors with diagonal lines indicate areas with little or no change, where <66% of models show change greater than the baseline variability, although there may be significant change at shorter timescales such as seasons, months, or days. Analysis uses model data and methods building from WGI AR5 Figure SPM.8. See also Annex I of WGI AR5. [Boxes 21-2 and CC-RC]

Figure 44. Projected changes in annual average temperature and precipitation. (source: Magrin et al. 2014)

By 2100, mild and severe droughts are predicted to double and triple in area within the Amazon region, respectively, at the same time that wet extremes will increase in area (Duffy et al., 2015). More extreme and prolonged droughts are likely to expose deep-rooted trees to water stress that can induce greater mortality rates than in shallow-rooted tree species (Chitra-Tarak et al. 2018). Based on Earth System Modeling that accounts for simultaneous effects of fires, water stress, and plant competition, a recent study suggests that up to 40% of Amazon forests may begin to convert to savanna before mid-century under high emission scenarios (Cano et al. 2022). However, the regions that it is predicted to happen are more in the southern and eastern flanks of the Brazilian Amazon, where annual precipitation are lower than in the Reference Region of the project, exacerbating the effects of forest fires (Nobre and Borma, 2009, Sampaio et al. 2018, Brando et al. 2020).

Land use change contributes significantly to environmental degradation, exacerbating the effects of climate change (Magrin et al. 2014). Changes in weather and climatic patterns negatively affect human health, increasing morbidity, mortality, and disabilities, and through the emergence of diseases in previously non-endemic areas.

3.4.2 Climate Change Impacts (GL1.2)

Although socioeconomic conditions have improved in the last decade in the region, there is still high vulnerability and an increasing risk of climate variability and change for community well-being and biodiversity. Below are summarized the main impacts to the Amazon according to the IPCC AR5 report for Central and South America (Magrin et al. 2014):

- Increase in frequency and extension of dengue fever and malaria and impacts on human health, migration and trade
- Changes in extreme flow in the Amazon rivers that affect transport and hydropower generation
- Loss of ecosystems and biodiversity and environmental services provided by forests
- Increasing temperature can discourage and/or encumber agricultural production (for some crops) by decreasing production or increasing the need for more inputs and labor.
- Decrease in food quality and productivity and increase in food insecurity

3.4.3 Measures Needed and Designed for Adaptation (GL1.3)

The project will encourage and support the communities to develop capacity and skills to improve sustainable management that optimizes the use of the land to adapt to climate change, at the same time that will increase activities that protected those food production systems. These activities, aimed at mitigation and adaptation of local climate changes by fostering sustainable rural production chains, organic certification, and food and nutritional sovereignty. The main activities are:

- Subsidize and coordinate the implementation of coffee agroforestry systems, processing, and the commercialization of its products.
- Support capacity building and training of families, individually and collectively, offering free quality and accessibility to technical assistance and rural extension services for sustainable agroforestry, organic production, and diversification of food production.
- Promote workshops and training aimed at the agroecological transition, food education, emphasizing the nutritional importance of food that can be produced in agroforestry systems, handling, sanitization, conservation.
- Carry out awareness workshops on fire control and management, and pesticide drifts.
- Support and coordinate the creation and maintenance of firebreaks, as well as providing tools necessary.
- Periodically monitor socioeconomic and environmental parameters of families and their farms, respectively, as a source of information to propose changes to adapt to climate change effects.

4 COMMUNITY

4.1 Without-Project Community Scenario

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

The community involved in the REDD+ Apuí Agroforestry Coffee Project comprises rural family farmers who are mostly part of the Rio Juma Rural Settlement Project and the Acari Rural Settlement Project, created in 1982 and 1992, respectively.

The communities comprise farming families and ranchers who own rural properties in the region. Most of them have been farming for several generations, and generally migrated from states in the south and southeast of Brazil when the military government encouraged the colonization of the Amazon. Many of these families first settled in other states, predominantly Rondônia, and then migrated to the project region in search of larger properties to expand agricultural production and/or have more land to share with their children.

The common characteristics are: i) the vocation for family agriculture, the cultivation of land in a family regime centered on the domestic production unit and on spatiality as a domain of shared agency between acquaintances and blood relatives, dividing work socially in order to cultivate the land and produce family sustainability (Le Tourneau and Bursztyn, 2010); ii) the centrality of occupation and possession of lots, private portions of land, constituting central family assets. In this sense, the security of land tenure is essential, converting their commitment and work into the conversion of improvements on land that they do not have definitive ownership, into valuation of the occupation with a view to its future sale.

- Current characteristics of communities - social and economic profile

As part of the studies for project design, a Socioeconomic Survey was carried out with rural producer families, who voluntarily responded to a survey with the objective of mapping the social and economic profile of the residents of the region at the time of the beginning of the project. The survey was carried out by the project team between April and July 2022, with **82 families** of family farmers residing in areas in the reference region. The interview was conducted with the objective of gathering information not only about the head of the family or representative, but also about the other family members – therefore, some questions reflect individual answers from the interviewees within the same family.

It is emphasized that the questions were answered voluntarily by rural producers and their families. The details and transcription of the questions asked in the Socioeconomic Survey will be presented to the VVB.

Regarding the origin of the respondents, most of the interviewees were not born in the city or in the state of Amazonas. A significant majority of producers (36%) come from the state of Rondônia and there is also a significant portion from the states of Paraná (12%) and Espírito Santo (12%) as shown in Figure 45.

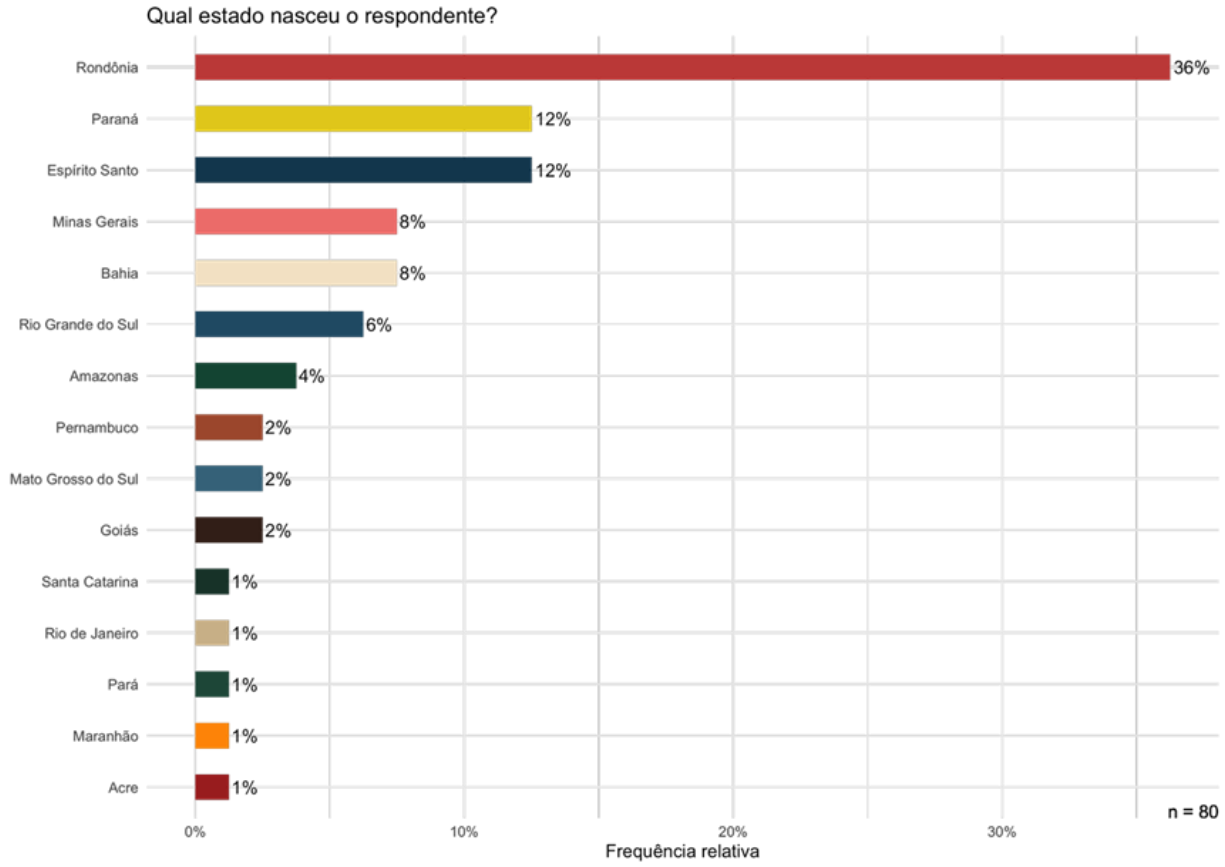

Figure 45. State of birth of household heads

Currently, most respondents live in the municipality of Apuí (85%), and the rest in Novo Aripuanã. Of the total interviewed, 83% live in the PA Rio Juma settlement, 16% in the Acari PA and 1% outside the settlement. 40% of the interviewees stated that they belong to a cooperative association or rural union.

Confirming the high trend of migration to the region, most respondents (34%) moved to the indicated municipalities between 2014 and 2022 and reside in the respective rural properties (Figure 46). Almost 85% have a rural property as their only or main residence.

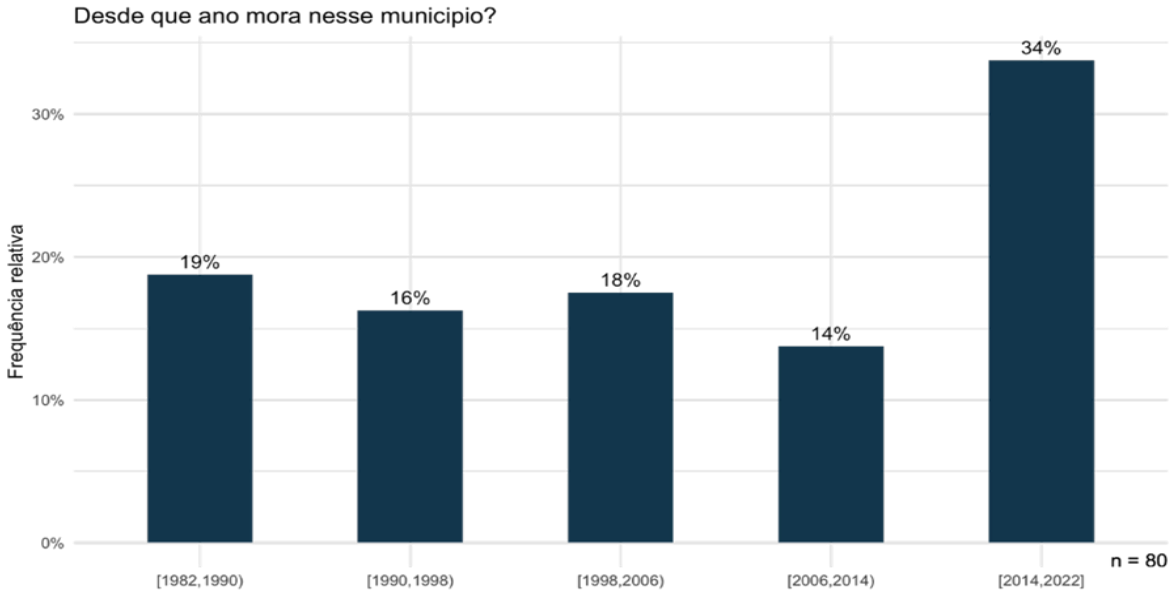

Figure 46. Length of residence in the municipality

Among the interviewed families, half have between 3 and 4 people living in the same property, 34% share the house between 1 and 2 people and 17% have between 5 and 6 people living in the same house.

Regarding the age characterization of this community, it is possible to observe a close number between men and women, but with a slightly higher representation of men. There is also a greater representation of children and young people in relation to the elderly, and that most people in the interviewed families are between 30 and 45 years old (Figure 47).

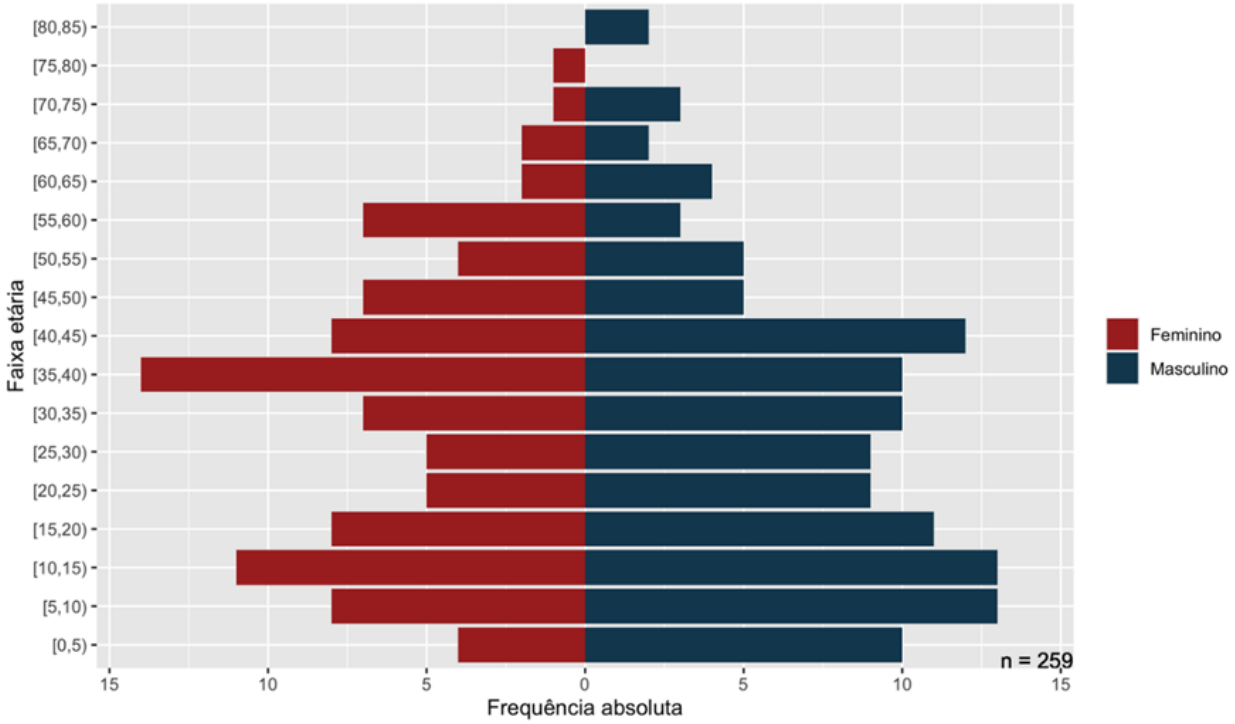

Figure 47. Gender and age group of household individuals

With regard to education, it is possible to observe in Figure 48 that there is a low level of education in the interviewed community as a whole, considering that about 45% of the interviewees did not complete primary education (basic education) and less than 30% are currently studying.

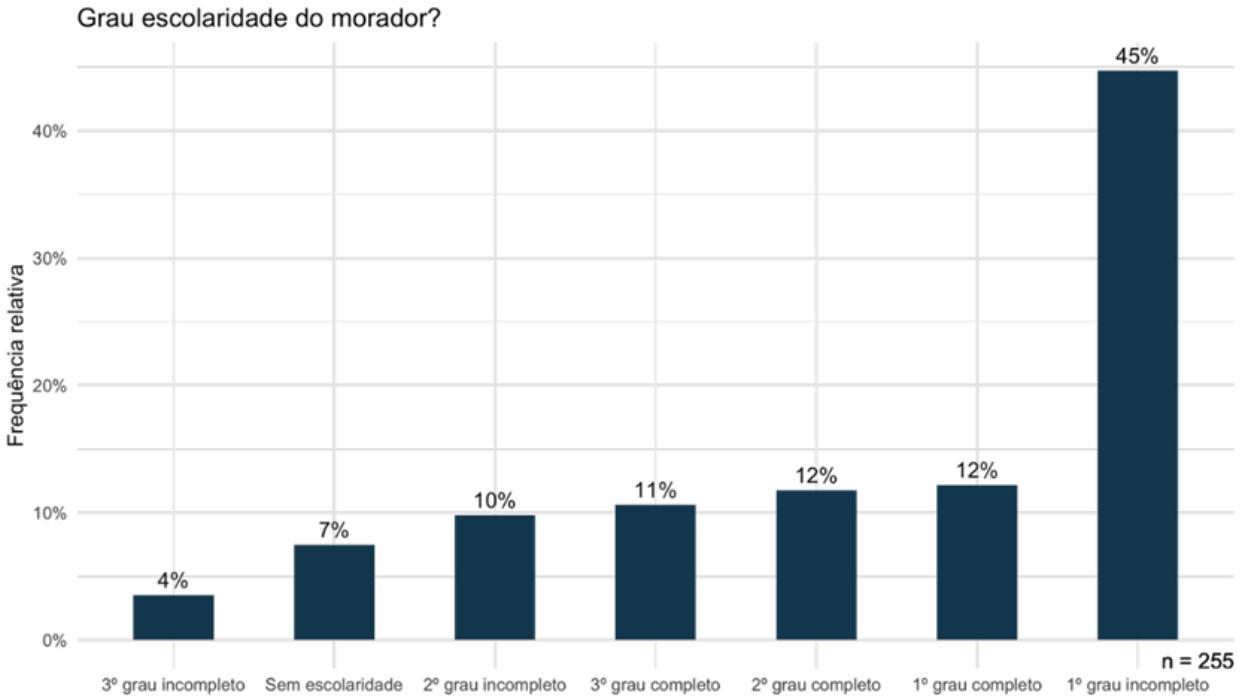

Figure 48. Level of education

Regarding aspects of health and access to medical services, the main diseases reported by the interviewees were viruses and worms, diseases commonly related to lack of adequate sanitation conditions (Figure 49). Regarding diseases and health conditions that generate some type of disability, a small part of the interviewees (12%) claimed to have a problem that generates disability, among them, the majority (67%) claimed to have some physical disability.

