HIWI REDD+ PROJECT

Document Prepared By Carbonext Tecnologia em Soluções Ambientais Ltda.

Contact Information: Janaina Dallan

Project Title	Hiwi REDD+ Project
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Project Location	State of Acre, Brazil
Project Proponent(s)	Carbonext Tecnologia em Soluções Ambientais Ltda Copacabana Agropecuária Ltda Leblon Agropecuária Ltda Ipanema Agropecuária Ltda Bella Aliança Agropecuária Ltda
Prepared By	Carbonext Tecnologia em Soluções Ambientais Ltda
Validation Body	Aenor International
Project Lifetime	31 August 2019 – 30 August 2049; 30-year lifetime
GHG Accounting Period	31 August 2019 – 30 August 2049; 30-year total period
History of CCB Status	Not applicable

Gold Level Criteria	Climate, Social and Biodiversity
Expected Verification Schedule	August 2022

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1 SUMMARY OF PROJECT BENEFITS

1.1 Unique Project Benefits

Outcome or Impact Estimated by the End of Project Lifetime	Section Reference
1) Protection and conservation of 20,505.00 hectares in the Amazon Forest.	3.1.3
2) Increased access on environmental topics and training on forest fire prevention and brigade.	4.2.1
3) Increased access to health care information and disease prevention.	4.2.1
4) Implementation of a Deforestation Alert System in the project region.	2.1.10

1.2 Standardized Benefit Metrics

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
GHG emission reductions or removals	Net estimated emission removals in the project area, measured against the without-project scenario	Not applicable	N/A
	Net estimated emission reductions in the project area, measured against the without-project scenario	2,642,522 tCO2	3.2.4
Forest[1] cover	For REDD[2] projects: Estimated number of hectares of reduced forest loss in the project area measured against the without-project scenario	5,160.7 hectare	3.2.1
	For ARR[3] projects: Estimated number of hectares of forest cover increased in the project area measured against the without-project scenario	Not applicable	N/A
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 occurred as a	Not applicable	N/A

[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
	result of project activities, measured against the without-project scenario		
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	30	4.4.1
	Number of female community members who are expected to have improved skills and/or knowledge resulting from training as part of project activities	10	4.4.1
Employment	Total number of people expected to be employed in project activities,[5] expressed as number of full-time employees[6]	4	4.4.1
	Number of women expected to be employed as a result of project activities, expressed as number of full-time employees	1	4.4.1
Livelihoods	Total number of people expected to have improved livelihoods[7] or income generated as a result of project activities	30	4.4.1
	Number of women expected to have improved livelihoods or income generated as a result of project activities	10	4.4.1
Health	Total number of people for whom health services are expected to improve as a	30	4.4.1

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

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

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

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
	result of project activities, measured against the without-project scenario		
	Number of women for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	10	4.4.1
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	30	4.4.1
	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	10	4.4.1
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	N/A	4.4.1
	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	N/A	4.4.1
Well-being	Total number of community members whose well-being[8] is expected to improve as a result of project activities	30	4.4.1

[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.

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
	Number of women whose well-being is expected to improve as a result of project activities	10	4.4.1
Biodiversity conservation	Expected change in the number of hectares managed significantly better by the project for biodiversity conservation,[9] measured against the without-project scenario	20,505.00 hectare	5.1.2
	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	7	5.5.1

2 GENERAL

2.1 Project Goals, Design and Long-Term Viability

2.1.1 Summary Description of the Project (G1.2)

The Hiwi REDD+ Project is a 20,505,00 hectare area of tropical rainforest located close to the municipalities of Bujari, Rio Branco and Porto Acre, in the state of Acre, Northern Brazil. The project will promote forest conservation and, consequently, reduce greenhouse gas emission that would occur due to illegal deforestation. A consortium of 4 rural properties comprises the Hiwi REDD+ Project Area.

The state of Acre is facing a rise in deforestation due to cattle ranching activities, with an 8.3% increase of cattle heads from 2020 to 2021[12]. In one decade, the herd increased about 50% in the State[13], the majority being small and medium ranches[14]. Bujari has 36.80% of its area used for pasture, for Porto

[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
[12] Amazonia.org
[13] Rebanho do Acre aumenta em torno de 50%
[14] EMBRAPA

Acre and Rio Branco, the percentage is of 45.11% and 27.17%, respectively[15]. The municipality of Rio Branco has the highest cattle herd in the State, with 14% of the total[12]. Bujari also presented an increase of 15.5% from 2018 to 2020[16], while in Porto Acre the growth was of 23.5% in the same period. Likewise, deforestation in the municipalities from 2018 to 2020 had a boost of 198%, 89% and 154%, respectively[17]. As the main deforestation driver in the region, cattle ranching is expected to grow during the project duration.

There are of 18 communities in the surroundings of the project area, mainly settlements, with an estimated 2,950 families, according to INCRA's database 18. Most of them depend on forest resources for their income and work with harvesting of non-timber forest products. The social condition of the communities is market with precarious health and educational system, as well as low economic development and lack in job opportunities. The project's climate, community and biodiversity objectives are summarized as follows:

Avoid and prevent unplanned deforestation of the tropical rainforest in the region, thus avoiding the emission of 2,642,522 tCO2e through a period of 30 years of the Project's crediting period (annual average of 88,084.07 tCO2e);
Protection and maintenance of 20,505,00 ha of forest;
Monitoring of fauna and flora present in the project area, included endangered species;
Trainings on fire brigade, and others related to the communities' sustainable development
Increase in the community's life quality through the offer of trainings, employments.

2.1.2 Project Scale

Indicate the scale of the project (project or large project).

Project Scale	
Project	x
Large project	

2.1.3 Project Proponent (G1.1)

Organization name	Carbonext Tecnologia em Soluções Ambientais
Contact person	Janaina Dallan
Title	CEO
Address	Rua do Rocio, 220 – conjunto 21. Vila Olímpia – São Paulo/SP
Telephone	+ 55 (11) 3168-8521

[15] Atlas das Pastagens (ufg.br)
[16] IBGE
[17] INPE
[18] INCRA

Email	redd.hiwi@carbonext.com.br

Organization name	Copacabana Agropecuária Ltda
Contact person	Ricardo Valadares Gontijo
Title	Partner and Administrator
Address	Rua Padre Marinho, 49, Sala 1201, Bairro Santa Efigênia, Belo Horizonte, MG.
Telephone	+55 31 9224-0009
Email	presidencia@direcional.com.br

Organization name	Leblon Agropecuária Ltda
Contact person	Ricardo Valadares Gontijo
Title	Partner and Administrator
Address	Rua Padre Marinho, 49, Sala 1201, Bairro Santa Efigênia, Belo Horizonte, MG.
Telephone	+55 31 9224-0009
Email	presidencia@direcional.com.br

Organization name	Ipanema Agropecuária Ltda
Contact person	Ricardo Valadares Gontijo
Title	Partner and Administrator
Address	Rua Padre Marinho, 49, Sala 1201, Bairro Santa Efigênia, Belo Horizonte, MG.
Telephone	+55 31 9224-0009
Email	presidencia@direcional.com.br

Organization name	Bella Aliança Agropecuária Ltda
Contact person	Ricardo Valadares Gontijo
Title	Partner and Administrator

Address	Rua Padre Marinho, 49, Sala 1201, Bairro Santa Efigênia, Belo Horizonte, MG.
Telephone	+55 31 9224-0009
Email	presidencia@direcional.com.br

2.1.4 Other Entities Involved in the Project

Organization name	N/A
Contact person	N/A
Title	N/A
Address	N/A
Telephone	N/A
Email	N/A

2.1.5 Physical Parameters (G1.3)

The Hiwi Project is composed of four zones: Bela Aliança, Nova Uberaba, Guanabara Copacabana e Leblon and Ipanema farms. The project is in the Brazilian Northern Region, in the state of Acre. It spans across three municipalities: Rio Branco, Porto Acre and Bujari, where most of the Project Area is located

Table 1: Coordinates of the project's properties

Zone	Property Name	Total Property (ha)	PA Area (ha)	Coordinates centroids	
PA - 1	Fazenda Bela Aliança	20,178.44	13,653.00	Lat:09º33'34,22"S	Lon:68º04'00,7'W
PA - 2	Fazenda Ipanema	4,786.22	2,395.00	Lat:09º45'55,02"S	Lon:68º07'48,44'W
PA - 3	Fazenda Nova Uberaba (Copacabana)	5,431.36	1,749.00	Lat:09º51'13,38"S	Lon:68º05'08,99'W
PA - 4	Fazenda Guanabara (Leblon)	6,191.41	2,708.00	Lat:09º51'25,52"S	Lon:68º10'24,23'W
Total		**36,587.43**	**20.505,00**		

According to IBGE, the state of Acre is divided into two mesoregions, the Vale do Jurá and Vale do Acre, each one of them are divided into microregions. The project is in the microregion of Rio Branco, in the Vale do Acre. The Reference Region (RR) is the largest geographic boundary and includes the Project Area (PA). It consists of the geographic boundary of the territory where the analysis of rates, agents, drivers of deforestation and patterns of land use change are based to project the baseline and future deforestation. The RR of the HIWI REDD+ Project has an area of 587,591.52 ha (five hundred and eighty-seven thousand, five hundred and ninety-one thousand and fifty-two hectares), located in the municipalities of Porto Acre, Bujari, Sena Madureira and Rio Branco, in the state of Acre, northern region of Brazil.