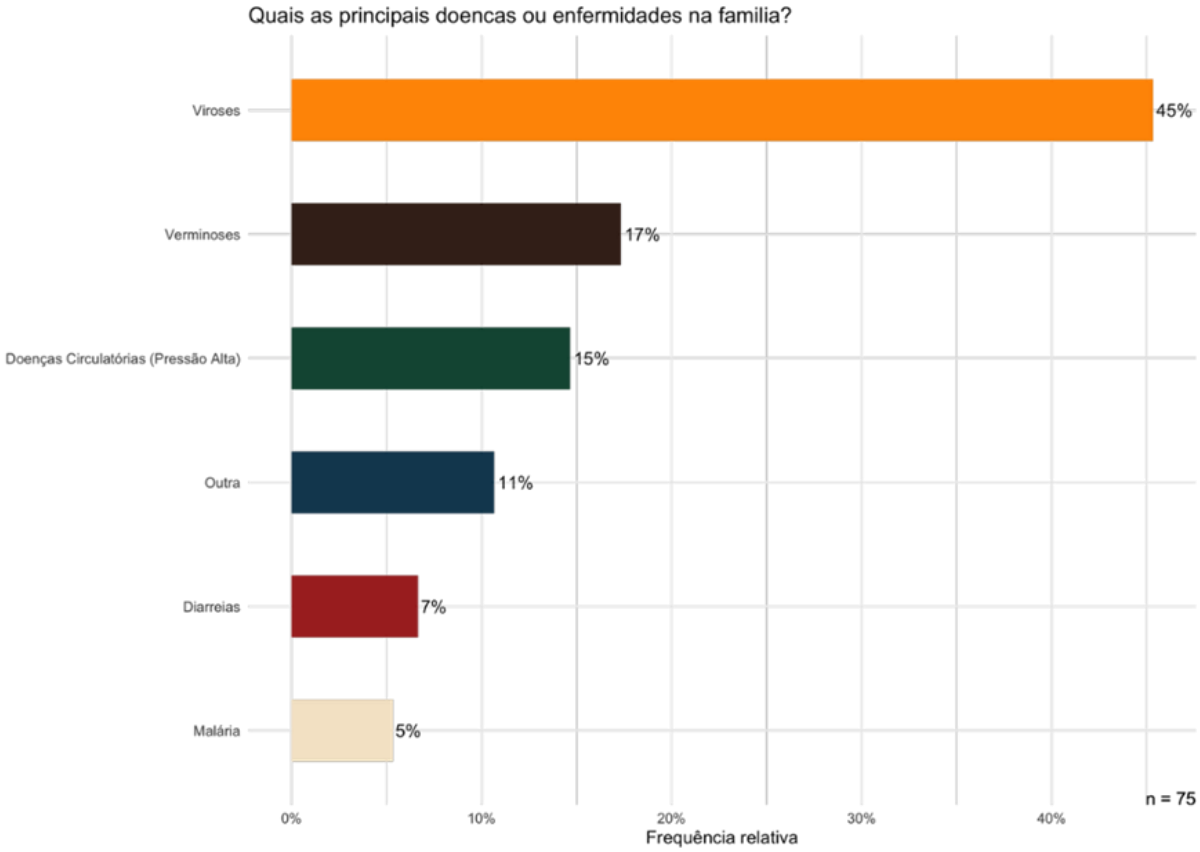

Figure 49. Major illnesses

Regarding access to medical services, 73% of respondents stated that they receive some type of medical care from community health agents or family doctors, however, most (83%) need to travel to the city to access this service. service.

- Income

Income from rural properties is the main source of income for most respondents (60%), with beef cattle being the most significant activity among those mentioned as the main source of income. The rest of the interviewees have as their main source of income paid activities outside the rural property where they live, such as daily rates and rural work on other properties (20%) and non-rural paid work (8%), and a portion still has as its main source income support and benefits such as retirement (9%) and government support or pension (1%), as shown in Figure 50.

Considering the sources of income from the rural property, the production of cattle for beef and milk is very expressive in the region, the increase in pasture areas is the main reason that leads to the suppression of native vegetation. Even with the more frequent major of income coming from cattle ranching for beef (27%) and dairy (19%), and outside farm paid jobs (20%) as can be seen in Figure 50, coffee production stands out as a fourth main source of income, as some families have already been participating in Idesam's coffee agroforestry project since 2012.

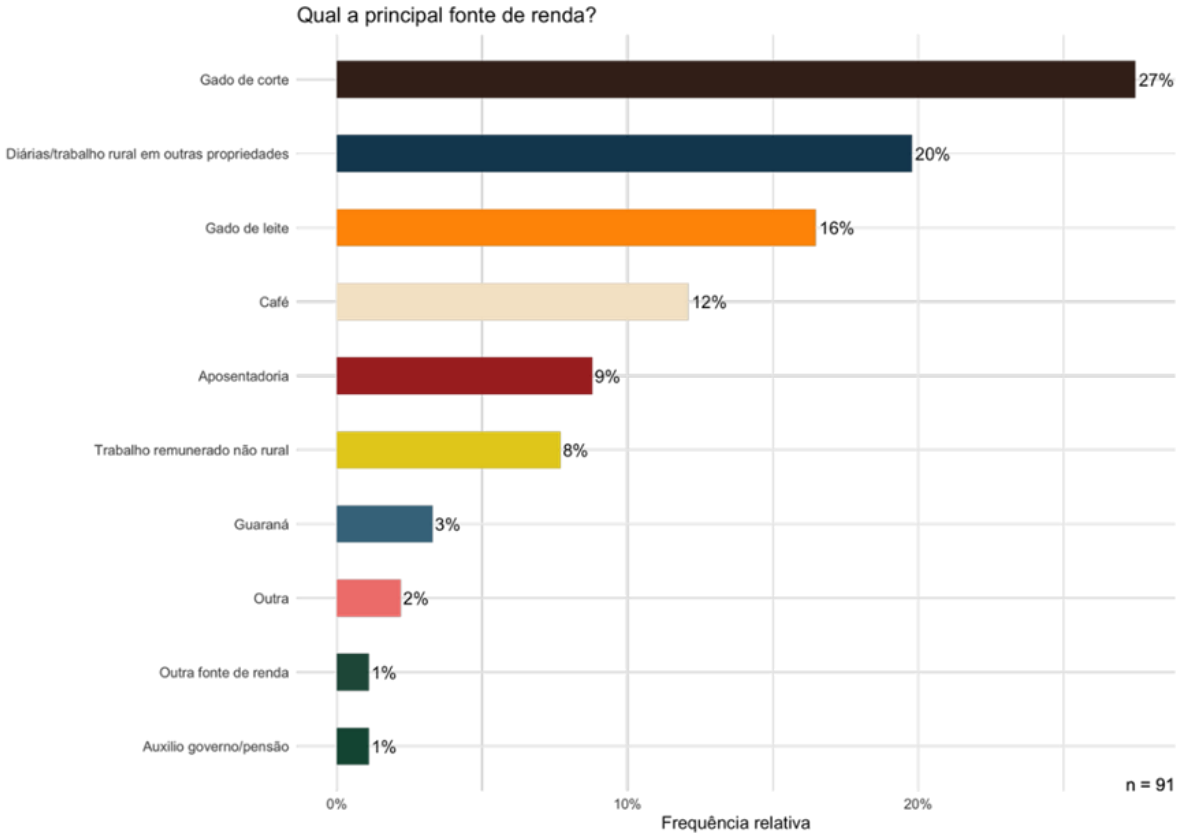

Figure 50. Main source of income

*other = other culture

With regard to the composition of income, for 59% of the interviewees, the income obtained on the property represents half, more than half or the totality of the family's total income (Figure 51). Dedication to productive activities on the property compared to other activities follows the same trend – 58% of respondents dedicate more time to the lot than to other activities. Despite the significant composition of income coming from the property, only 36% of respondents said they get most of the food consumed by the family from the lot.

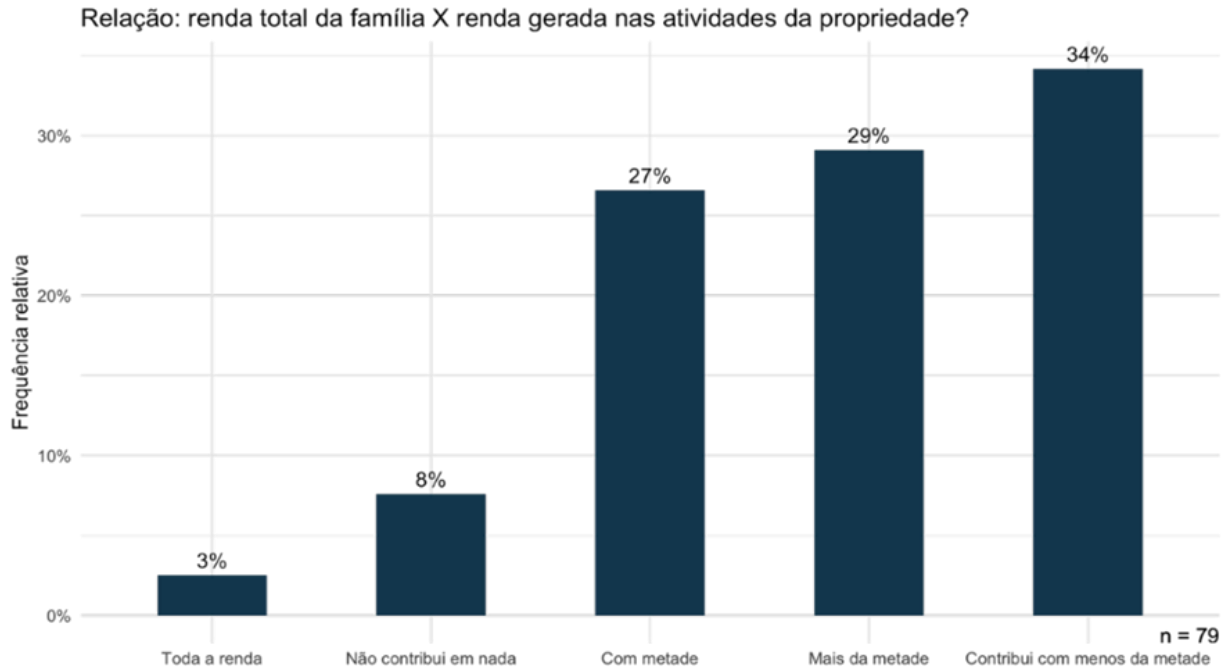

Figure 51. Representation of income generated on the property in relation to total income

Still regarding income composition, 63% of rural producers have another source of income in addition to production on the rural property plot, with more than half of respondents (66%) having some type of paid work outside the plot.

Regarding producers who work outside the lot, or who have relatives who work outside the rural property, more than 70% provide daily services in other rural properties and the rest have some formal trade in the urban area. For just over half of the respondents, the monthly amount that comes from activities outside the property corresponds to less than 1 minimum wage – Figure 52.

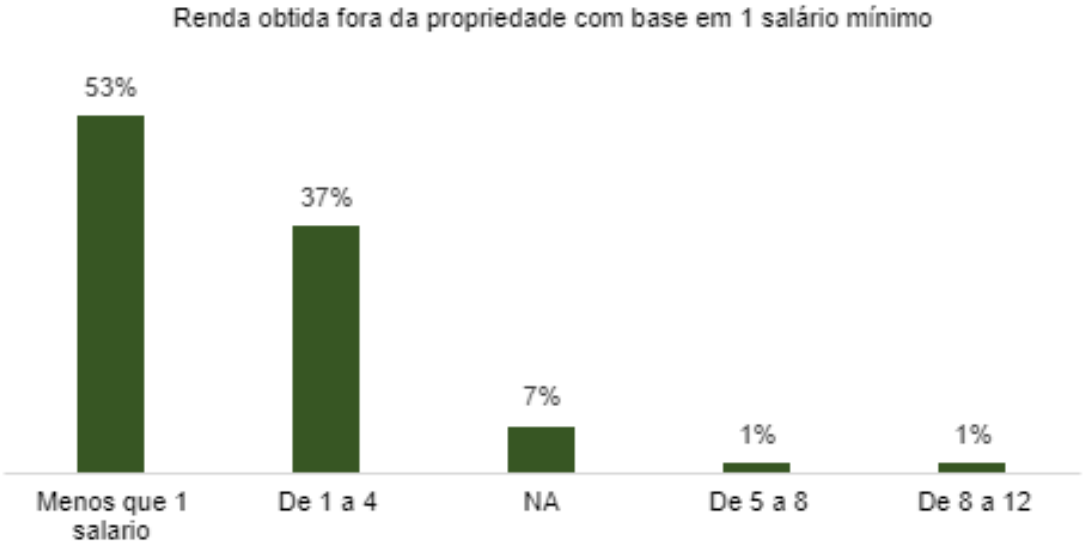

Figure 52. Income obtained from activities performed outside the property

There is also a portion of producers who receive some type of government assistance, as shown in Figure 53, among the types of assistance, Bolsa Família (Brazilian federal government income supplement program) and retirement are the most common.

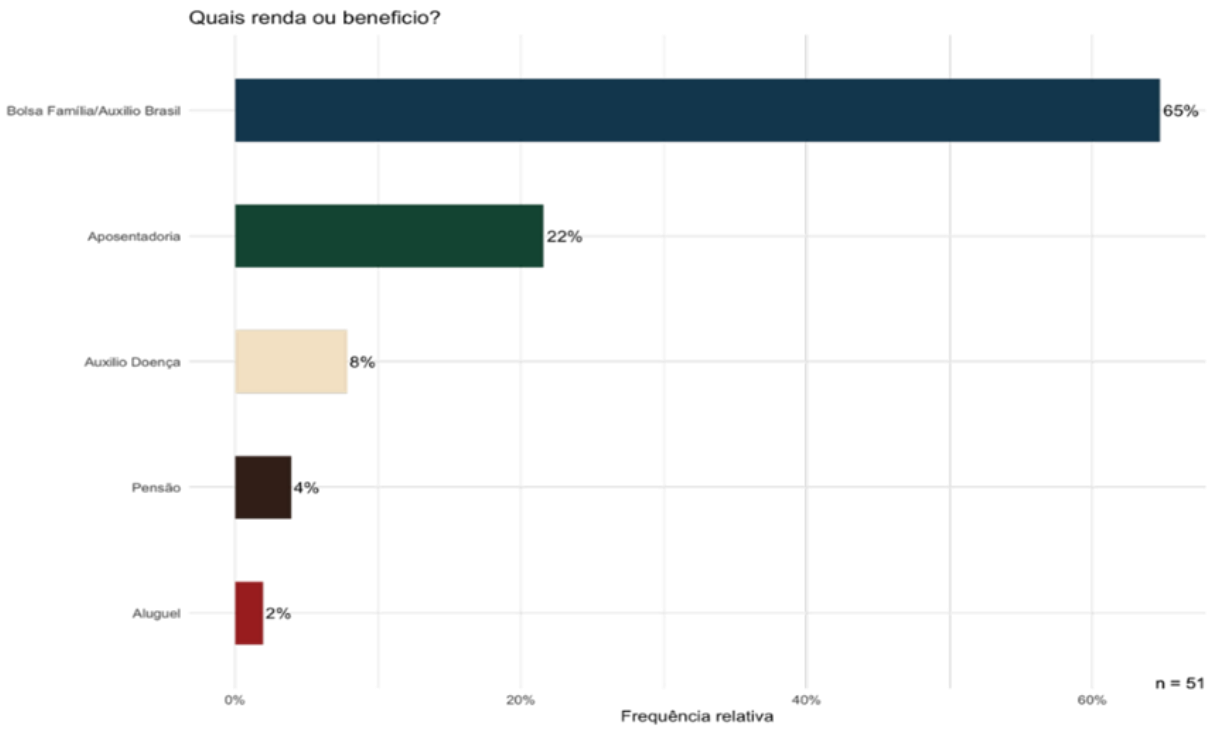

Figure 53. Other sources of income or benefit

- Property Characterization

On average, respondents' properties are 120 hectares in size. The size of the property of the interviewees ranged from 2.5 ha - considered rural farms - to 575 hectares - the size of property considered average for the Amazon, where the fiscal module is 100 hectares.

It is important to point out that the group of interviewees does not correspond 100% to the group of project participants registered to compose the Initial Instances of Project Activity (PAI#1-42).

When asked about the area of the property destined to annual crops, 70% declared that they had no area destined to annual crops, with the rest between 0.4ha and 8ha of area destined to annual crops. The same trend was declared regarding areas for perennial crops – 77% have no area designated for perennial crops.

Considering the area of the property destined for use in Agroforestry Systems (SAFs), 67% of the interviewees declared that they did not have an area destined for SAFs, while the rest have from 0.5ha to 5 ha destined for SAFs. Of those who have SAFs, the majority (58%) have between 1 and 2ha.

Regarding the use of the property for pasture, the majority (92%) declared having an area with pasture, with an average of 58 hectares, with the highest frequency being between 30 and 60 hectares. The majority (62%) of those who answered that they had an area for pasture stated that they had not rented a pasture area in the last year.

Regarding the location of rural properties, 65% of respondents have their rural properties at least 31 km away from the center of the municipality (Figure 54), with a large portion (13%) located an average of 72

km away. The vehicle most used by families for locomotion is the motorcycle, and most of those who own motorcycles (60%) have 1 vehicle available for the whole family.

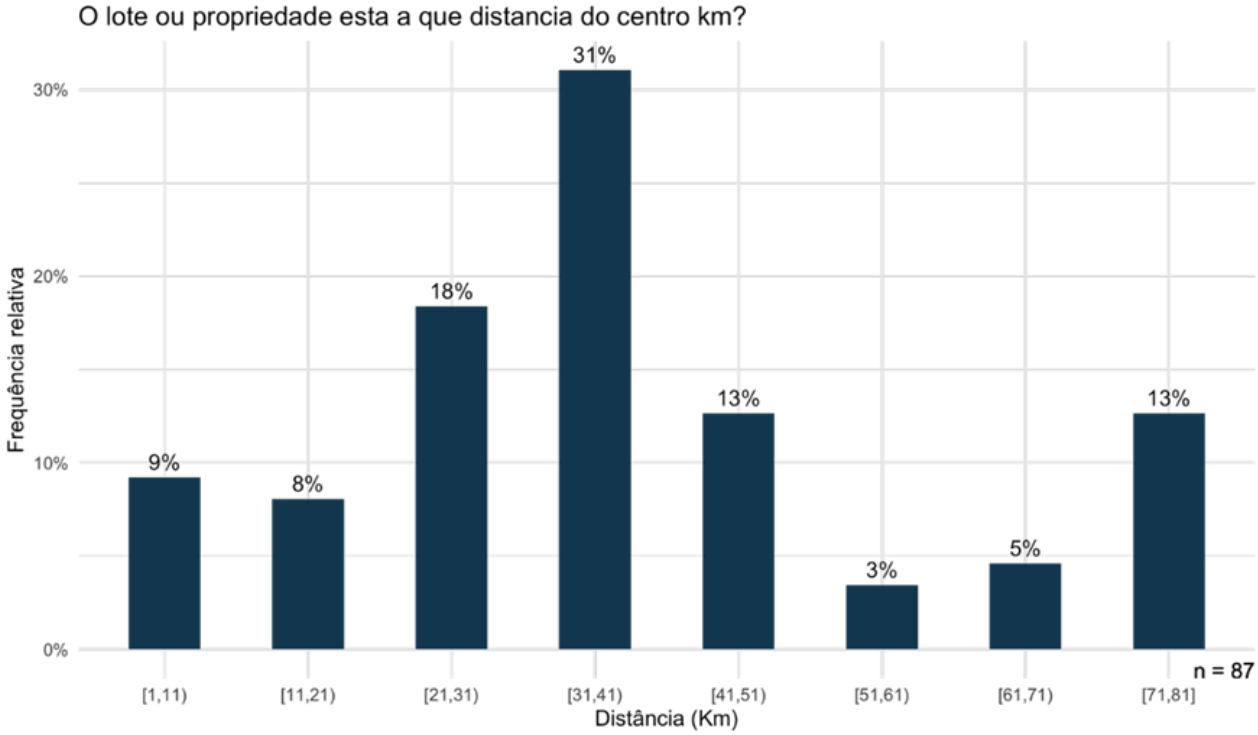

Figure 54. Distance from property to the closest town (in km)

Access from the city to the countryside is via unpaved roads, most of which are dirt roads with gravel (68%). Most of these roads are in a poor or fair state of conservation, according to the declaration of 97% of the producers.

With regard to infrastructure, 79% of the properties have access to electricity, most of which are connected to the electricity grid (90%) and the rest have solar panels.

With regard to sanitation, most declared using a simple cesspool or septic tank with a sink, but a significant portion has open sewage disposal (23%), as shown in Figure 55. The main source of water used in most properties comes from a river or spring, declared by 60% of respondents, while the rest say they use a simple well or an artesian well.

Still in relation to sanitation, 88% of respondents said they had piped water supply, but only 67% declared drinking filtered water. 19% declared drinking chlorinated water and 11% consume untreated water, the rest did not respond (3%).

Figure 55. Sewage discharge

Regarding the disposal of garbage on the property, almost all respondents (93%) declared that they burn non-organic waste on their property, with only 4% destined for recycling or collection, and the rest buried. Organic material is disposed of in the open according to 48% of participants, and the rest is buried, burned or composted.

Among electronic items and household appliances, all interviewed producers claimed to have at least 1 product or service among the listed alternatives (Figure 56). The most common product or service was the gas stove, owned by 97% of respondents.

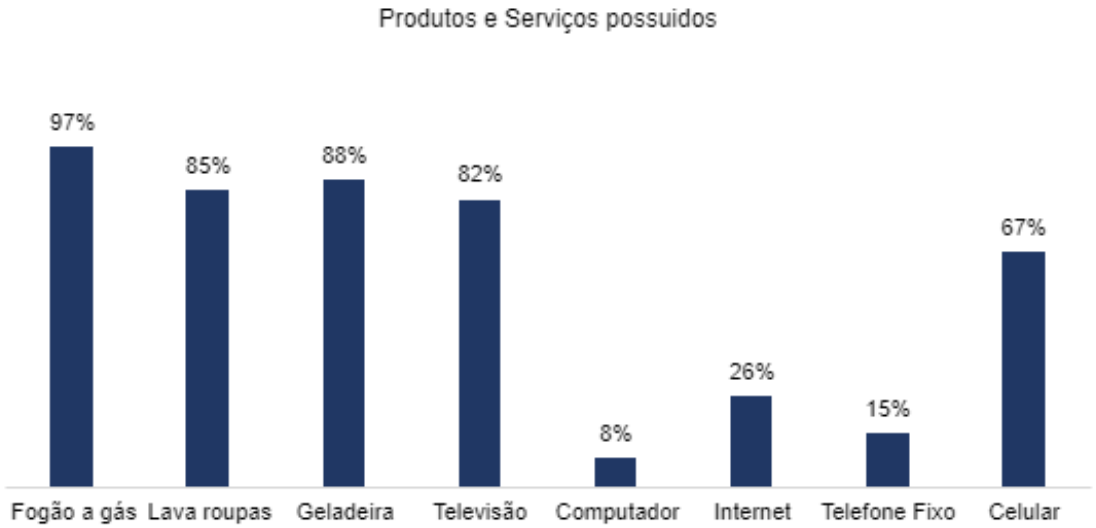

Figure 56. Products and services (goods) owned.

Regarding facilities on the property, 90% of respondents have at least 1 of the facilities on their property within the options indicated in Figure 57. Among those who have facilities, the most common installation is wire or wood fence, present on the property of 82% of participants.

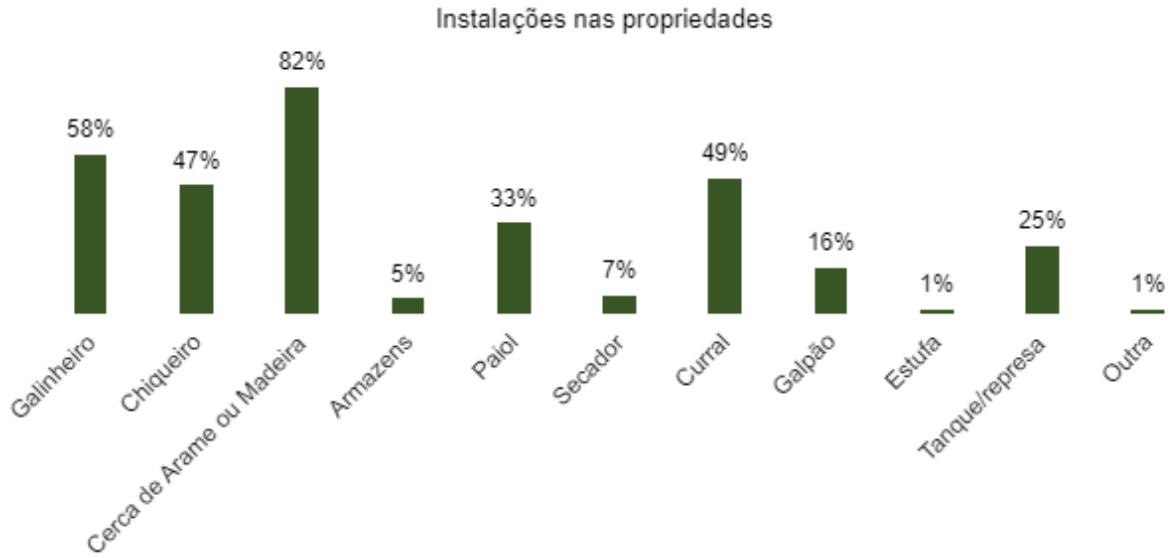

Figure 57. Installations and improvements on properties

Considering a structure for fighting fires and fires, the vast majority declared that they set up firebreaks in part (49%) or the entire area (45%) of their property, with annual cleaning of firebreaks for the majority (73%) of those who have.

- Production

The interviewees answered questions about production and commercialization involving agricultural production, horticulture, livestock, poultry and others, and questions about the use of by-products of animal and vegetable origin and extractivism.

Regarding agricultural production coffee is among the five main species produced on the lots (Figure 58), behind species such as cassava, banana, pineapple and corn that are normally produced for consumption within the property, whether to feed the family or to raise animals.

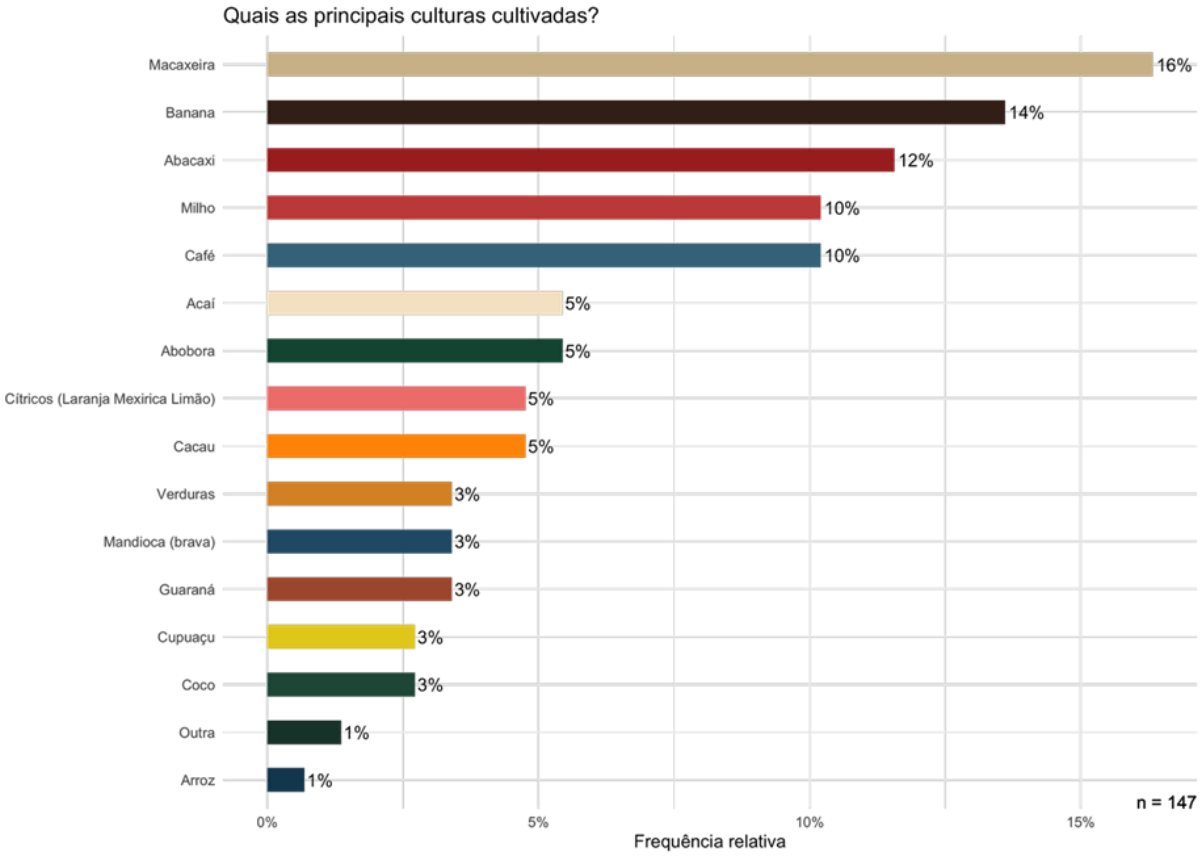

Figure 58. Relative frequency of cultivated agricultural crops

Regarding the cultivation of vegetable gardens, the majority (62%) do not have vegetable gardens on the property, and those who do have it for their own consumption. A large part (77%) of the respondents have poultry on the property, and the majority also raises for their own consumption. A portion of the interviewed producers (41%) have pigs on the property, but do not sell them.

Only 30% of the producers declared that they obtain some by-product from animal and vegetable crops, most of which are eggs, fruits, pulp and milk. Considering extractive products and other vegetables, 11% of the producers confirmed extracting products from the forest, the majority being between açaí and copaíba, and the rest chestnuts, tree seedlings, wood and others.

4.1.2 Interactions between Communities and Community Groups (CM1.1)

The project will have the participation of communities of rural producers from the three municipalities that comprise the project area and reference region: Apuí, Manicoré and Novo Aripuanã.

Considering rural work, rural producers have autonomy, whether to produce or to perpetuate their interactions, focused on family farming and specialized in lots/properties. Even so, kinship ties and social and religious activities favor group work, sometimes through joint efforts, sometimes through exchanges of rural services, implements and favours, mostly informal.

For the most part, producers interact with groups in geographical proximity, usually according to the Vicinal – the name given to the dirt roads that cut through the rural areas of the municipalities – where their property

is located. The producers participating in the Project's Initial Instances of Activities (PAI#1-42) are distributed in 15 neighboring areas and usually carry out activities interacting with the nearby population through leisure activities.

A part of producers is organized in associations and rural cooperatives. According to the answers to the Socioeconomic Survey presented in section 4.1.1 - Descriptions of Communities at Project Start (CM1.1), 40% of the interviewees declared to be part of a cooperative association or rural union. The main social organization of which the producers are members is the Ouro Verde Family Producers Association (APFOV).

The project foresees an increase in interaction between groups of communities of family farmers involved in the project due to the carrying out of capacity building activities, training and technical assistance provided for by the project, as well as the informative and engagement meetings of the project.

4.1.3 High Conservation Values (CM1.2)

The REDD+ CAA project used the guidelines of the document “Common Guidance for the Identification of HCV” released in 2021 by the HCV Resource Network (https://www.hcvnetwork.org/library/common-guidance-for-the-identification-of-hcv-english-indonesian-french-portuguese) for the identification of their HCVs.

The area considered for identifying the HCVs of the REDD+ CAA project is the Project Zone, comprising the Project Area, Leakage Management Areas and the Leakage Belt, which is the rural area with small and medium-sized properties in the regions of Apuí, but will increase as more PAI enter the project.

This project, by proposing the consolidation and added value to the productive chains of family farming, encouraging the planting of Apuí agroforestry coffee, will allow local communities access to an alternative income, and, consequently, an alternative to the conversion of natural environments, a process that, as previously explained, has historically occurred in the region.

In this way, in addition to boosting the maintenance of natural environments and associated biodiversity values, it will promote the maintenance of social values linked to the empowerment and improvement of the quality of life of local communities. It is important to point out, in relation to the proposal for the implementation of an Agroforestry System, that, historically, in tropical and subtropical forests around the world, native societies managed plants and landscapes, promoting the establishment in the forests of several useful species for human beings (Levis et al. al, 2017).

The HCVs of this project were identified according to the 6 categories of HCVs proposed by the “Common Guidance for the Identification of HCV” (HCV Resource Network, 2021) based on the FSC definitions of HCVs. For the REDD+ CAA project, HCVs from the following categories were identified:

HCV 1 Species diversity: *Concentrations of biological diversity including endemic species, and rare, threatened or endangered species, that are significant at global, regional or national levels.*

HCV 3 Ecosystems and habitats: *Rare, threatened, or endangered ecosystems, habitats or refugia.*

HCV 4 Ecosystem services: *Basic ecosystem services in critical situations, including protection of water catchments and control of erosion of vulnerable soils and slopes.*

HCV 5 Community needs *Sites and resources fundamental for satisfying the basic needs of local communities or indigenous peoples (for livelihoods, health, nutrition, water, etc...), identified through engagement with these communities or indigenous peoples.*

HCV 6 Cultural values *Sites, resources, habitats and landscapes of global or national cultural, archaeological or historical importance, and/or of critical cultural, ecological, economic or religious/sacred for the traditional cultures of local communities or indigenous peoples, identified through engagement with these local communities or indigenous peoples.*

HCVs related to biodiversity are presented in section 5.2.4 - High Conservation Values Protected (B2.4), and below is the HCV identified for the community component:

HCVs related to cultural services

Cultural services refer to non-material benefits provided by ecosystems, through, for example, recreation, tourism and cultural identity.

Table 67. Community High Conservation Value

High Conservation Value 1	Rio Juma Settlement Project and Acari Settlement Project (HCV 5 and HCV 6)
Qualifying Attribute	The properties participating in the project (instances) are mostly located in settlement projects. As presented in sections 2.1.6 - Social Parameters and 4.1.1 - Descriptions of Communities at Project Start (CM1.1) these settlement projects were created with the aim of encouraging the distribution of land and occupation of the territory for productive purposes in the years 70 and 80. For the community of family farmers in these areas, the rural properties which they have possession given by the government are important for their subsistence and livelihoods, as activities carried out within the property generate the main source of income for this community – see Figure 50, section 4.1.1 Descriptions of Communities at Project Start (CM1.1). So it's an HCV 5 – important for community needs. In addition to income generation, housing on these properties and the common way of life are characterized as an identity for these communities, the identity of the settled family rural producer. It is in this context that this HCV is also an HCV 6 – important for maintaining cultural values.
Focal Area	The focal area of this HCV are the properties (lots) of settled family farmers. The project intends to strengthen the cultural identity of the settled rural family producer (HCV 5, associated with the production and commercialization of an organic and agroforestry product (HCV 6), encouraging and enabling the permanence of this community in the properties.