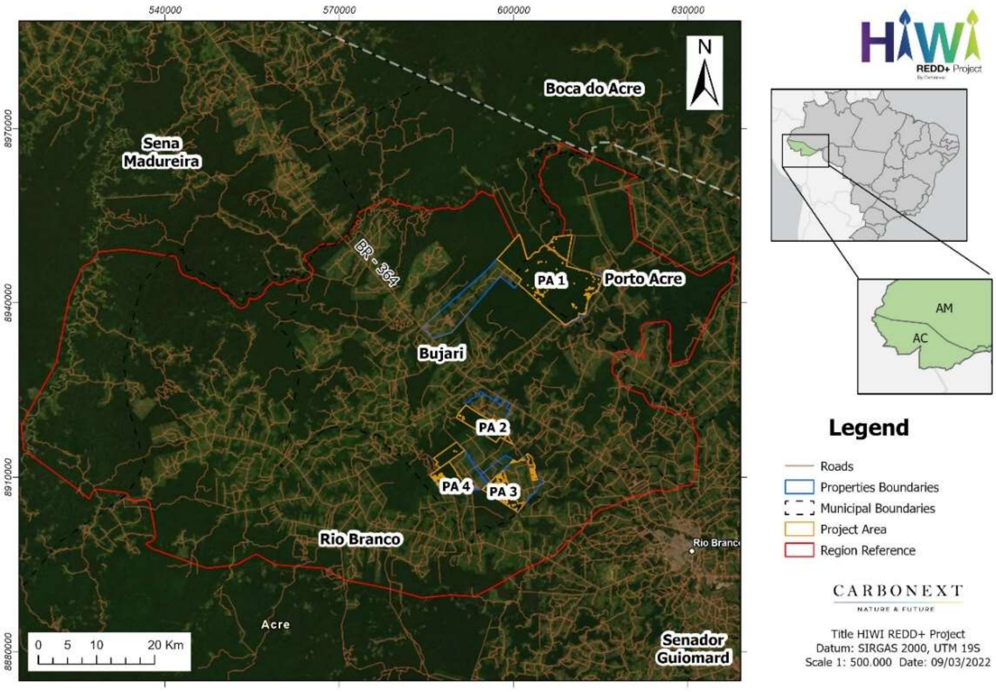


Figure 1: Project location within the regional divisions of the State of Acre

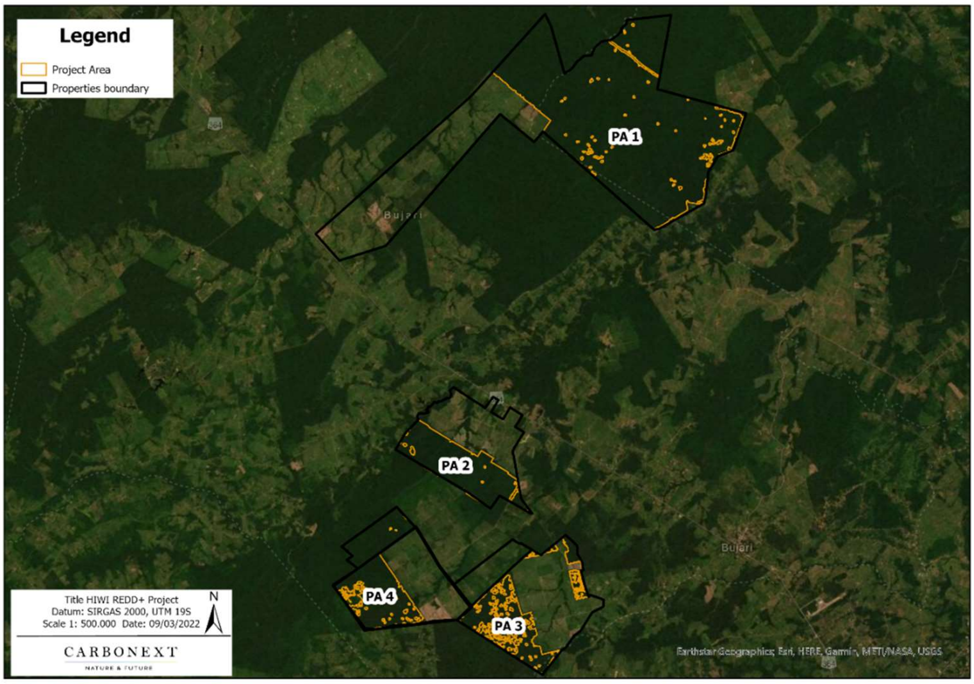


Figure 2: Map of Location of the Project Area and property boundaries.

A summary of the key geographic variables pertaining to the project area follow below.

Elevation

This geological arena geomorphological and soil-forming processes act together with climate to determine the landscape of Acre. Relief is gently undulating over much of the state but steeper in the upper reaches of the rivers, while the Serra do Moa or Sierra de Contamana Physiographic Complex in the northwest corner of Acre show their proximity and affinity to the Andes by their ridges, waterfalls, and small but steep mountains to 600 m elevation (Silveria, 2008).

According to Santos el al. (2018) the State of Acre has its relief structure represented by the Amazon Depression, the Lower Plateau of the Western Amazon and the Amazon Plain. Characterized, respectively, by an extensive lowered surface, low plateaus and large wetlands and lakes. These types of relief units will only be found with these specificities in Acre, which will influence the drainage and vegetation pattern to be different from all other relief units in the Amazon and consequently in Brazil.