4.1.4 Without-Project Scenario: Community (CM1.3)

Based on the data presented in section 2.1.6 - Social Parameters and 3.1.4 - Baseline Scenario, it appears that for the communities of family farmers, the scenario of higher likelihood without the project would be the sale of farms that would be further deforested, or increasing deforestation to expand pasture because:

- Low forested land prices: low land value for forested areas in relation to other regions stimulate high deforestation rates on properties;

- Growing cattle economy: high appeal and incentive to livestock production, with allocation and increase of areas for pasture;
- Low application of: Land policy, Development policies and Environmental law non-compliance and low surveillance desincetivize forest conservation.

The combination of these drivers for deforestation in the project region and participating project properties can result in:

Table 68. Deforestation Drivers and Communities well-being impact

Deforestation Drivers	Impact for Communities	Result in Community well-being
Low forested land prices	Family farmers sell their land	Marginalization and/or vulnerability of housing; loss of source of income; loss of food sustenance
Growing cattle economy	Family farmers stop conserving forests and producing sustenance to allocate larger areas to pasture or pasture lease	Food vulnerability, reduced livelihood diversity from the sale of agricultural and extractivism products;
Low law enforcement and Low public policy	Family farmers are vulnerable to land conflicts due to the lack of command and control actions. Family farmers do not access public policies that encourage rural family production or forest conservation	Involvement in land conflict and loss of income

There is an imminent risk of abandonment of the lots by the community of family farmers if, as previously described, adequate public policies and infrastructure, associated with the consolidation of production chains and an increase in income from the exploration of the lots, are not consolidated.

This imminent risk of abandonment of the lots and their submission to real estate speculation tends to re-concentrate land ownership and marginalize groups of small family farmers who, without sustenance through activities on the lots, are in a situation of social vulnerability. Producers' income is mostly linked to productive activities on their properties or the sale of their workforce as day laborers or hourly workers on third-party properties (see section 4.1.11 - Descriptions of Communities at Project Start (CM1.1)- Figure 50) therefore, it is essential to consolidate the production chains of local family farming products, adding value (as in the case of Apuí agroforestry coffee) and strengthening Producers by presenting training processes that qualify and improve their agricultural practices.

Therefore, it is understood that the impact on communities in the scenario without the project is negative.

In this sense, paying for the environmental services provided by the Producers in the conservation of the forest, increasing their income and strengthening good practices in family farming in an agroforestry system with high added value will contribute significantly to the increase in the families' income. It is expected that the project will be able to move regional indicators further away from the poverty line, ensuring a better quality of life for Producers.

4.2 Net Positive Community Impacts

4.2.1 Expected Community Impacts (CM2.1)

The expected impacts for communities involved in the project are detailed in Table 70 below. All impacts are classified as expected benefits from the implementation and maintenance of the project activities described in section 2.1.11 - Project Activities and Theory of Change, Appendix 2. The implemented activities will be communicated and carried out in partnership with the communities identified on a voluntary basis and the monitoring of impacts will be made through the Project's Monitoring Plan.

Table 69. Expected Community Impacts

Community Group	Settled family farmers from the Rio Juma and Acari Settlement Projects in Apuí/AMand family farmers in Apuí, Manicoré and Novo Aripuanã
Impact(s)	Increase and diversification of income; improved food security; promotion of education and training in sustainable rural production, firefighting and commercialization of agroforestry and organic products; increased protection against wildfires; increase in land security; inclusion of women and young people in income-generating activities and increased quality of life related to climate and biodiversity aspects.
Type of Benefit/Cost/Risk	All of the above impacts are direct benefits anticipated through project implementation and maintenance.
Change in Well-being	• Increase and diversification of income – positive impact through payments for environmental services and purchase of agroforestry products, with a focus on organic coffee with high added value • Improved food security – positive impact through the consumption of agroforestry and organic products • Promotion of education and training in sustainable rural production, firefighting and marketing of agroforestry and organic products - positive impact through the provision of educational activities, training and qualifications that allow for an increase in knowledge • Increased protection against fires – positive impact through support for building firebreaks and controlled use of fire • Increase in land security - positive impact through the provision and availability of information that increases opportunities for land regularization, as well as technical assistance to achieve land regularization • Inclusion of women and young people in income-generating activities – positive impact through the inclusion of these groups in training, capacity building and workshops • Increased quality of life related to climate and biodiversity aspects - positive impact through forest conservation and implementation of agroforestry systems

4.2.2 Negative Community Impact Mitigation (CM2.2)

No negative impacts arising from the project are anticipated for the identified communities. However, in the event or imminence of negative impacts, measures to mitigate any negative impacts on the quality of life of communities will be implemented in accordance with participatory and voluntary processes, as described in the items in section 2.3 Stakeholder Engagement.

With regard to precautionary processes against negative impacts, the project provides for a routine visit and follow-up with producers from the communities described above, in addition to periodic surveys – every 3 years, see 2.3.8 - Continued Consultation and Adaptive Management (G3.4), in which it will be possible to identify cases and occurrences of negative impact and measures to mitigate consequences. As an example, the project will have a mechanism for recording occurrences and EHS Risk Assessment that must be completed by the project team, already providing for precautionary measures and risk mitigation of negative impacts, more details about this process in section 2.3.12 Feedback and Grievance Redress Procedure (G3.8) and Occupational Safety Assessment (G3.12).

4.2.3 Net Positive Community Well-Being (CM2.3, GL1.4)

All project activities, presented in Section 2.1.11 - Project Activities and Theory of Change, Appendix 2, and summarized in section 4.2.1 - Expected Community Impacts (CM2.1) contribute to an improvement in the quality of life of the communities involved. Compared to a “Without Project Scenario”, as detailed in sections 4.1.4 Without-Project Scenario: Community (CM1.3), 3.1.4 - Baseline Scenario and 3.1.5 - Additionality, the project foresees activities that bring additional benefits to these communities.

An example of this improvement in quality of life – net positive impact – would be the increase in income, income diversification, food security and climate and biodiversity benefits for the population of family farmers through the implementation of agroforestry systems that produce high value certified organic coffee aggregate.

Currently, as explained in section 4.1.1 - Descriptions of Communities at Project Start (CM1.1), producers obtain a significant part of their income from land use activities such as cattle raising that degrade the soil and threaten the forest and have no guarantee of purchasing their product or access to the market, causing financial and food insecurity. With technical assistance activities, implementation of agroforestry systems, and support in the commercialization of products, the project intends that producers have a positive impact on their quality of life.

The activities to be implemented by the project (based on what is presented in section 2.1.11 Project Activities and Theory of Change) with a net positive impact on communities and the problems associated with them that intend to be resolved are:

Table 70. Community well-being problem to be addressed by project’s activities

Project Activity	Associated Community well-being problem addressed
Forest Protection and Environmental Monitoring	Conversion of the forest into a productive area causing loss of quality in the air, soil, water and other natural resources beneficial to human health and production; Use of fire on properties causing loss of quality of air, soil, water and other natural resources beneficial to human health and production
Payment for environmental services	Low financial return from the property; Zero financial return for forest preservation activities

	Low incentive to stay on the land and high incentive to sell property
Sustainable production, income generation and gender inclusion	Low income; Rural production with the use of pesticides; Rural production with low added value; Gender inequality;
Land and environmental regulation	Social vulnerability due to lack of regular land tenure;

Furthermore, there is at least one factor resulting from the Project that will be beneficial to all inhabitants of the region, even those who are not engaged in the Project: the ecosystem services provided by the forest areas preserved by the engaged Producers, which will ensure quality of life and curb the impacts of climate change, benefiting their production and well-being.

Regarding the benefits of adapting to climate change for all communities – directly and indirectly benefited – the project's activities include forest conservation, implementation of agroforestry systems in degraded areas and support in fighting and preventing fire. These activities provide climate benefits such as improved soil quality, reduced GHG emissions, removal of GHG emissions, diversification and food security, and mitigation of extreme weather-related events.

4.2.4 High Conservation Values Protected (CM2.4)

The HCV identified in section 4.1.3 - High Conservation Values CM1.2) will not be adversely affected by the project. Only benefits of increased quality of life and strengthening of cultural identity, in addition to climate benefits and increased biodiversity are predicted for the HCV areas identified for the Project Zone (project area and leakage belt).

4.3 Other Stakeholder Impacts

4.3.1 Impacts on Other Stakeholders (CM3.1)

Potential positive impacts on other stakeholders are presented below;

- Commercialization of agroforestry products: The commercialization of products with high added value will promote, in the region of Apuí, Manicoré and Novo Aripuanã, a financial and economic movement, bringing income to the region through the sale of local products. An example is the sale of organic and agroforestry coffee from partner properties.
- Qualified workforce in sustainable agriculture: Technical assistance and workshops, qualifications and training in sustainable agriculture and agroforestry for family farmers involved with the project will bring benefits to a broader group of stakeholders. This benefit will come through the training of local people in activities on this theme that will be able to offer their time and work to stakeholders such as companies and other producers.
- Land regularization: By supporting land regularization for producers who have areas registered in the project, the project will benefit stakeholders such as local government and bodies that seek to achieve results in land regularization in Brazil, such as INCRA.
- Climate benefits: All stakeholder groups in the project region will benefit from climate change mitigation through the preservation and conservation of forests and recovery of degraded areas with the planting of agroforestry systems.

Relevant or significant negative impacts are not expected from the implementation of the project, however, the following may occur:

- Difference in land value in the territory: land value may increase or decrease according to forest areas protected by the project in rural properties, impacting third-party purchases by rural properties in the project region
- Social conflicts between communities not involved in the project: due to the project implementing a range of activities that will bring about improvements in the participating properties, mainly related to the implementation of agroforestry systems and firebreaks for firefighting, there may be small conflicts motivated by envy or competition for access to market between producers involved and not involved in the project.

4.3.2 Mitigation of Negative Impacts on Other Stakeholders (CM3.2)

One way to mitigate any negative impacts that the project may have on other stakeholders is to carry out participatory processes for defining and implementing project activities, with the aim of trying to map possible impacts and consequences and taking preventive or mitigating measures.

As explained in section 2.3.8 - Continued Consultation and Adaptive Management (G3.4), each year the project will present a moment of presentation about the project to possible new producers involved, with the completion of a registration and Socioeconomic Survey. The Socioeconomic Survey contains questions about conflict between neighbors and others, in which it will be possible to map possible negative impacts involving other stakeholders of the project. In addition, the project maintains a protocol for recording occurrences with mitigation or resolution actions that must be decided and discussed by the project's Management Board - any negative impacts mapped or that also occurred for other stakeholders will follow the conflict resolution flow set out in section 2.3 .12 - Feedback and Grievance Redress Procedure (G3.8).

4.3.3 Net Impacts on Other Stakeholders (CM3.3)

As presented in section 4.3.1 - Impacts on Other Stakeholders (CM3.1), the project does not expect to have direct negative impact outcomes for other stakeholders - these are unlikely and minor impacts. All activities implemented and maintained by the project will be mutually agreed upon with the farmers that own the properties involved in the project, through a partnership contract in which the activities are exposed and listed, receiving free, prior and voluntary consent from all involved. In this way, the project does not expect to have any negative external impacts, since most of the activities will occur to benefit the farmers that contain the Project Area - including occurring within these properties. The activities that may occur outside the properties, such as courses, capacity building, training and educational processes, will be open to a larger public and do not have characteristics to generate negative impacts.

4.4 Community Impact Monitoring

4.4.1 Community Monitoring Plan (CM4.1, CM4.2, GL1.4, GL2.2, GL2.3, GL2.5)

The Monitoring Plan for communities in the REDD+ CAA project was created based on the activities presented in section 2.1.11 - Project Activities and Theory of Change and on the data obtained in the Socioeconomic Survey described and presented in section 4.1.1 - Descriptions of Communities at Project Start (CM1.1).

The baseline of the dimension of communities in the project is defined by the Socioeconomic Survery, applied to families interested in joining the Project before the start of activities on their lots and properties – see summary presentation in section 4.2.1 - Descriptions of Communities at Project Start (CM1.1), and

reapplied every 4 years, in order to produce data in a historical series that makes it possible to measure and evaluate the benefits and impacts of the Project in their lives. The Socioeconomic Survey includes questions in the dimensions: Registration, General Data, Social, Health, Housing, Social organization and Conflicts and Economic and Productive. The themes of the questions asked in each dimension are shown in Table 72 below.

Table 71. Questions in the Socioeconomic Survey

Dimension of Socioeconomic Survey	Theme of questions asked
Initial Registration	Name Year of birth Age Contact phone Residence on rural property address and access Year of acquisition of the property and available documentation
General data	County Located in Settlement geographic coordinates
Social	State of Birth Year of moving to Amazonas How many people reside on the property Family and family data Education Income and benefits received by the family Source of income
Health	Main illnesses in the family Health care and access Physical or mental disability
Home	rooms in the house construction material sewage release Water supply and access to water and sanitation
Social organization and conflicts	Participation in social organization (association, cooperative, union) Frequency of meetings and results of meetings Threat or violence Conflict resolution
Economical and Productive	State of the access road to the lot Mobility – family vehicles Electricity Electronic devices and property infrastructure Time dedicated to activities on the property Income generated on the property Property facilities Technical assistance Property area, land uses and availability of natural resources Flora species in the SAFs Species grown on the property

	Animals raised on the property Production of animal and vegetable by-products Hunting and fishing Use of burning, clearing, transgenics, pesticides and pesticides on the property Destination of productive waste and garbage on the property fines and embargo Preferred days for project visits

Based on the data obtained and the project activities presented in section 2.1.11 - Project Activities and Theory of Change, the Community component indicators that will be monitored are presented in Table 73.

Table 72. Community indicators

Activity	Source	Indicator	Frequency
Fire prevention planning and training	Training and planning report	No of visitors	annual
Firebreaks implemented and maintained	Amazon Agroforestry Database	N of properties with firebreaks	annual
Women and youth training	Training reports	No of visitors	annual
Agroforest systems implemented	Monitoring reports	area in hectares	annual
Technical assistance visits to family farmers	Visit worksheets	Number of families attended	3 times per year
Agroecological, organic and agroforestry management training	Training reports	No of visitors	annual
Agroforestry coffee commercialization	Amazon Agroforestry Database	Number of bags of 60kg produced BRL paid per bag BRL paid per bag with price (organic, management premium)	annual
Organic certification	Reports	Number of families with renewed organic certification Number of new families with organic certification	annual
Land regularization	Socieconomic Survey	Number of families supported with land title	Every four years
Socioeconomic aspects	Survey	income from production, diseases, number of sources of income	Every four years

4.4.2 Monitoring Plan Dissemination (CM4.3)

The plan and monitoring of project activities related to the community, presented in section 4.4.1 - Community Monitoring Plan, will be available to the communities involved and project stakeholders through the communication channels described in section 2.3.2 - Dissemination of Summary Project Documents.

To facilitate the access of rural family farmers to the material, the monitoring plan of all project activities will be available at Idesam's headquarters in Apuí, and will be presented by project technicians during periodic meetings about the project, as scheduled in section 2.3 .8 - Continued Consultation and Adaptive Management.

4.5 Optional Criterion: Exceptional Community Benefits

The REDD+ CAA project seeks to be validated to the Gold Level of CCB for exceptional community benefits due to its characteristics of significant additional impact on smallholder farmers in a significantly threatened region on the Brazilian Amazon, considering that the high risk of deforestation is directly linked to the increase in land insecurity for family farmers who depend on their land as a source of income and way of life.

4.5.1 Exceptional Community Criteria (GL2.1)

The project fulfills both criteria to be considered exceptional in terms of smallholder's management rights to land, and due to its location in a low human development region/administrative area.

Smallholders' management rights to land in project area:

Smallholders (family farmers) are entitled to the project area and have granted to REDD+ CAA project the right to generate carbon credits within the project area to Amazonia Agroflorestal (proponent) through a contract. The contract clearly defines that family farmers are the landowners and give Amazonia Agroflorestal the right to generate credits in exchange for payment for environmental services through a benefit sharing mechanism. The right and duty to manage and conserve the forest areas, as well as other areas within the property, is entitled exclusively to the landowners (family farmers). Amazonia Agroflorestal as the project's proponent will not have the right to manage or enforce activities within the lands participating on the project area. If deforestation or any other land degradation activity occurs within the properties,

Location in a low human development region with more than 50% of households within the communities below national poverty line.

The REDD+ CAA project is located within the municipalities of Apuí, Novo Aripuanã and Manicoré. As presented in section 2.1.6 - Social Parameters, Table 6, social indicators for the region are low. According to IBGE, on the last census for poverty indicators made for the municipalities:

Table 73. Social indicators within Project Area. Source: IBGE, 2003.

Indicator	Amazonas state	Apuí	New Aripuanã	Manicoré
Poverty Index	48.44%	34.7%	75.45%	50.73%
Gini Index	0.50	0.46	0.40	0.41

4.5.2 Short-term and Long-term Community Benefits (GL2.2)

As described in the project activities (section 2.1.11 - Project Activities and Theory of Change) and the positive community benefits (section 4.2 - Net Positive Community Impacts), the project will generate short-term and long-term net positive well-being benefits for family farmers or community members.

See Appendix 2 and section 2.1.11 - Project Activities and Theory of Change and Table 70 section 4.2 - Net Positive Community Impacts.

Below is a summary of the expected benefits of the project for the communities involved, based on the sections mentioned above:

- Support the project participants in capacity and monitoring to conserve forests;
- Increased awareness of forest and biodiversity conservation and how to conserve forest resources;
- Generation of carbon income through payment for environmental services;
- Increase and diversification of income – positive impact through payments for environmental services and purchase of agroforestry products, with a focus on organic coffee with high added value
- Agroforestry systems focused on organic coffee production are implemented;
- Technical assistance in sustainable production and continued rural extension;
- Promotion of education and training in sustainable rural production, firefighting and marketing of agroforestry and organic products - positive impact through the provision of educational activities, training and qualifications that allow for an increase in knowledge
- Workshops for women and young people on sustainable rural production;
- Improved food security – positive impact through the consumption of agroforestry and organic products
- Rural producer families living with quality of life and fair income through their production;
- Sustainable agriculture and extraction being carried out by engaged and empowered families;
- Women and young people trained in income-generating activities;
- Producers with regularized rural properties;
- Increased security over land ownership;
- Increased protection against fires – positive impact through support for building firebreaks and controlled use of fire;
- Increased quality of life related to climate and biodiversity aspects - positive impact through forest conservation and implementation of agroforestry systems

4.5.3 Community Participation Risks (GL2.3)

As described in the sections2.3.3 - Informational Meetings with Stakeholders and2.3.7 - Stakeholder Consultation (G3.4), during the pre-consultation process with family farmers, the public participating in the project, risks of participation of the community of family farmers in the project were mapped.

The mapped risks were:

1. Sharing, by the REDD+ CAA project, its proponent and technical partner, of information on land use with inspection authorities;
2. Conflicts with neighbors over the use of fire and deforestation in the border areas of the properties, considering the boundaries between the neighboring property and the property participating in the project;
3. Limitation of land use activities in non-forest areas;

This mapping considered the main notes made during the pre-consultation meetings and recorded in meeting minutes and notes by the project team.

To address these risks, the project proponent and technical partner sought to define, through clauses in the project participation contract, measures and commitments that mitigate the occurrence of these risks and that define, with clarity and transparency, the obligations and limitations of the parties.

As an example of the mitigating clause for risk 1 identified above, Amazônia Agroflorestal and Idesam undertake not to share information on land use and personal data, as well as information collected in project diagnoses and records with inspection bodies or authorities.

As a monitoring measure of risks related to participation in the project, the REDD+ CAA project will carry out the participatory processes described in section 2.3.8 - Continued Consultation and Adaptive Management and the monitoring of community indicators presented in section 4.4 - Community Impact Monitoring

4.5.4 Marginalized and/or Vulnerable Community Groups (GL2.4)

The project identifies women as a marginalized group within the community of family farmers. Table 75 presents the description of impacts for this identified group.

Table 74. Marginalized and Vulnerable Community Group

Community Group 1	**Women**
Net positive impacts	The project will carry out activities that promote the inclusion of women in rural production activities - production of organic gardens for family consumption and sale - and training in social organization and social control of organic production certification.
Benefit access	Cultural barriers regarding the role of women in activities such as rural production, training, contract signing, negotiations and payment transactions are to be expected. The activities described above are exclusively aimed at the group of women and young people, guaranteeing access to the planned benefit of the activities. With regard to women's access to payment for environmental services - the benefits shared by the project - does not impose limitations on the use of these resources considering family dynamics, but will monitor the families' socioeconomic indicators throughout the life of the project, with

	the intention of verify improvement in the quality of life and income generation of the family as a whole. The project encourages the signing of participation contracts in the project on behalf of the woman as the family representative, and when it is not possible to sign as the first representative, it encourages the signature as a witness.
Negative impacts	No negative impacts or effects are expected from project activities on the women's group. The monitoring of Community Indicators and the monitoring of occurrences through the channels of communication and contact between the project team and family farmers are measures taken to avoid possible negative impacts.

4.5.5 Net Impacts on Women (GL2.5)

See section 4.5.4 Marginalized and/or Vulnerable Community Groups (GL2.4) and supplements in section 2.1.11 Project Activities and Theory of Change.

4.5.6 Benefit Sharing Mechanisms (GL2.6)

The benefits to be shared by the REDD+ CAA project are based on the result of reducing deforestation at each project verification. The project will share with the family farmers participating in the project part of the revenue generated with carbon credits from the reduction of deforestation in the project area.

The sharing system is based on the payments for environmental services mechanism, considering the remuneration of the family farmers for the conservation service of the native forest.

The distribution will include Amazônia Agroflorestal, the project proponent, and the family farmers that have properties with forest areas in the project area - producers who signed a contract with the REDD+ CAA project granting the proponent the right to generate carbon credits for avoided deforestation on their property.

Design and implementation

The calculation of project results is done based on the performance of each property in relation to the conservation of the forest area within the properties registered in the project compared to the projected deforestation based on the reference region. The process of calculating the project's benefit sharing is described below.

Step 1 - Verification of Reduction of Emissions by Avoided Deforestation: the project will carry out verification, in accordance with VCS guidelines and with VVB auditing, of emission reductions in the Project Area in each period.

The REDD+ CAA project provides for verification of project results every two years.

Step 2 - Issuance of VCUs: based on the verification of results in the period, Verra follows the process of issuing verified emission reductions (VCUs) to make the REDD+ credits generated by the project available to the market.

Step 3 - Distribution of the result: from the calculation of emissions reductions from avoided deforestation, the project reserves part of the emissions reductions (20%) to cover a technical reserve for the project (buffer credits plus a contingency).

From the rest of the emission reductions verified in the period (after the technical reserve discount) - the net emission reductions will be commercialized as VCUs in the voluntary carbon market by the project proponent.

Amazônia Agroflorestal, as the project proponent, is solely and exclusively responsible for selling the credits.

The revenue generated by the sale of VCUs on the voluntary carbon market will be used to pay for the investments in the project and its financing (costs, expenses, and project financing) and the remainder, after deduction of the costs and expenses of the project, will be shared between the project proponent, Amazônia Agroflorestal, and the family farmers participating in the project.

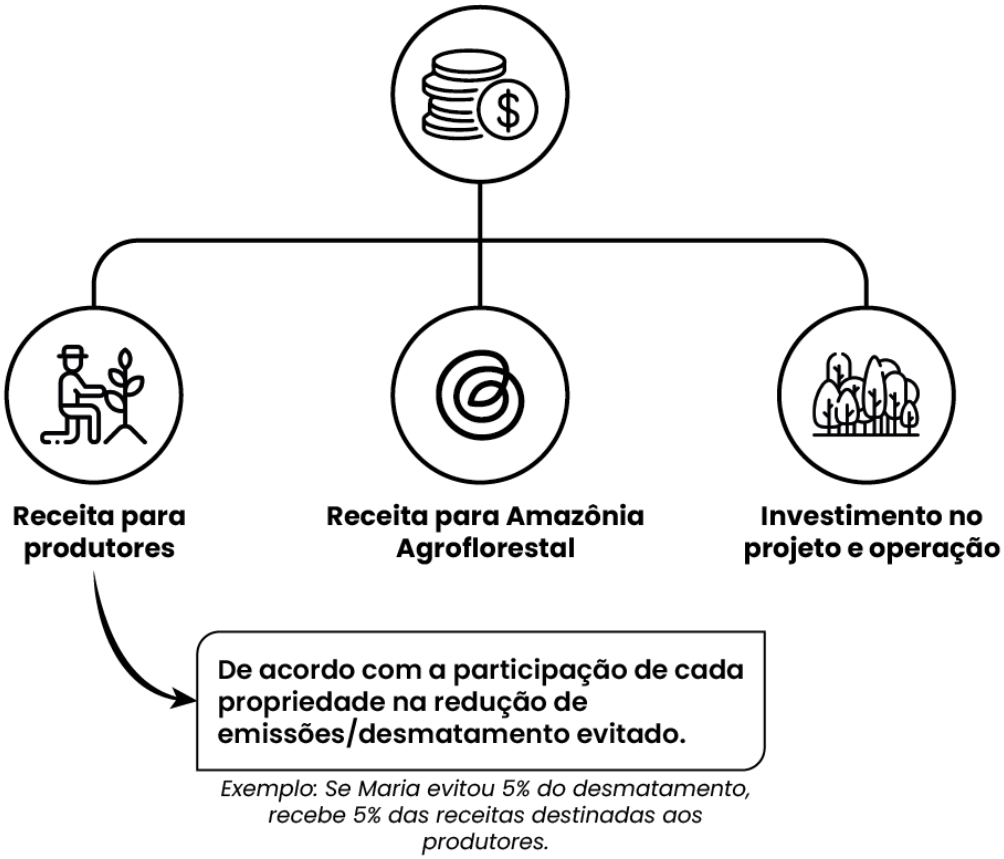

Figure 59. Revenue distribution from credits generated by the project.

Step 4 - Calculation of remuneration to family farmers according to contribution to reducing deforestation: from the volume of net VCUs available to family farmers, the calculation of the distribution per property will be based on the performance of avoided deforestation by each individual property. At each verification, the producer receives benefits related to the contribution that their forest area generated to the general result of avoided deforestation in the project.

To exemplify the process a fictitious example is presented below.

In this example, there are 50 participating producers, whose properties together add up to a total of 4.000 hectares of forests, an average of 80ha of forests per producer.

The estimated fictitious deforestation rate for the southern region of Amazonas is 3.5% per year. Thus, in this example, 3.5% of 4.000 hectares of forest were cleared in one year, or 140 hectares. Assuming that the deforestation of each hectare of forest emits 500 tons of CO2 (carbon dioxide), if there is no deforestation in the project area between 2022 and 2023, it will be possible to obtain a total of 70,000 tons of CO2 in VCUs (120ha x 500tonCO2).

Of these 70,000 tons of CO2 in VCUs:

- 20% (14,000 VCUs) is reserved in technical reserve (explained above);
- 80% (56,000 VCUs) available for sale

Of the 56,000 VCUs available for sale and converted into revenue (USD or BRL):

- X% will be used to fund investments (costs and expenses) and project financing;
- Revenue – X% will be divided 50% for Amazônia Agroflorestal (proponent) and 50% for family farmers participating in the project

Of the 50% distributable to the family farmers participating in the project, the division for each producer will be according to the area of avoided deforestation, for example:

Considering the total of 140 hectares of avoided deforestation in the verified period

Producer A: was responsible for avoiding the equivalent of 14 hectares of deforestation, that is, 10% of the total area of avoided deforestation. Producer A will receive 10% of the revenue amount distributable to producers (50% Revenue from selling 56,000 VCUs - X%)

It is worth mentioning that in the REDD+ CAA Project benefit-sharing model, the rural producer participating in the project only receives payments for environmental services when there is no deforestation in the native forest area of the property between one verification and another of the project, even if the rate of deforestation verified on your property is lower than the rate verified in the surroundings. In summary, the family producer participating in the project will only receive payment for environmental services when deforestation in the forest area of his property is zero.

More details on the sharing of benefits and payment model for environmental services of the REDD+ CAA project is in the contract signed with the family farmers participating in the project. The contract, as well as the Book of Agreements, will be shared with the VVB in the validation process.

Acceptance and participation of smallholder's community

As described in sections 2.3.4 - Community Costs, Risks, and Benefits and 2.5.3 - Free, Prior and Informed Consent (G5.2), the project and its conditions were first presented in a pre-consultation phase, where the Interested producers carried out an initial registration for the project, and, subsequently, FPIC workshops were held, in which producers committed themselves, through a contract, to participate in the project.

In the pre-consultation phase, family farmers had the opportunity to address points of attention and doubts, as well as suggest formats for participating in the project.

During the FPIC, the benefit sharing model was presented and discussed, as well as the payment for environmental services explained. At this time, family farmers had the opportunity to clarify doubts about the proposed model before signing, in a free, prior and informed manner, the participation contract.

See sections 2.3.4 - Community Costs, Risks, and Benefits and 2.5.3 - Free, Prior and Informed Consent (G5.2).

Transparency

Regarding transparency of the sharing of benefits, Amazônia Agrofloresstal, the project proponent, undertakes, through the contract with family farmers, to report to the Advisory Board of the REDD+ CAA Project (see section 2.4.1 - Project Governance Structures (G4 .1)):

- Advances, challenges and stages of development of the Carbon Project;
- Pertinent information related to the Project's maintenance and implementation costs, giving transparency to the distribution of the net profit generated by the commercialization of carbon credits.

As an observation, it is worth mentioning that Idesam, the project's technical partner, does not participate in the project's benefit-sharing scheme, therefore, it does not receive direct compensation for the credits generated by the project.

4.5.7 Benefits, Costs, and Risks Communication (GL2.7)

The rural family farmers of Apuí, Manicoré and Novo Aripuanã represent the communities impacted and involved by the project. Therefore, see section 2.3.4 - Community Costs, Risks, and Benefits for details of communicating the benefits and risks of participating in the project.

Relevant and additional information on this topic can also be found in sections:

- 2.3.3 - Informational Meetings with Stakeholders;
- 2.3.7 - Stakeholder Consultations;
- 2.3.8 - Continued Consultation and Adaptive Management;
- 2.3.10 - Stakeholder Participation in Decision-Making and Implementation (G3.6);
- 2.5.3 - Free, Prior and Informed Consent (G5.2);

Meeting minutes of pre-consultation and FPIC meetings, and signed contracts with participating family farmers will be available for VVB evaluation during the validation process.

4.5.8 Governance and Implementation Structures (GL2.8)

Due to the group of rural family farmers being one of the key actors in the project, including the owners of the properties in which the Project Area is located, information on the governance structure also involving family farmers has already been presented in section 2.4.1 - Project Governance Structures (G4.1).

4.5.9 Smallholders/Community Members Capacity Development (GL2.9)

Due to the group of rural family farmers being one of the key actors in the project, including the owners of the properties in which the Project Area is located, information on training and employability of family farmers through the project is described in section - 2.3.15 Community Employment Opportunities (G3.10).

It is also worth noting that project activities are planned to train the population of participating family farmers, see section 2.1.11 - Project Activities and Theory of Change.

5 BIODIVERSITY

5.1 Without-Project Biodiversity Scenario

5.1.1 Existing Conditions (B1.1)

Biodiversity loss impacts the functions, goods and services provided by ecosystems; such impacts can be as significant as, for example, those caused by climate change (Cardinale et al. 2012).

According to classifications on the occurrence of endemic species in the Amazon (Da Silva, Rylands & Fonseca, 2005), the project area is located in the Rondônia Endemism Center, delimited by the Madeira (on the left) and Tapajós (on the right) rivers. This area covers 475,000 km2, of which 12.56% were deforested until 2004 (Da Silva, Rylands & Fonseca, 2005). This area contains a significant number of endemic species, many of which occur in a very restricted area (Da Silva, Rylands & Fonseca, 2005). Species need more protected and strategically located areas to be adequately represented in a biodiversity conservation system (Rodrigues and Gaston, 2001).

The geographical area defined for the project is within the limits of the territory of influence of the Mosaic of Conservation Units (CUs) in the Southern Amazonas (ICMBIO, 2022) and, to the south and to the north by Conservation Units. This includes the Apuí UC Mosaic, created as a state government strategy to constitute a barrier against the colonization front of the 'Arco do Desmatamento', coming from the south of the Amazon, state of Mato Grosso.

The defined geographical area of the project is crossed by the BR 230 (Transamazônica Highway) and several secondary roads (side roads). In addition, ~50% of the project's geographic area is included in priority areas for conservation mapped by this Ministry[17], where the majority are of extremely high relevance for the conservation, sustainable use and sharing of benefits from biodiversity, as shown in Figure 60. These areas constitute a reference for decision-making in the planning and implementation of environmental management actions that promote sustainable use.

[17] http://dadosambientais.mma.gov.br/areas-prioritarias/

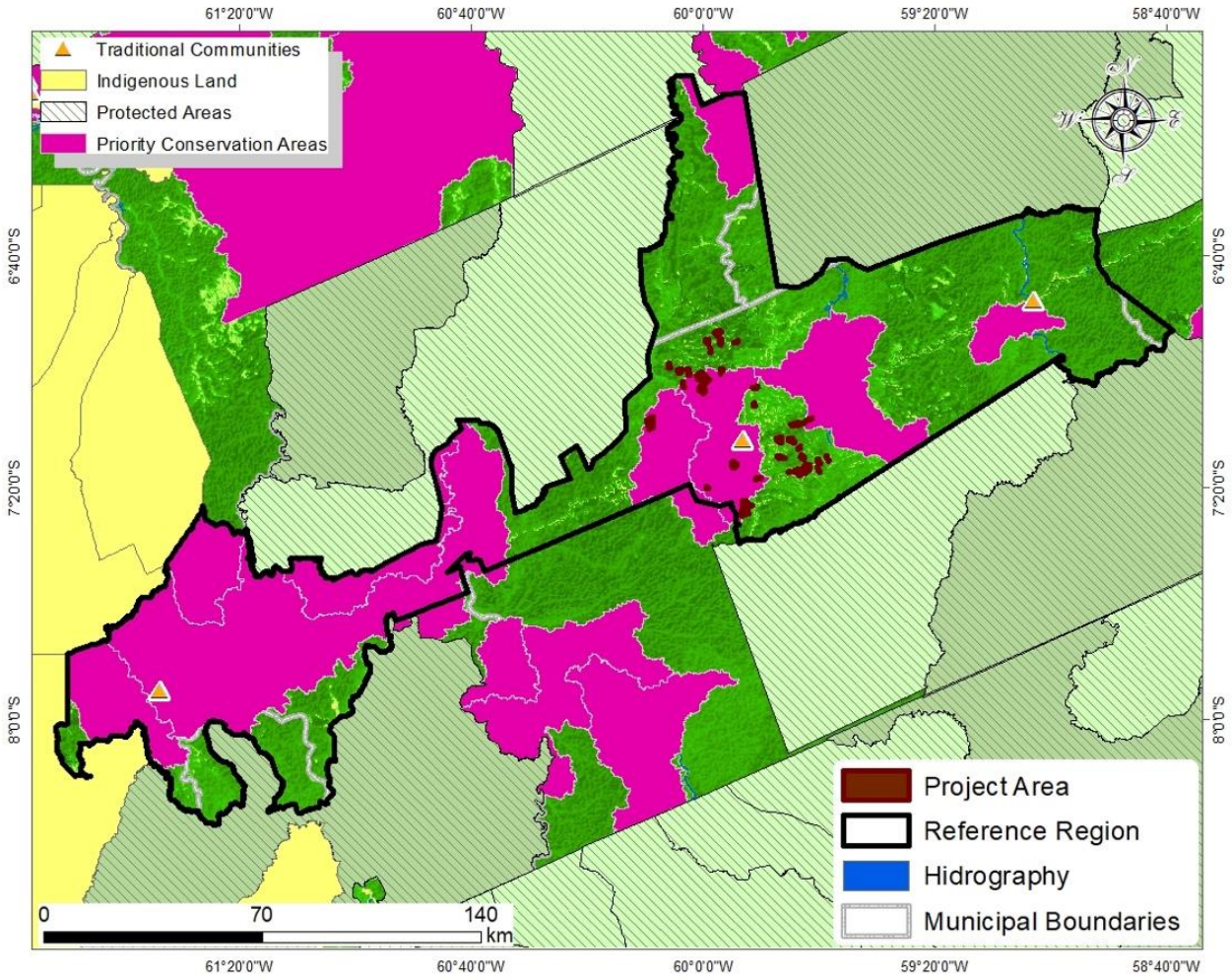

Figure 60. Priority Areas for Conservation in the Reference Region. Source MMA (2018)

The region is under high human pressure, whose main threats to the integrity of the biome and to biodiversity have historically been deforestation for livestock, mining and illegal logging (Carrero et al. 2020a; Coelho et al. 2017; Yanai et al. 2020, Wenzel and Sá, 2020a, 2020b). The three municipalities that make up the region - Apuí, Novo Aripuanã and Manicoré, are part of the list of priority municipalities of the Ministry of the Environment, for actions to prevent, monitor and control deforestation[18].