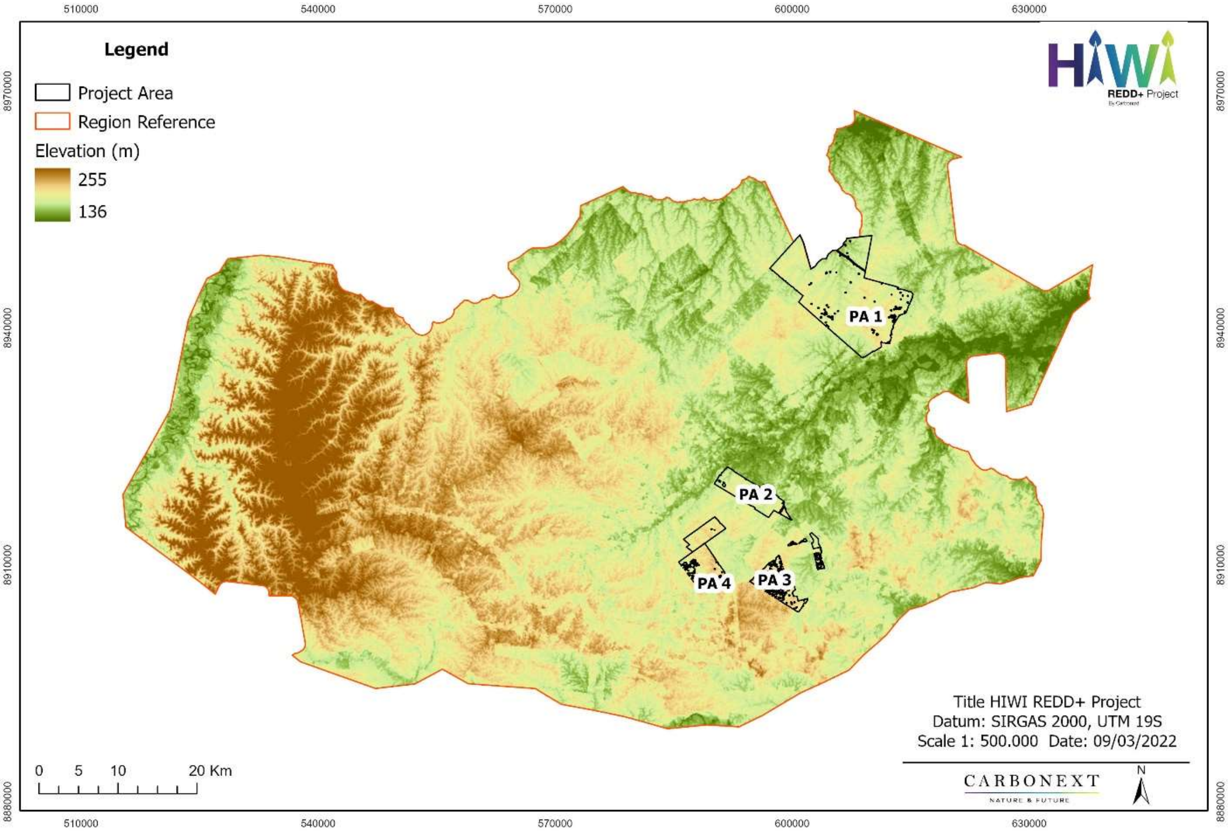


Figure 3: Elevation Map of the Region of Reference Region and Project Area

Slope

The mean slope in at least 90% of the PA is within the range of ±10% of the mean slope observed in at least 90% of the RR. According to Topodata[19] – INPE sources, the Reference Region is concentrated in the relief classes of Flat and Soft Undulating Areas. The Project Area presents similar characteristics divided into Flat and Soft Undulating Areas, as can be seen in the Figure below.

[19] Topodata INPE: http://www.dsr.inpe.br/topodata/dados.php; subsets: 09s69 – SN ; 10s69 – SN ;
Topodata – Banco de dados geomorfométricos do Brasil, disponível em INPE (Instituto de Pesquisas Espaciais): http://www.dsr.inpe.br/topodata/index.php, acessado em 05/01/2022.

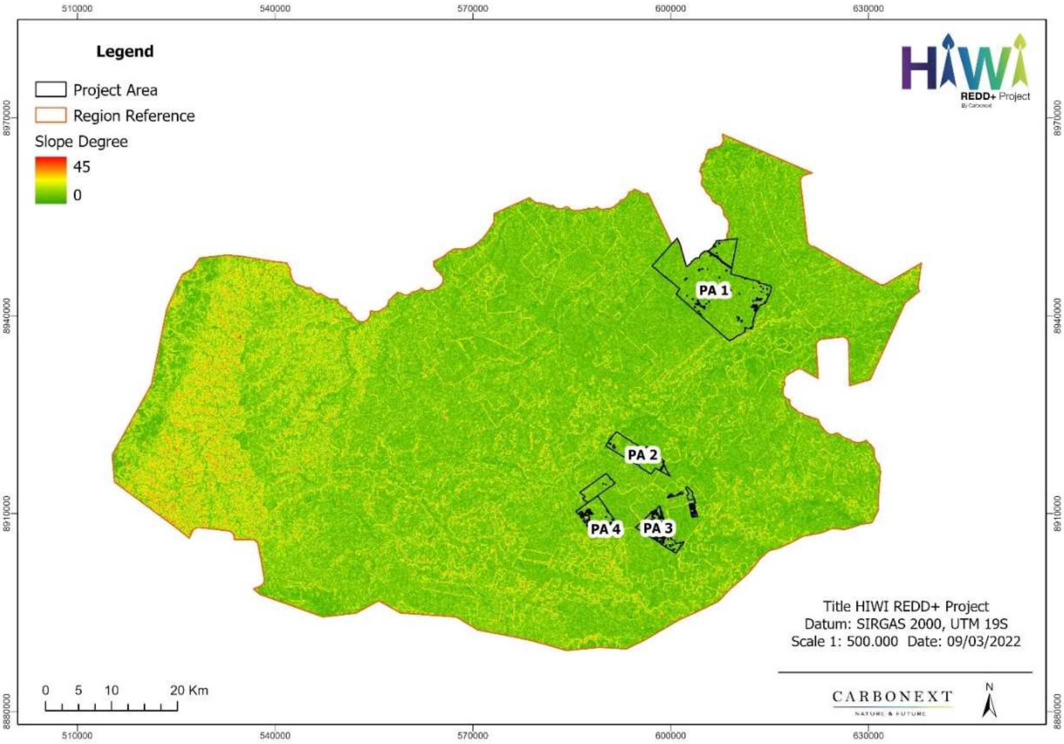


Figure 4: Declivity Map of the Region of Reference Region and Project Area

Table 2: Slope range in the PA and RR

Slope (degree)			
Area	10% min	mean	10% max
PA	5,18	5,75	6,33
RR		6,50	

Soil

The properties and nature of Amazonian soils are dictated principally by their chemical and mineralogical properties, which for the most part is determined by the mineralogy of the parent material. Much of Amazonia is characterized by deep and highly weathered soils that are nutrient-poor and classified as oxisols or Argisols (Lima 2001).

According to the Brazilian Soil Classification System (SiBCS, 2006)[20], the Region of Reference is composed by the following soil types, as show in the figure below:

[20] http://geoinfo.cnps.embrapa.br/layers/geonode%3Abrasil_solos_5m_20201104

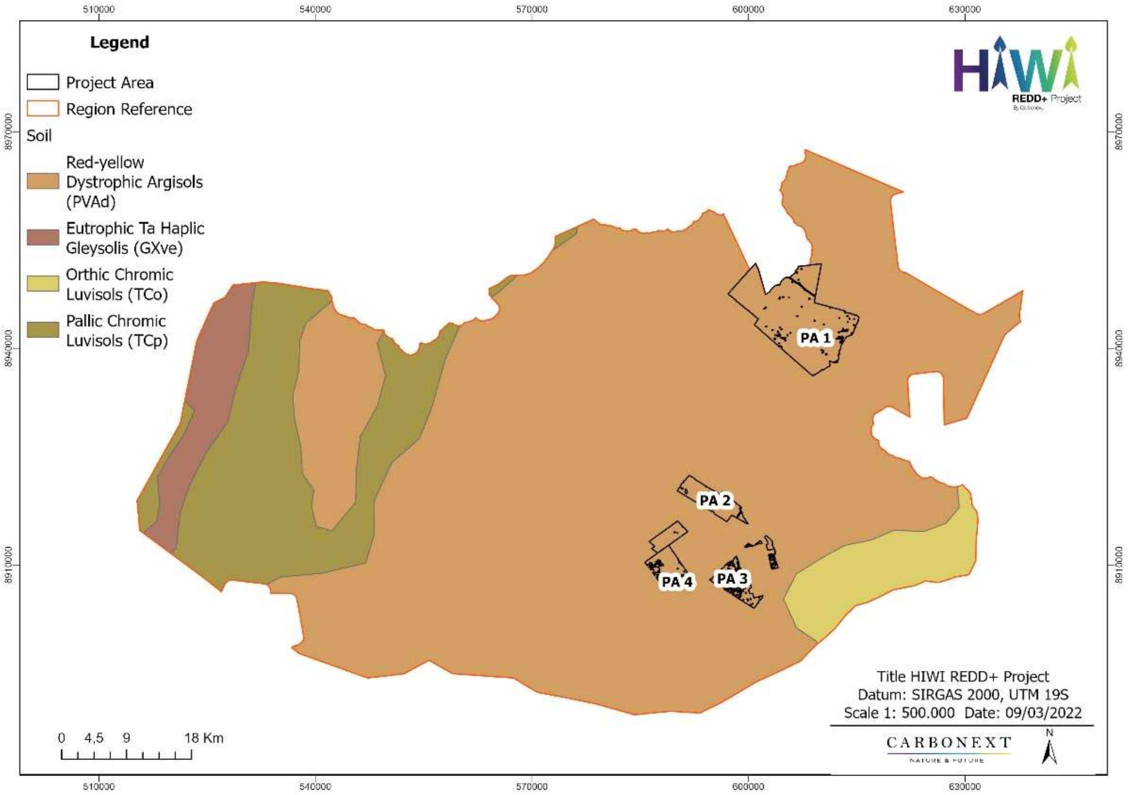


Figure 5: Soil Map of the Region of Reference Region and Project Area.

The soil in the project area is 100% Red-yellow Dystrophic Argisols (PVAd). The Red Yellow Argisol class is present throughout the national territory, from Amapá to Rio Grande do Sul, constituting the most extensive soil class in Brazil. The Red-Yellow Dystophic Argisols, classified in the third categorical level of the SiBCS, have the characteristic of being soils with low fertility[21].

Table 3: Soil Types in the Reference Region

Soil types	Description type	Soil Area in the Reference Region (ha)
PVAd	Red-yellow Dystrophic Argisols	464,372
TCp	Pallic Chromic Luvisols	80,957
TCo	Orthic Chromic Luvisols	23,071
GXve	Eutrophic Ta Haplic Gleysolis	19,192

21 https://www.agencia.cnptia.embrapa.br/gestor/solos_tropicais/arvore/CONT000gn0pzmhe02wx5ok0liq1mqk4130gy.html

Climate

According to Köppen's climatic classification (Alvarez et al., 2013)[22], the Project Area is located within a Tropical Monsoon Climate ("Am"), which characterizes it as hot and humid equatorial, with a dry season between the months of June and September. The historical monthly average temperature series for the period 1981-2010 (30 years) is around 24-25ºC[23].

The figure below illustrates the average annual precipitation series for the period 1970-2000 (30 years) to the Project Area and the Reference Region, with an average annual precipitation of 147.79 mm for the Project Area, and 150.39 mm for the Region of Reference[24].