Thus, several public management and territorial planning policies that aim to expand conservation actions beyond the limits of protected areas are being implemented in the defined geographic area of project activities. The various active institutions and ongoing projects make this territory strategic not only regarding the conservation of rare and endemic species, but, above all, it is a strategic area for establishing partnerships, necessary both for the implementation and for ensure the continuity of the proposed actions.

The region of Mosaico da Amazônia Meridional (MAM) is identified as one of the main zones of endemism in the Southern Amazon, both for birds and mammals. It is located in an isolated and well-preserved area of the Amazon, of high biological importance, and has areas of high and medium richness of species of birds, mammals and amphibians and the set of UCs of this mosaic protects extensive, continuous and intact

[18] http://combateaodesmatamento.mma.gov.br/municipios-prioritarios

forest environments, in addition to a diversity of environments such as campinaranas, tabocais and rocky fields, ensuring the maintenance of endemisms, ecosystem functionality and environmental services in an important region of the Amazon (Abreu et al. 2013).

It should also be noted that the Apuí UC Mosaic Management Plan points to the existence of at least 10 to 12 endangered species, especially in the UC PARNA Juruena, considering the majority to be mammals and birds such as the primate *Mico chrysoleuca*, ararajuba (*Guaruba guarouba*) and the hyacinth macaw (*Anodorynchus hyacinthinus*) - all considered endangered also by the IUCN (Governo do Estado do Amazonas, 2010). Considering that the species do not respect the boundaries of Conservation Units, it is concluded that it is important to implement actions in the proposed area, which will be integrated into this existing ecological corridor, expanding the living and survival area for several species. In addition, the area of this project includes the following vegetation formations: Dense Ombrophyllous Forest, Open Ombrophyllous Forest, and forested Savannas. The Management Plan of the UCS of Apuí shows that these vegetations, mainly the dense and open rainforests, have high conservation value due to the high diversity of soil and, consequently, of species of fauna and flora (Governo do Estado do Amazonas, 2010).

5.1.2 High Conservation Values (B1.2)

As presented in section 4.1.3 - High Conservation Values (CM1.2), the REDD+ CAA project used the guidelines of the document "Common Guidance for the Identification of HCV" released in 2021 by the HCV Resource Network[19] for the identification of their HCVs.

The area considered for identifying the HCVs of the REDD+ CAA project comprises the Project Area and the Leakage Belt, which is the rural area with small and medium-sized properties in the regions of Apuí, Novo Aripuanã and Manicoré, see section 2.1.7 – Project Zone Map.

The HCVs of this project were identified according to the 6 categories of HCVs proposed by the "Common Guidance for the Identification of HCV" (HCV Resource Network, 2021) based on the FSC definitions of HCVs. For the REDD+ CAA project, HCVs of categories 1, 3, 4, 5 and 6 were identified, see section 4.1.3 - High Conservation Values (CM1.2).

Community-related HCVs are presented in section 4.1.3 - High Conservation Values (CM1.2), and below is the HCV identified for the biodiversity component:

HCVs related to provisioning ecosystem services

Provision ecosystem services are related to the supply of environmental goods or products used by human beings for consumption or commercialization. This HCV includes species whose conservation has high significance, both locally, as they are essential to the livelihood of local communities, but also globally, as many of the species are also classified as endangered.

Table 75. Biodiversity High Conservation Value related to provisioning ecosystem services

High Conservation Value 2	Species of flora and fauna that provide essential extractive resources for the subsistence of local communities (HCV 4).
Qualifying Attribute	Maintaining the way of life of communities of local family farmers depends directly on the conservation of species whose traditional use sustains families, as they provide: extractive products for food and/or commercialization of the surplus (eg, Brazil nut, bacaba , copaiba, fish, wood); wood for building houses, fences and canoes for transportation

[19] https://www.hcvnetwork.org/library/common-guidance-for-the-identification-of-hcv-english-indonesian-french-portuguese

	(eg cedar, itaúba, ipe, among others); plants used for medicinal purposes; fibers and lianas for making basketry or for sale as handicrafts. It should be noted that several of these species are threatened with extinction, as detailed in Table 77 below, which lists the most relevant species in this context of provision services, as well as the conservation status of each.
Focal Area	Area of native or regenerating forest within the properties (instances) participating in the project.

Table 76. Species from different taxonomic groups occurring in the project area that provide different types of ecosystem services.

SCIENTIFIC NAME	POPULAR NAME	LIST (MMA)	LIST (IUCN)	KIND OF SERVICE	GROUP
Anodorhynchus hyacinthinus	Blue Arara	UV	UV	Dispersion	Fauna
Aniba rosaeodora Ducke	Rosewood	EN	EN	Oil	Flora
Bertholletia excelsa	Brazil nuts	UV	UV	Food, sale	Flora
laurus nobilis	blond	-	LC	Wood	Flora
Genipa americana	genipapeiro	-	LC	Wood	Flora
Calycophyllum spruceanum	mulatto	-	-	Wood	Flora
guazuma ulmifolia	parakeet	-	LC	Wood	Flora
tapirira guianensis	cupiuba	-	LC	Wood	Flora
erysma uncinatum	cedar	-	LC	Wood	Flora
eschweilera atropetiolata	chestnut	-	CD	Wood	Flora
Clarisia racemosa	howler monkey	-	LC	Wood	Flora
pear glabrata	shoemaker	-	LC	Wood	Flora
Simarouba amara	marupá	-	LC	Wood	Flora
Piranhea trifoliata	piranheira	-	LC	Medicinal bark	Flora
Licaria puchury-major	pulled	-	-	Medicinal	Flora
Himatanthus sucuuba	succuuba	-	-	Medicinal	Flora
hymenaea parvifolia	Jutaí	UV	LC	Medicinal bark	Flora
carapa guianensis	andiroba	-	LC	Medicinal	Flora
Copaifera langsdorffii	Copaiba	-	LC	Medicinal	Flora
aspidosperma carapanauba	carapanauba	-	LC	Medicinal	Flora
Hymenaea courbaril	jatobá	-	LC	Medicinal	Flora
Allophylus amazonicus	supiarana	-	LC	Medicinal	Flora
Cymbopogon citratus	Holy grass	-	-	Medicinal	Flora
Brosimum parinarioides	Amapá	-	LC	medicinal milk	Flora
uncaria tomentosa	Cat nail	-	-	Medicinal	Flora
iron libido	Juca	-	-	Medicinal	Flora
Oenocarpus bacaba	asshole	-	-	Food	Flora
Mauritia flexuosa	buriti	-	-	Food	Flora
Euterpe oleracea	açaí	-	-	Food, sale	Flora
Astrocaryum aculeatum	tucumã	-	LC	Food, sale	Flora
Passiflora cincinnata	wild passion fruit	-	-	Food	Flora
How to use	sip	-	-	Food	Flora
Oenocarpus bataua	patauá	-	-	Food	Flora
Poraqueiba sericeia Tul	mari mari	-	-	Food	Flora
caryocar Braziliense	pequia	-	LC	Food	Flora
endopleura uchi	uixi	-	LC	Food	Flora
Peltophorum dubium	faveira	-	LC	Wood	Flora
Byrsonima crassifolia	muruci	-	LC	Wood	Flora
Mezilaurus itauba	itauba	UV	UV	Wood	Flora
Minquartia guyanensis	acariúba	-	-	Wood	Flora
plathymenia reticulata	yellowish	-	LC	Wood	Flora
Pterodon emarginatus	sucupira	-	LC	Wood	Flora
Minquartia guianensis	acariquara	-	NT	Wood	Flora
chamek ateles	black-faced spider monkey	UV	EN	Ecotourism, dispersion, Food	mammals
furipterus horrens	Bat	UV	LC	Pest control	mammals
Leopardus wiedii	Margay	UV	NT	Ecotourism	mammals
Lonchorhina aurita	Bat	UV	LC	Pest control	mammals
Myrmecophaga tridactyla	giant anteater	UV	UV	Pest control	mammals
panthera onca	jaguar, black jaguar	UV	NT	Ecotourism, keystone species	mammals

Priodontes maximus	giant armadillo, armadillo	UV	UV	Ecotourism, dispersion, Food	mammals
Pteronura braziliensis	otter, giant otter, water jaguar	UV	EN	Ecotourism	mammals
concolor cougar	puma, puma, red jaguar, cougar	UV	LC	Ecotourism, keystone species	mammals
Speothos venaticus	bush dog	UV	NT	Ecotourism, dispersion	mammals
terrestrial tapirus	Tapir	UV	-	Ecotourism, dispersion, Food	mammals
tayassu peccary	peccary, pig	UV	UV	Ecotourism, dispersion, Food	mammals
Cuniculus paca	paca	-	LC	Food, sale	mammals
Tolypeutes tricinctus	armadillo	UV	EN	Food, sale	mammals
Dasyprocta sp.	agouti	-	-	Food, sale	mammals
Cervidae sp.	deer	UV	UV	Food, sale	mammals
spatula quedula	teal	-	LC	Food, sale	avifauna
Trichechus inunguis	Amazonian manatee	UV	UV	Ecotourism, dispersion, Functional therapy	mammals
*Pyrilia vulturina**	vulture parrot	UV	LC	Ecotourism, dispersion, birdwatching	avifauna
tigrisoma fasciatum	dark oxen	UV	LC	Ecotourism, dispersion, birdwatching	avifauna
tinamus tao	Bluebird	UV	UV	Ecotourism, dispersion, birdwatching	avifauna
Cracinae sp.	curassow	UV	-	Ecotourism, dispersion, birdwatching	avifauna
harpy harpyja	harpy eagle,	UV	UV	Ecotourism, dispersion, birdwatching	avifauna
psophia viridis	jacamine	UV	UV	Ecotourism, dispersion, birdwatching	avifauna
Psittacidae sp.	Macaw	UV	-	Ecotourism, dispersion, birdwatching	avifauna
aramus guarauna	limp	UV	LC	Ecotourism, dispersion, birdwatching	avifauna
tigrisoma fasciatum	dark oxen	UV	LC	Ecotourism, dispersion, birdwatching	avifauna
Piaractus mesopotamicus	pacu	-	-	Food	Ichthyofauna
sardinella january	sardine	-	-	Food	Ichthyofauna
Prochilodus lineatus	curimbata	-	-	Food	Ichthyofauna
Cychla ocellaris	peacock bass	-	-	Food	Ichthyofauna
Theobroma grandiflorum	curauacu	-	LC	Food	Ichthyofauna
Prochilodus lineatus	curimatã	-	-	Food	Ichthyofauna
Arapaima gigas	arapaima	-	DD	Food	Ichthyofauna
Leporinus freiderici.	aracu	-	-	Food	Ichthyofauna
Semaprochilodus sp.	jaraqui	-	LC	Food	Ichthyofauna
Hypophthalmus edentatus	mapara	-	-	Food	Ichthyofauna
Schinopsis Braziliensis Engl	bararua	-	LC	Food	Ichthyofauna
geophagus Braziliensis	face	-	-	Food	Ichthyofauna
Hoplias sp.	betrayed	-	LC	Food	Ichthyofauna
Osteoglossinae sp.	aruana	-	-	Food	Ichthyofauna
Phractocephalus hemioliopterus	pirarara	-	-	Food	Ichthyofauna
Hoplosternum littorale	tambiuata	-	-	Food	Ichthyofauna
Castelnaean fur	papa	-	LC	Food	Ichthyofauna
Pseudoplatystoma fasciatum	surubim	-	-	Food	Ichthyofauna
Hypostomus plecostomus	bodo	-	-	Food	Ichthyofauna

HCVs related to supporting ecosystem services

Supportive ecosystem services are considered those that contribute to the production of other ecosystem services such as maintenance of biological and genetic diversity of species. This HCV includes species that are central to maintaining the ecosystem balance: endemic species, endangered species and species at the top of the food chain. The preservation of these species has global significance, since it is about maintaining genetic heritage in the present era in which more and more scientists corroborate the theory of the occurrence of the 6th mass extinction, resulting from human activities (Wagler, 2011).

Table 77. Biodiversity High Conservation Value related to supporting ecosystem services

High Conservation Value 3	Central species for maintaining the ecosystem balance: endemic species, endangered species and preserved top of the food chain species (HCV 1)
Qualifying Attribute	Every species has characteristics and functionalities that are important for maintaining balance and ecosystem services. Maintaining the mosaic of phytophysiognomies in the region makes it possible to conserve the home range for these species, including large predators throughout the trophic chain, such as the jaguar (*Panthera onca*) and Jacaretinga (*Caiman crocodilus*). the list of the main species that fall under this HCV, whose occurrence in the region has already been diagnosed, is detailed in Table 77. It is important to point out that the monitoring that will be carried out within the scope of this project (item 5.4) has great potential to contribute to science with the discovery of new species.
Focal Area	Area of native or regenerating forest within the properties (instances) participating in the project.

Table 78. Endangered species found in the mosaic of Apuí Conservation Units that are close to the project area

Scientific name	Common name	IUCN Classification	Records in Conservation Units
Priodontes maximus	giant armadillo	VU	ESEC Terra do Meio* and FLONA of Humaitá*[1]
Myrmecophaga tridactyla	giant anteater	VU	ESEC Terra do Meio
Tapirus terrestris	Tapir	VU	ESEC Terra do Meio and FLONA of Humaitá
Inia geoffrensis	Pink Dolphin	EN	FLONA of Humaitá
Tayassu peccary	peccary	VU	ESEC Terra do Meio, PARNA Juruena* and Mosaico do Apuí*[2]
Ateles marginatus	white faced spider monkey	EN	ESEC Terra do Meio
Podocnemis unifilis	Tracajá	VU	ESEC Terra do Meio
Penelope pileata	Jacupiranga	VU	ESEC Terra do Meio
Chelonoidis denticulata	tortoise-tinga	VU	ESEC Terra do Meio
Pteroglossus bitorquatus	Red-necked Aracari	EN	ESEC Terra do Meio
Tinamus tao	blue bird	VU	FLONA of Humaitá
Pseudoplatystoma corruscans	Painted / Surubim	EN	FLONA of Humaitá
Lagothrix lagothrica cana	gray woolly monkey	EN	FLONA of Humaitá
Pteronura brasiliensis	giant otter	EN	FLONA of Humaitá, PARNA Campos Amazônicos and PARNA Juruena
Guaruba guarouba	Ararajuba	VU	Mosaic of Apuí
Crax fasciolata	curassow	VU	Mosaic of Apuí
Anodorhynchus hyacinthinus	Blue Arara	VU	Mosaic of Apuí
Aniba rosadora	Rosewood	EN	Mosaic of Apuí
Harpy harpyja	Harpy	VU	PARNA Campos Amazônicos
Myco manicorensis	Marmoset of Manicoré	VU	PARNA Campos Amazônicos
Panthera onca	Jaguar	VU	wide occurrence
concolor cougar	Puma	VU	wide occurrence

HCVs related to regulatory ecosystem services

Regulatory ecosystem services contribute to maintaining the stability of ecosystem processes, such as habitat maintenance and carbon sequestration. This HCV therefore deals with the maintenance of the local

landscape, that is, maintenance of the mosaic of phytophysiognomies that make up the area, which, as detailed in item 2.1.5 - Physical Parameters, is located in a region that originally has more than 91 % of the area in tropical forest (Dense Ombrophylous Forest and Open Ombrophylous Forest) and portions of non-forest formations (grasslands), composed of wooded savannah or herbaceous or shrubby pioneer formations around rivers and lakes.

Table 79. Bidiversity High Conservation Value related to regulatory ecosystem services

High Conservation Value 4	Preserved forest and rural environments (HCV 3)
Qualifying Attribute	The maintenance of standing forest and grassland environments in maintaining the carbon stock via avoided deforestation in the context of climate change. As well as forest environments, grassland environments play a very important role in the stock and cycling of carbon at a global level (Lal, R. 2008), in addition to having high biodiversity and providing services highly demanded by society, such as water supply, erosion control, and cultural values (Bengtsson et al, 2019)
Focal Area	Area of native or regenerating forest within the properties (instances) participating in the project.

5.1.3 Without-project Scenario: Biodiversity (B1.3)

In without-project scenario, the native forest areas of the participating properties would be deforested almost entirely to establish pastures for livestock, as described in section climate 3.1.4. Impacts on biodiversity would be the loss of habitat and species populations in these areas, as well as the environmental services that the forest provides. This forest loss also directly affects soil conservation and disturbs ecological processes on a larger scale (Pagiola et al., 2004).