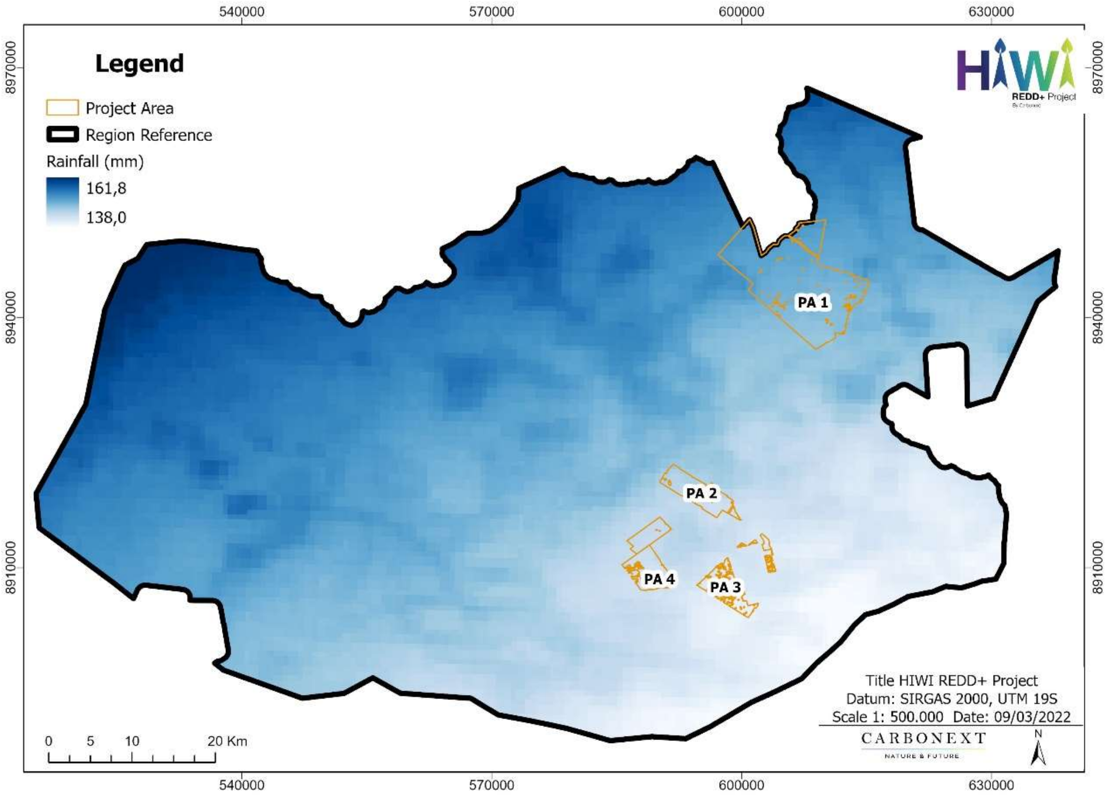


Figure 6: Precipitation Map of the Region of Reference Region and Project Area.

Hydrology

22 http://143.107.18.37/material/mftandra2/ACA0225/Alvares_etal_Koppen_climate_classBrazil_MeteoZei_2014.pdf

23 https://clima.inmet.gov.br/GraficosClimatologicos/DF/83377.

24 FICK, Stephen E.; HIJMANS, Robert J. WorldClim 2: new 1-km spatial resolution climate surfaces for global land areas. **International journal of climatology**, v. 37, n. 12, p. 4302-4315, 2017.

Both areas (Region reference and the project area) are in the Amazon Basin[25], formed by the Amazon River and its tributaries with common characteristics such as the extent and water volume and bigger variation in the dimensions and widths of their Igarapés, rainfall regimes, interspersing periods of floods and droughts[26].