Expansion of illegal mining: Recent reports show a trend towards the establishment of mining activities in the region[20]

Deforestation for extensive livestock expansion. As described in the no-project scenario (Section 3.1), livestock expansion takes place over forested areas, causing habitat loss that contributes to the local extinction of specimens while reducing the population size of biological communities in the reference region and in the project area.

Illegal timber extraction in forest areas: Recent studies carried out by the IMAZON in the PARNA Campos Amazônicos warn of the advance of deforestation in this region, threatening the entire mosaic of protected forests and areas located beyond the limits of the NAtional Park; destruction intensified again as new logging settlements emerged outside the park boundaries. Increasingly, loggers are invading the forest in search of unexplored areas.

Increase in hunting and illegal fishing: Failure to promote income alternatives for project beneficiary communities may lead to an increase in illicit activities such as illegal hunting and fishing, historically carried out in the region and with negative impacts on biodiversity conservation, listed threats among the main ones existing in the group of UCs of the Mosaico da Amazônia Meridional (Management Plan of PARNA Campos Amazônicos and Mosaico do Apuí).

[20] https://www.bbc.com/portuguese/Brazil-59425015

Loss of biodiversity and ecosystem services: the conversion of natural habitats, whether forest or grassland, leads to loss of biodiversity, local extinction and increased vulnerability of populations of different species, and, consequently, directly impacts the ecosystem services provided by these environments and all the associated diversity.

5.2 Net Positive Biodiversity Impacts

5.2.1 Expected Biodiversity Changes (B2.1)

The activities proposed in this project will have a positive impact on aspects related to biodiversity conservation, as they will ensure the maintenance of forest remnants, areas of high conservation value and associated services, and, consequently, will promote the maintenance of habitats for several species.

In addition, the project will promote income alternatives for local communities and, consequently, reduce the pressure and threats to natural resources arising from illegal activities, such as hunting, mining and logging. It should also be noted that encouraging the implementation of agroforestry systems, as described in section 2.1.11 - Project Activities and Theory of Change, with a focus on planting coffee intercropped with agricultural and forestry species, promotes the recovery of areas, in addition to contributing to the diversification of production, to replace chemical fertilizers with organic fertilizers, and, consequently, to improve soil quality (Figueiredo et al. 2015)).

It is also possible to approach the perspective of the potential of agroecological systems as facilitating spaces for the dispersion of species among natural fragments, which can contribute to minimize local extinctions resulting from the fragmentation of habitats (Vandermeer and Perfecto 2007).

Table 80. Expected Biodiversity Changes

Biodiversity Element	**Preservation of biodiversity and local phyto-physiognomies**
Estimated Change	Decrease in illicit activities such as hunting, mining and logging, as well as the advancement of livestock, and, consequently, a decrease in pressure and negative impacts on biodiversity and on the habitats of species.
Justification of Change	The promotion of income alternatives and actions for training and empowering the local community make it possible to reduce illegality and the advance of livestock in native areas. It is possible to estimate this from the number of people involved in the activities promoted by the Project, the percentage of native area kept intact throughout the project, as well as, through the historical monitoring of the number of infraction notices drawn up in the region by the inspection authorities.
Biodiversity Element	**Recovery of degraded areas**
Estimated Change	Agroforestry Systems will reforest areas already anthropized inserted in the Project region, with a focus on coffee planting and income generation for the community.
Justification of Change	Community involvement in project actions that provide alternative income allows communities to choose to engage in legal activities that promote sustainability, as opposed to predatory activities historically carried out in the region; the planting of agroforestry systems in degraded areas facilitates the dispersal of species, promotes increased diversity, soil health and the provision of different ecosystem services. Monitoring of degraded areas converted into SAFs will be carried out, with regard to both

	community involvement, as well as aspects related to biodiversity and the resulting production and income.

5.2.2 Mitigation Measures (B2.3)

As described in item 5.1.3 - Without-project Scenario: Biodiversity (B1.3), there are different threats to biodiversity conservation in the proposed territory, therefore, this project anticipates the occurrence of probable environmental damage to the region, and seeks to reverse the pressure trends on the territory, proposing actions aimed both at protecting the environment and at improving the quality of life of local communities.

The containment of illicit activities that cause direct impacts on the environment and the conservation of biodiversity, such as deforestation, hunting and illegal fishing, is possible through not only inspection, but mainly through interventions focused on prevention and precaution, that is, through environmental education actions and the implementation of sustainable income alternatives.

Based on the activities proposed in item 2.1.11 -Project Activities and Theory of Change, the REDD+ CAA Project focuses on mitigation actions for threats to biodiversity:

- Monitoring of forest cover;

- Monitoring of fire outbreaks;

- Strengthening partnerships for firefighting plan.

- Creation and support for the maintenance of firebreaks;

- Awareness workshops on fire control and handling and pesticide drift

- Biodiversity monitoring;

- Implementation of fauna and flora protection signs in the project's forests.

- Subsidy and coordination in the implementation of agroforestry systems and organic production certificate

- Provision of agroforestry technical assistance to all agroforestry producers participating in the project

Details on how these actions will be implemented are in item 2.1.11 -Project Activities and Theory of Change and item 5.4.1 - Biodiversity Monitoring Plan (B4.1, B4.2, GL1.4, GL3.4) presents how the biodiversity indicators will be monitored

5.2.3 Net Positive Biodiversity Impacts (B2.2, GL1.4)

All project activities, presented in Appendix 2, from Section 2.1.11 - Project Activities and Theory of Change, and summarized in section 5.2.1 Expected Biodiversity Changes (B2.1) contribute to greater conservation of biodiversity in the project area. Compared to a “Without Project Scenario”, as detailed in section 5.1.3 Without-project Scenario: Biodiversity (B1.3), the REDD+ CAA project foresees activities that bring benefits and mitigation actions that aim to ensure the protection of biodiversity.

Several positive impacts on biodiversity conservation are expected as a result of the implementation of this project, such as: end of pressure from illegal hunting, fishing and deforestation; maintenance of forest remnants and the species and habitats associated with these remnants; maintenance of ecological corridors in a region surrounded by protected areas that are home to rare and endemic species that require an extensive home range for their survival; greater involvement and commitment of the local community

with the conservation of biodiversity, as actions of environmental education, technical training and promotion of income alternatives will be developed with these communities; finally, it will be possible to continuously evaluate the results arising from the project through the biodiversity monitoring system,

The activities foreseen by the project (based on what is presented in section 2.1.11 - Project Activities and Theory of Change) with a net positive impact on biodiversity and the problems associated with them that intend to be solved are:

Table 81. Associated Biodiversity problems addressed by the Project Activities

Project Activity	Associated Biodiversity problem addressed
Forest Protection and Environmental Monitoring	Conversion of forest into productive area causing loss of quality of air, soil, water and other natural resources beneficial to protection and maintenance of ecosystem services; Use of fire on properties causing loss of quality of air, soil, water and other natural resources beneficial to protection and maintenance of ecosystem services;
Payment for environmental services	Zero financial return for forest preservation activities, generating incentives for the expansion of the agricultural and livestock frontier;
Sustainable production, income generation and gender inclusion	Rural production with the use of pesticides and in a degrading way to the maintenance of ecosystem services;
Land and environmental regulation	Social vulnerability due to lack of regular land tenure causing areas with native forests to be converted due to pressure from the agricultural frontier, threatening resources and ecosystem services;

It should also be considered that the REDD+ CAA project will promote the initial preservation of 3,700 hectares of forest remnants in the initial instances of the project (PAI#1-42) and plans to increase this area over the first 10 years of the project, grouping new forest areas to be conserved by the project. In addition, the project will promote the implementation of Agroforestry Systems in areas already anthropized and, according to FAO (FAO 2010a, 2010b) non-native trees and managed forests provide a wide range of forest goods and services and help reduce pressure on the natural forests. These activities are essential to promote benefits from adaptation to climate change for biodiversity, as they provide climate benefits such as improved soil quality, reduced GHG emissions, removal of GHG emissions and mitigation of extreme weather-related events. The project expects that the conservation and regeneration of degraded areas will allow the local biodiversity in the project area and surroundings to have, therefore, resilience capacity to adapt to climate change.

5.2.4 High Conservation Values Protected (B2.4)

As this project provides for actions that essentially aim at maintaining the region's natural ecosystems and implementing an alternative income through the planting of agroforestry systems, there is no action in this proposal that would allow a loss or that could negatively affect the HCVs identified in section 5.1.2 - High Conservation Values (B1.2).

The proposed agroforestry system will not include any invasive exotic species and will be implemented in areas already anthropized, favoring health and diversity in the soil and in the planting areas. The generation of alternative income is a central point of this proposal since, in addition to stopping the conversion of

natural areas into pastures, it has the potential to minimize pressure from illegal hunting, fishing and deforestation.

5.2.5 Species Used (B2.5)

As described in the section 2.1.11 - Project Activities and Theory of Change, one of the main activities of the project is the implementation of agroforestry systems focused on coffee production, aiming to strengthen and consolidate the agroforestry and organic coffee chain, with high added value, in the region of project. This is the only REDD+ CAA project activity that uses the planting of tree species in its execution.

For the implementation of agroforestry systems, which are already implemented in properties in the region through the actions of Amazônia Agroflorestal, the project proponent, and Idesam, technical partner, the species presented in Table 83 below.

Table 82. Forestry and agricultural species used in Agroforestry Systems to be implemented by the REDD+ CAA project.

Popular name	Scientific name
Café conilon	*Coffee canephora*
Açai-touceira	*Euterpe oleraceae Mart.*
Andiroba	*Carapa guianensis Aubl*
Banana	*Musa spp*
Cacau	*Theobromacacao L.*
Castanha do Brasil	*Bertholletia excelsa Bonpl.*
Cedro	*Cedrela odorata*
Copaiba	*Copaifera glycycarpa Ducke*
Cupuaçu	*Theobroma grandiflorum (willd.)*
Erytrina	*Erythrina poepiggiana*
Faveira branca	*Parkia multijuga Benth.*
Gliricidia	*Gliricidia sepium*
Inga	*Inga edulis Mart.*
Ipê Amarelo	*Hidroanthus serratifolius*
Itaúba	*Mezilaurus itauba (Meisn.) Taub. ex mez*
Jatobá	*Hymenaeae oblongifolia*
Mogno	*Swietenia macrophylla*
Orelha preta	*Enterolobium contortisiliquum (Vell.) Morong*
Paricá, bandarra	*Schizolobium amazonicum*
Peroba Branca	*Aspidosperma macrocarpon*
Pupunha	*Bactris gasipaes HBK*
Pau rosa	*Aniba roseodora*

Furthermore, as verified in the result of the Socioeconomic Survey applied to rural producer families (section 4.1.1 - Descriptions of Communities at Project Start (CM1.1)), the following are usually produced in productive areas: cassava, banana, pineapple, corn, coffee, açaí, pumpkin, citrus, cocoa, cassava, guarana, cupuaçu, coconut and rice

5.2.6 Invasive Species (B2.5)

Invasive alien species are considered as one of the main direct causes of biodiversity loss worldwide.

The REDD+ CAA project has as one of its proposed activities the planting of coffee (Coffea canephora), in association with other species in an agroforestry system (see section 2.1.11 - Project Activities and Theory of Change).

Some fruit species, such as coffee, are classified as exotic/non-native species, that is, species that were introduced through human activity outside their past or present natural distributions. No mentions were found in the scientific literature that robusta coffee is a species of invasive behavior in Brazil, given its high degree of domestication. Invasive exotic species, in turn, are defined as those that, after being introduced, threaten ecosystems, habitats or species.

In the project activities, species that have records, history or potential to become invasive will not be introduced; in the planting activities of agroforestry systems, domesticated species that depend on management for their dispersion and maintenance will be used, giving priority to the planting of species native to the region, such as cedar, copaíba, andiroba, cupuaçu, açaí and peach palm. The project will follow recommendations contained in the global guidelines on non-native trees, taking all necessary precautions for the introduction and management of exotic species (Brundu et al., 2020).

The REDD+ CAA project does not foresee that the native forest area of the properties, object of conservation of the project, will be negatively impacted by the use of the species in the Agroforestry Systems.

5.2.7 Impacts of Non-native Species (B2.6)

As described in section 5.2.6 - Invasive Species (B2.5), the REDD+ CAA project has as one of its main activities the implementation of agroforestry systems focused on the production of coffee, the coffea canephora species, better known as conilon or robusta coffee. In the agroforestry systems to be implemented by the project, this coffee is the main product, while native species – see section 5.2.5 - Species Used (B2.5) – are intercropped to guarantee the ecological and productive function of the agroforestry.

Coffea canephora is not a native species of the Brazilian Amazon, or the project region, however, there is no record or history of invasion in Brazil by coffea canephora, according to a query carried out in the Horus Institute Database (https://bd.institutohorus.org.br/especies).

Table 83. Information about *Coffea canephora*

Species	*Coffea canephora*
Justification of use	*It is an understory tree widely planted in Brazil as an industrial permanent crop. It is the pillar of income generation in agroforestry systems. The species is traditionally planted in Brazil, and widely disseminated by the Brazilian Agricultural Research Corporation (EMBRAPA) in the Amazon, especially in the states of Minas Gerais, Espírito Santo, Mato Grosso, Rondônia and Amazonas*
Potential Adverse Effect	*Unidentified adverse effects*

5.2.8 GMO Exclusion (B2.7)

No GMO will be used in the project activities. In fact, project activities will plant native tree species within agroforestry systems.

5.2.9 Inputs Justification (B2.8)

As presented in section 2.1.11 - Project Activities and Theory of Change and pointed out in section 5.2.6 Invasive Species (B2.5), the REDD+ CAA project will promote the recovery of degraded areas with agroforestry systems based on coffee production organic.

The project will support the process to obtain the Organic certification of Brazil the production in the agroforestry systems of the family farmers participating in the project.

Figure 61. Organic Certification Seal of Brazil

Since 2015, family farmers in the project region have had the support of Idesam (the project's technical partner) to achieve organic certification of agroforestry production, through the Maniva Agroecology Network of Amazonas (see definition in section 2.1.9 - Stakeholder Description) – network which, through the participatory certification system, supports small farmers in the Amazon to achieve organic certification of their production. The REDD+ CAA project intends to continue this activity.

Figure 62. Logo of the Participatory Certification System of the Maniva Agroecology Network

In certified properties, the use of chemical inputs is not allowed in agroforestry systems, but it can still be done, according to legislation, in crops other than coffee, following all legal requirements to guarantee the organic conformity of production.

Another guideline resides in following the requirements described in the Organic Management Plan. The Organic Management Plan is one of the documents required by Brazilian law and is applied by the certifier as a portrait of the property and its production, with monitoring due to the need to always be updated and revised. It is the document that demonstrates the organic production and handling practices permitted by law, as in the case of coffee, for example, the manufacture and use of biofertilizers and homemade traps to control the coffee berry borer.

An Organic Management Plan was designed for the project to be followed by each property and inspected annually, at a minimum, for renewal of the seal certification.

5.2.10 Waste Products (B2.9)

All residue from agroforestry management systems will be used on the property itself as organic matter that covers the agroforestry soil, and the responsibility for disposing of or using this residue from agroforestry management rests with the family farmers participating in the project.

Waste from capacity building and training activities will be classified and properly disposed of. The same goes for waste generated at the Amazônia Agroflorestal and Idesam offices in Apuí and Manaus.

5.3 Offsite Biodiversity Impacts

5.3.1 Negative Offsite Biodiversity Impacts (B3.1) and Mitigation Measures (B3.2)

Possible negative impacts on biodiversity in areas outside the target area of the REDD+ CAA project are the increased pressure for natural resources and environmental crimes in areas not covered by the project. The justification for this type of risk is that the project, in the implementation of its activities, may end up generating pressure for activities with a negative impact outside the project zone, a leakage of activities

To mitigate this possible impact, actions to be implemented, such as biodiversity monitoring actions, training and promotion of income alternatives, will also be offered in order to contemplate, involve and empower the surrounding communities. Table 85 shows the possible negative impacts and the mitigation measures.

Table 84. Negative Offsite biodiversity impacts and mitigation measures

Negative Offsite Impact	Mitigation Measure(s)
Fires and burns	• Partnership with the local fire brigade in southern Amazonas – Prevfogo, with training, supply of materials and fuel; • Actions to raise awareness about the use of fire in the region, open to both participants and non-participants in the project; • Monitoring of fires outside the project area
Deforestation and forest degradation	• Monitoring of deforestation outside the project zone, including leakage belt; • Partnership with local bodies for the environmental regularization of properties (e.g. IDAM – see section 2.1.9 - Stakeholder Description) • Training in sustainable rural production activities for participants and non-participants in the project

Illegal hunting or fishing activities	• Installation of information signs about places of high conservation value and prohibition of hunting or fishing in the project area that will be able to inform the community outside the project area

It is important to highlight that a mosaic of protected areas – the Mosaic of Apuí Conservation Units, is adjacent to the area around the area proposed for this project (see section 2.1.11 - Project Activities and Theory of Change) with public policies being implemented and communities already active. Therefore, the project's actions will be developed, also seeking to strengthen and complement converging and successful actions in progress. Idesam, technical partner of the REDD+ CAA project, is a member organization of Apuí's Mosaic of Conservation Units Advisory Council.

5.3.2 Net Offsite Biodiversity Benefits (B3.3)

In the without-project scenario, activities such as the probable deforestation of forest remnants, the increase in environmental crimes, the sedimentation of water bodies, soil compaction and contamination by agrochemicals due to livestock activities, are possible scenarios with direct negative impacts on the environment and conservation of local and regional biodiversity.

The actions proposed in this project will result in benefits for the conservation of fauna, flora, soil and water resources, for example, benefits that will invariably extend beyond the limits and communities residing in the target zone, and will ensure the maintenance of essential ecosystem services for mitigating climate change.

Furthermore, the "edge effects" caused by deforestation in the project area in the "no project" scenario would alter the surrounding forest habitat, causing, among other things, a high tree mortality rate and reduction of animal species (Laurance et al., 2000; Ferraz et al., 2007).

Monitoring and research actions on biodiversity will provide the necessary information to avoid and/or mitigate negative effects inside and around the project area, such as those caused by illegal deforestation.

The maintenance of forest remnants in the project area and the implementation of agroforestry systems in areas already anthropized will also promote benefits to the biome as a whole, adding areas of ecological corridor in a region of high conservation value.

The expected benefits to biodiversity through the implementation of project activities can be seen in Appendix 2, from section 2.1.11 - Project Activities and Theory of Change

5.4 Biodiversity Monitoring

5.4.1 Biodiversity Monitoring Plan (B4.1, B4.2, GL1.4, GL3.4)

The Monitoring Plan for biodiversity of the REDD+ CAA project was created based on the activities presented in section 2.1.11 - Project Activities and Theory of Change and on the species presented in section 5.1.2 High Conservation Values (B1.2).

For specific species of fauna and flora that will be monitored, the situation of the species according to the IUCN list and occurrence in the region was used as a selection criterion. Species that appear as EN-endangered by the IUCN classification in Table 77, section 5.1.2 High Conservation Values (B1.2), with a greater possibility of occurrence in the project region, and species classified as VU - vulnerable species due to the frequent occurrence of interaction with communities in the project area, namely: jaguar (VU), tapir (VU), rosewood (EN) and Brazil nut (VU). More details about the situation of these species in the

scenarios with and without the REDD+ CAA project are presented in section 5.5.2 - Trigger Species Population Trends (GL3.2, GL3.3).

In order to carry out an effective monitoring plan that allows the monitoring and measurement of all these indicators, more than one methodology will be used. The indicators that will be monitored are shown below at Table 86.

Table 85. Biodiversity indicators monitored

Activity	Source	Indicators	Frequency
Invertebrates biodiversity monitoring	eDNA soil samples*	Quantity, family of invertebrates per type of land use	Every two years
vertebrates monitoring	Camera traps	Quantity, species name, location *if tapirs or jaguars are monitored, numbers will be specified into a separate indicator	Continuous after year 2
Agroforestry biodiversity monitoring	ASF inventory	Quantity, species name, and purpose	Every four years
Native species and bio-products utilized	Socioeconomic survey	Extractivism species used	Every four years
Vertebrates and human interaction	Socioeconomic survey	Hunted or fished species; Number of animals; Frequency; Panthera onca - jaguar attacks	Every four years

The eDNA will be monitored using the Terrabio methodology, designed by USAID and CIAT (see section 2.4.4 - Project Management Partnerships/Team Development (G4.2)). According to the Terrabio method, the e-DNA technique (Environmental DNA) identifies, through laboratory analysis, the presence and diversity of existing invertebrates at least at the class level, based on the extraction of DNA in soil samples that will be collected for this purpose. The specific DNA extraction and amplification methods will follow the TERRABIO protocol and the result of the analyzes will result in the following indicator, to be monitored throughout the project: i) richness and diversity of key invertebrate species (members of the orders *Hymenoptera* and *Lepidoptera* due to their important role as pollinating species) in anthropized areas where agroforestry systems will be implemented ii) richness and diversity of invertebrate species in forest areas adjacent to the anthropized areas where the SAFs will be implemented. In addition to making it possible to survey the invertebrate community in natural forested areas in the region, it will be possible to compare this diversity with the existing diversity in anthropic areas before and after the planting of AFS.

5.4.2 Biodiversity Monitoring Plan Dissemination (B4.3)

The plan and monitoring of project activities related to biodiversity, presented in section 5.4.1 - Biodiversity Monitoring Plan (B4.1, B4.2, GL1.4, GL3.4), will be available to the communities involved and project

stakeholders through the communication channels described in section 2.3.2 - Dissemination of Summary Project Documents.

To facilitate the access of rural family farmers to the material, the monitoring plan of all project activities will be available at Idesam's headquarters in Apuí, and will be presented by project technicians during periodic meetings about the project, as scheduled in section 2.3 .8 - Continued Consultation and Adaptive Management.

5.5 Optional Criterion: Exceptional Biodiversity Benefits

5.5.1 High Biodiversity Conservation Priority Status (GL3.1)

Presented in section 5.1.2 - High Conservation Values (B1.2).

5.5.2 Trigger Species Population Trends (GL3.2, GL3.3)

The trigger species identified by the REDD+ CAA Project and their population trends are presented in Table 86.

Table 86. Trigger species identified and their population trends

Trigger Species	***Panthera onca*- jaguar, black jaguar, jaguaretê, yaguaretê, tiger, jaguar, kanguçu - VU**
Population Trend at Start of Project	The destruction of habitats combined with predatory hunting, mainly due to the alleged economic damage caused to the creation of domestic animals, means that populations have been severely reduced in Brazil (Procarnivoros, 2022). It is difficult to estimate the number of specimens occurring within the Project Area, certainly more than 2.
Without-project Scenario	Predatory hunting will be established with greater intensity, in addition to the aggravating factor of conversion of habitat to pasture, which will lead to a reduction in the home range of a large mammal whose home area can reach 260km2 (Procarnivoros, 2022).
With-project Scenario	Community involved in the project and in environmental education actions, starting to value and protect local biodiversity, especially endangered species; the project's biodiversity monitoring actions will support analyzes of the species' conservation status.
Trigger Species	***Tapirus terrestris*– Tapir (VU)**
Population Trend at Start of Project	The main threats to the species are habitat fragmentation, deforestation and predatory hunting (BioBrazil, 2012); it is a species traditionally consumed as a source of protein by traditional communities. It is difficult to estimate the number of specimens occurring within the Project Area, certainly more than 2.
Without-project Scenario	Predatory hunting and the conversion of the species' natural habitat into livestock areas can lead to a decrease in the population.
With-project Scenario	Community involved in the project and in environmental education actions, starting to value and protect local biodiversity, especially endangered species; the project's biodiversity monitoring actions will support analyzes of the species' conservation status.

Trigger Species	***Aniba roseaodora*- Rosewood (EN)**
Population Trend at Start of Project	Outstanding forest species that produces an essential oil with a unique fragrance, demanded by the world perfumery industry, classified as endangered by the IUCN and protected by federal ordinance (Ordinance N 443 12/2014, MMA); for a long time its exploitation was conducted in a predatory manner (Krainovic, 2017). It is estimated that some individuals of this species are present and occur naturally in the forest areas registered for the Project Area.
Without-project Scenario	The conversion of areas where Pau rosa occurs and/or predatory exploitation will lead to a decrease or even extinction of the local population.
With-project Scenario	Community involved in the project and in environmental education actions, starting to value and protect local biodiversity; the project's biodiversity monitoring actions will support analyzes of the species' conservation status; inclusion of individuals of the species in agroforestry systems.
Trigger Species	***Bertholletia excelsa*– Brazil nuts (VU)**
Population Trend at Start of Project	A symbol species of the country, with high sociocultural value and multiple uses: in addition to fresh consumption, the chestnut can be used for oil extraction, culinary use, cosmetics, lubricant; the hedgehog has a high calorific value and can be used as charcoal and used in the manufacture of handicrafts. Wood was historically widely used in the construction of houses and canoes, however, since its cutting was prohibited (Decree No. 5975 of November 30, 2006.) this use has been greatly reduced (Zingra, 2015). It is estimated that some individuals of this species are present and occur naturally in the forest areas registered for the Project Area.
Without-project Scenario	The conversion of areas where chestnut trees occur and/or predatory exploitation will lead to a decrease or even extinction of the local population.
With-project Scenario	Community involved in the project and in environmental education actions, starting to value and protect local biodiversity; the project's biodiversity monitoring actions will support analyzes of the species' conservation status; if there is a demand from the community, sustainable extractivism and the processing of by-products of the species can be an alternative source of income.

- **APPENDICES**

  - **Appendix 1: Stakeholder Identification Table**

Stakeholder	Rights, Interest and Overall Relevance to the Project
Rural family farmers from the municipalities of Apuí, Matupi and Novo Aripuanã	Family farmers are the group of stakeholders benefited by the project. These actors have the profile of small family farmers and are located throughout the rural extension of the municipalities of Apuí, Manicoré and Novo Aripuanã. The relevance of these stakeholders to the project is based on their direct influence on the activities that the project will develop and on the performance results of the project, since they are the key stakeholders responsible for avoided deforestation.
Municipalities of Apuí, Manicoré and Novo Aripuanã	The municipal governments of Apuí, Manicoré and Novo Aripuanã are the main municipal authorities in the project region, where the project area and reference region are located. The prefectures are responsible for the application of local public policies that can influence, mainly, the quality of life of the project's beneficiary population or the progress of the project's planned activities.
Municipal Secretariat of Environment of Apuí (SEMMA- Apuí)	The Municipal Secretary of Environment of Apuí (SEMMA) is the environmental agency closest to the project's activities related to the implementation of environmental recovery plans in rural properties and land regularization.
Secretary of Environment of Amazonas (SEMA-AM)	The relevance of SEMA/AM to the project is noteworthy for its role as the Managing Body of the State Environmental Policy - Law 4.266/2015 that establishes the State of Amazonas Policy for Environmental Services and the Environmental Services Management System.
National Institute for Colonization and Agrarian Reform (INCRA)	Within the project's reference region there are three Settlement Projects (PA): PA Rio Juma (Apuí), PA Acari (Novo Aripuanã and Apuí) and PA Matupi (Manicoré) and properties located within the settlement territories are part of the project area. For these properties INCRA is the agency responsible for regularizing the land title, or Título de Domínio.
Institute of Environmental Protection of the State of Amazonas (IPAAM)	It is an agency linked to the Secretary of Environment of the State of Amazonas (SEMA/AM) and its purpose is environmental management, implementation, and execution of national and state environmental policies.
Institute of Agricultural Development and	Its purpose is to supervise, coordinate and execute technical assistance activities and agricultural and forestry extension according to the strategic policies of the Federal and State governments. In Apuí, IDAM

Sustainable Forestry of the State of Amazonas (IDAM)	has its headquarters and works mainly with rural extension activities, environmental adequacy and regularization of rural properties, and monitoring.
Advisory Council of the Mosaic of Conservation Units of Apuí	Consultative body responsible for proposing opinions, managing and proposing plans and actions aimed at protecting the Mosaic's Conservation Units, such as the Mosaic Management plan.
Municipal Council for Sustainable Rural Development of Apuí (CMDRS)	A consultative, deliberative, and managing body for the sustainable rural development of the municipality of Apuí, created by municipal law 195/2009.
Ouro Verde Family Producers Association (APFOV)	The Associação de Produtores Familiares Ouro Verde (APFOV) is the local association in Apuí that aggregates and organizes Apuí's rural family farmers, mainly agroforestry coffee producers.
Association of Rural Producers of the Vicinal Estrada Nova (ASPRUVEN)	Entity representing the rural family farmers of the Vicinal Estrada Nova (km65) in Apuí.
Association of Rural Producers of Rio do Couro (ASPRORICO)	Entity that represents the family farmers of the Três Estados sector in Apuí.
Association for the Sustainable Development of Sucunduri (ADSSAM)	Entity representing the rural family farmers of Vicinal Sucunduri in Apuí.
Aripuanã-Guariba Agro-extractivist Association (ASAGA)	Entity representing the agroextractivist community of the Aripuanã-Guariba Extractive Settlement Project in Novo Aripuanã.
Maniva Agro Ecology Network (Rede Maniva de Agroecologia)	Social movement formed by farmers, technicians, students, consumers and organizations with the goal of promoting agroecology and organic production in Amazonas. It is the network responsible for the organic certification of products in the properties of those involved in the project.

- **Appendix 2: Project Activities and Theory of Change**

Components	**Project Activity**	**Activities**	**Outputs** (short term)	**Outcomes** (medium term)	**Impacts** (long term)
Climate and Biodiversity	Forest Protection and Environmental Monitoring	Monitoring forest cover Monitoring fire outbreaks Monitoring of forest carbon stocks Strengthening partnerships for firefighting plans Creating and supporting the maintenance of fire breaks Awareness-raising workshops on fire control and management and pesticide drift Biodiversity monitoring Environmental monitoring of the project's properties. Implementation of signs to protect the fauna and flora.	Support the project participants in capacity and monitoring to conserve forests	Increased awareness of forest and biodiversity conservation and how to conserve forest resources Reduction of forest loss from fires and pesticide drift. Reduction of hunting, fishing, and forest extraction	Forest Landscapes conserved and population aware of importance of forest protection
Climate and Biodiversity	Payment for environmental services	Create a benefit-sharing system with direct payment for avoided deforestation to forest holders	System created and running	Generation of carbon income	Conserved forests and financially compensated forest stewards
Community and Biodiversity	Sustainable production, income generation and gender inclusion	Support and coordination in the implementation of agroforestry systems and organic production seals Provision of agroforestry technical assistance to all the properties participating in the project	Agroforestry systems implemented Families with technical assistance	Generation of income from sustainable production Increased quality of life and nutrition, and participation of women and	Family farmers living with quality of life and fair income through their production Sustainable agriculture and extraction being

		Support for the processing and commercialization of products from the SAFs Workshops and training on agroecological transition, food and traditional education, processing and beneficiation. Workshops with women and youth on income generating productive activities. Monitoring of the project's socioeconomic parameters	Agroecological transition workshops food nourshing diversity Workshops for women and youth	youth in income generation	carried out by engaged and empowered families Empowered women and youth
Community	Land and environmental regulation	Technical cooperation agreements with governmental institutions. Technical assistance to the project's producers to achieve land and environmental regularization of their properties.	Producers with regularized rural properties	Increased security over land ownership	Law and Environmental compliance

- **Appendix 3: Project Risks Table**

Identify Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
Fires	Fires are a common practice to control secondary regrowth in pastures in the Amazon. They can cause severe forest and crop burning if left uncontrolled, threatening biological communities and farmers income. Also, it may cause respiratory problems.	Our mitigation actions include: Green barriers on the limits of agroforestry properties Firebreaks will be built and kept to avoid firespread to forests and agroforestrys Support and training: the project proponent will support the fire brigade in the regions, with material and training, and conduct fire awareness and management workshops with project participants and surrounding farmers.
Herbicides and pesticides spread	Herbicides' spread pulverized, from land or air, may cause contamination of forests and agroforestry systems, and also kill plants.	The project will engage with herbicide application service companies that use airplanes to raise awareness make agreements with them about to create best practices on how to avoid agrotoxic spread from their operations. Project participants and their neighbors will attend workshops on agroecological techniques to replace herbicides/pesticides use in their agricultural activities, as well as good practices to their application.
Participant evasion/selling property	Due to the increasing demand for lands in the region, there is a possibility that the participant farmers are offered to sell their property, therefore, abandoning the project. Thus, land buyers are likely to engage in deforestation and pasture formation.	The project is selecting farmers that are aware of the long-term commitment and want to keep their lands, as expressed in their initial surveys. The project will support landowners that are eligible to receive land titles, therefore, increasing land security of the farmers, at the same time, they will not be able to sell the property for 10 years, as the current law mandates. The agreement will include one article that obliges the farmer to sell to buyers that will commit to keep the no-deforestation agreement in the coming years.

Reduced farm income	Economic incentives are essential to keep project participants' livelihoods and satisfaction with the project. If participants feel they are receiving less than what they would be willing to avoid deforestation, the risk is project evasion and property selling, with likely baseline deforestation patterns in the project area.	The project will implement a series of activities to long-lasting and sustainable income generation for participant farmers. These include: Close technical support to farmers engaging in coffee agroforestry, with trainings, and material support that will result high-quality and productivity harvests. Support organic certification and sales, paying premium prices for the coffee beans. Foster other supply chains and commercialization of seeds and oils, fruits from agroforestry systems. Implement a system of Payment for Environmental Services resulted from avoided deforestation that will be participatorily designed with participants.

- **Appendix 4: Protocol for the Consultation Process for Project REDD+ CAA (taken from Annex - Guidelines and Protocol for the Consultation Process for Project REDD+ CAA)**

Phase	Step	Participants	Objectives	Activities	Expected delivery
Pre-consultation	Mobilization of potential participants	Project Team and family farmers	Inform all producers with general information about the Project, providing informative material.	Invitations for producers with a presentation of the Project attached and information about the Project, its objectives and calling for the Presentation Meeting (first stage of the Consultation).	Project presentation material and invitations
	Diagnosis and surveys	Project Team and family farmers	Apply the Socioeconomic Survey and collect the necessary documentation.	Socioeconomic Survey application tools and registration.	Documentation, data collected and registration
Consultation (FPIC)	First phase: Project presentation meeting: Information	Project Team (proponent and technical partner) and invited family farmers	Informative meeting to Inform all family farmers about the Project, providing informative and training material in clear and didactic language.	All information about the Project, in a printed version. Didactic or enlightening material on REDD+. Informative material on monitoring and indicators. List of questions and answers.	Meeting minutes with questioning notes and validating the materials made available
	Second phase: Meeting for Agreement	Family farmers	Internal decision. The producers must meet without the presence of the Project Team, with all the Project information so that they can debate internally and decide whether to accept it or not. This internal deliberative moment can be an extension of the presentation meeting itself, without the presence of the project team.	All information about the Project, in a printed version. Didactic or enlightening material on REDD+, validation mechanisms and monitoring. Informative material on monitoring and indicators. Contract to be signed with membership criteria, responsibilities, roles, penalties, and governance arrangement.	Signed contracts.
Post signature of the Contract	Agreement on the Governance Arrangement representative of the Farmers	Project Team and Family farmers participants	Agreement on the governance arrangement representing the family farmers – Project's Advisory Board.	Promote the agreement on the project's governance arrangement, with the distribution of tasks and attributions.	Project Documentation, Governance Arrangement, Minutes formalizing the Advisory Board

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