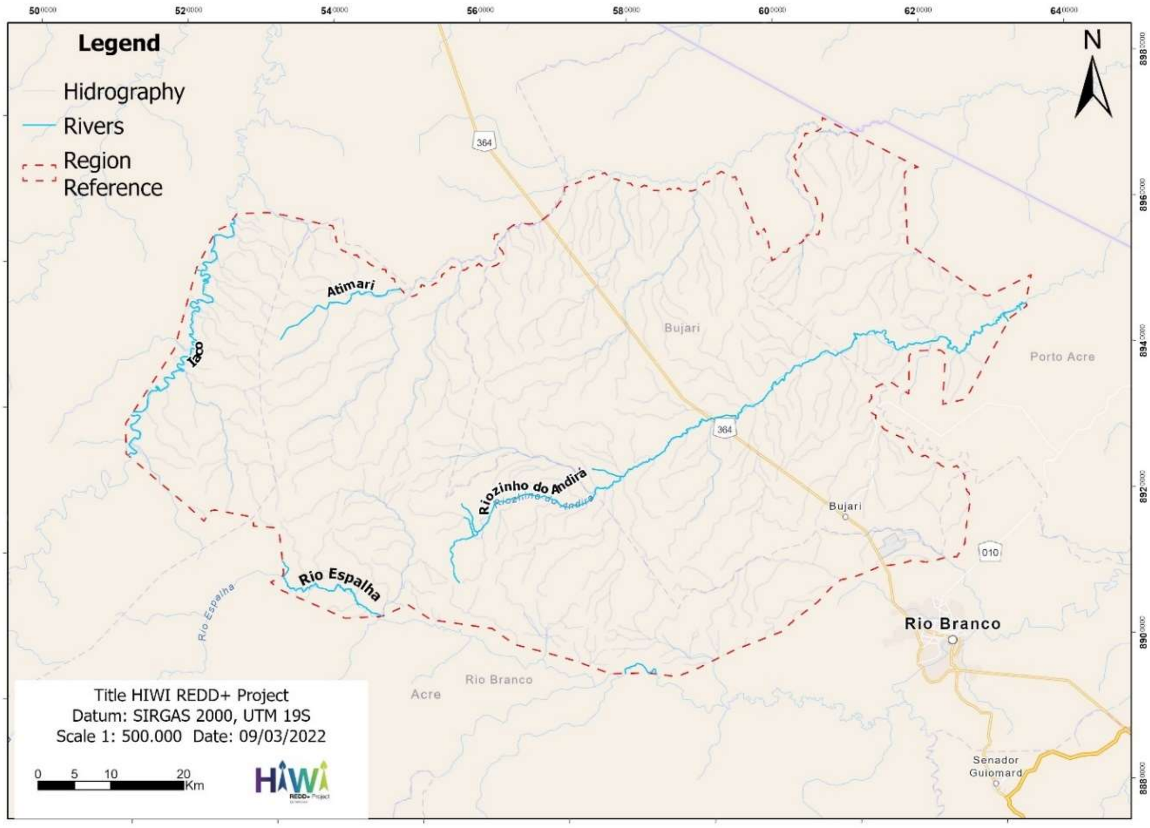


Figure 7: Hydrography in the reference region and project area

Inside the Reference Region, the main watercourse is the Iaco, Riozinho do Andirá, Atimari, Rio Branco River, a tributary that belongs to the Alto Purus basins and Rio Acre.

Table 4: River in the Reference Region and PA area

Name River	Length (km)	Basin
Iaco	72,48	Alto Purus
Riozinho do Andirá	111,46	Rio Acre
Atimari	21,12	Rio Acre
Rio Espalha	30,29	Rio Acre

Vegetation

25 https://www.ceivap.org.br/ligislacao/Resolucoes-CNRH/Resolucao-CNRH%2032.pdf
26 https://www.amazonia.cnptia.embrapa.br/publicacoes_estados/Acre/Fase%201/Vol.%201_Recursos_Naturais_e_Meio_Ambiente.pdf

In the state of Acre, forest types are based on the Brazilian Forest Classification System (Veloso et al., 1991), with most of Acre being covered by one or another form of open forest (Figure below), whose canopy is discontinuous and allows more light to penetrate to an understory that can be dominated by palms, arborescent bamboos of the genus Guadua, lianas or, in a few places, by *Phenakospermum amazonicum*). Dense forests are found more frequently in the upper rivers, and dense submontane forests occur only in this region as well, specifically in the Serra do Divisor. Also, in the upper Juruá it is found a complex of vegetation types on white sands, consisting of campinas and campinaranas or Amazonian caatingas (Silveira, 2008).

This part of Acre also contains patches of forest whose soils and floristic composition are characteristic of Central Amazonia. One formation of limited extent but that draws attention because of its physiognomy and floristic novelties, rarities, and distributions (Daly et al. 2006).

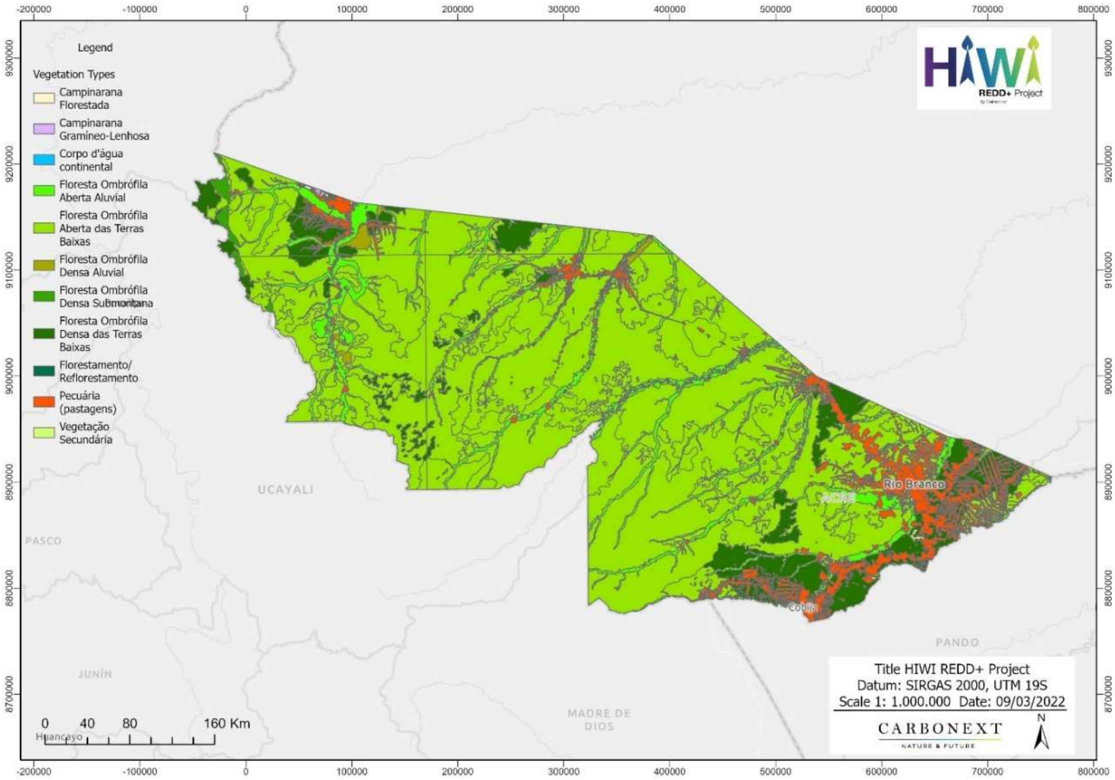


Figure 8: Vegetation types in Acre

The vegetation classes in at least 90% of the PA are the same vegetation classes observed in at least 90% of the RR. In the region, there are predominantly two types of forests: dense ombrophilous forest and open ombrophilous forest, both with a great diversity of plant formations

The types of vegetation found within the reference region and the project area are as follows:

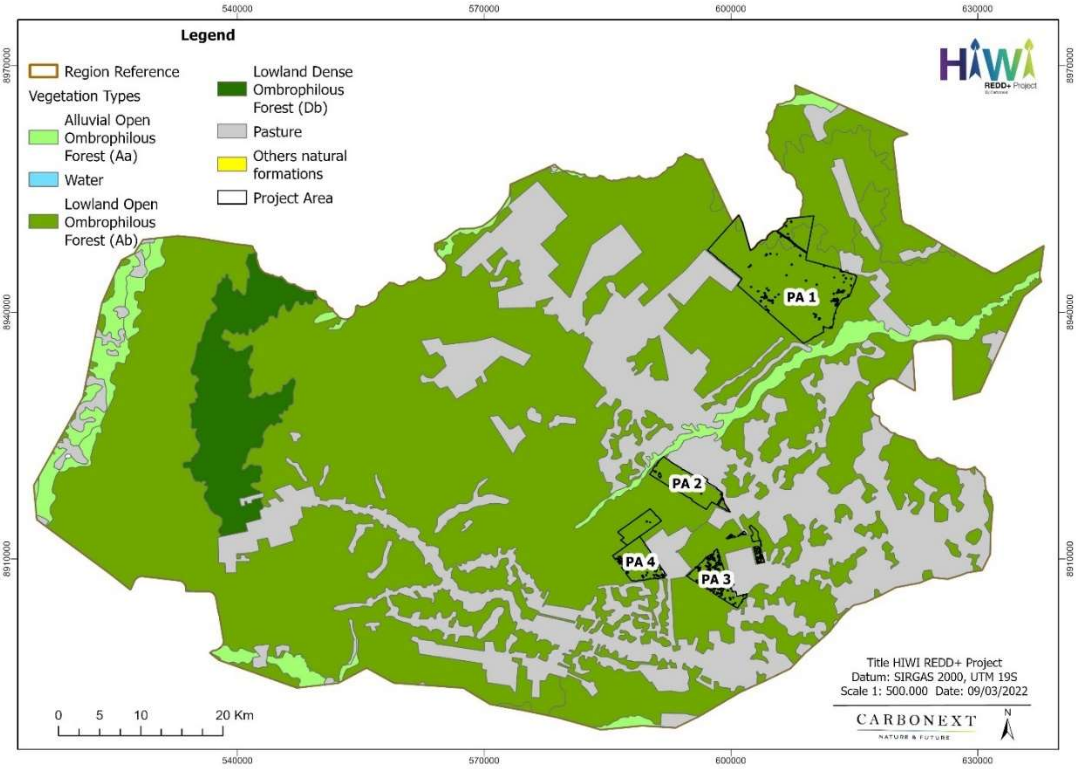
- Alluvial Open Ombrophilous Forest (Aa)

- Lowland Open Ombrophilous Forest (Ab)
- Lowland Dense Ombrophilous Forest (Db)

As seen in the figure below, 100% of the project area in located in a Lowland Open Ombrophilous Forest. This type of forest represents 9.72% of the forest types presents in the Amazon Forest[27]. In the State of Acre, it is the forest type with the highest occurrence. It occupies most of the morpho-structural unit defined as the Sub-Region of the Low Plateaus of the Amazon, corresponding to the depression of the Rio Acre - Rio Javari[28].

Table 5: Vegetation Composition in the RR and PA

Area	Veg. Type	ha	%
PA	Open Ombrophilous Forest	20.505,00	100
RR	Alluvial Open Ombrophilous Forest (Aa)	22.349	3,8
	Lowland Open Ombrophilous Forest (Ab)	389.322	66,2
	Lowland Dense Ombrophilous Forest (Db)	25.175	4,28



27 [1 - Programas Relacionados com o Desenvolvimento Sustentável (mma.gov.br)]
28 https://biblioteca.ibge.gov.br/visualizacao/livros/liv95899.pdf

Figure 9: Vegetation types in the reference region and project area

2.1.6 Social Parameters (G1.3)

The Project is located close to the municipalities of Bujari, Rio Branco, and Porto Acre, in the state of Acre, Northern Brazil. The process of land-use change in the State began in the mid-1970s, when a large part of rubber plantations were transferred from extractive communities to the hands of people and business groups residing outside the State. This process caused the expulsion of many rubber tappers from their positions, promoting a large rural exodus. However, there was no longer any interest in the rubber trees, in the chestnut trees, but in the land for the formation of pasture and the implantation of large properties for large-scale livestock production.[29]

In the period from 1976 to 1985, the Federal Government, through INCRA (National Institute of Colonization and Agrarian Reform), started a massive process of land discrimination in the State, whose objective was to differentiate between public and private lands, controlling the harmful action of speculators and land grabbers. At the end of the 70's, using the expropriation procedure for Agrarian Reform purposes, the first Settlement Projects were created. In 2001, the Instituto de Terras do Acre was created with the aim of supporting the Federal and State Governments in the creation of new areas of public interest, such as Conservation Units, Settlement and Indigenous Land.[29]

The project is located in the Baixo Acre region, which comprises the municipalities of Acrelândia, Bujari, Capixaba, Plácido de Castro, Porto Acre, Rio Branco and Senador Guiomard. The region concentrates the highest cattle herd of the State. [29]

The majority of the Project Area is located close to the Bujari municipality, a town founded in 1882 based on vegetable extraction and syringe plantations for rubber extraction. Bujari was originally built by three families whose livelihood depended on rubber extraction and subsistence farming. Its first considerable expansion is dated in 1969, when multiple families started to settle close to the highway that bordered the town. It was elevated to a municipality level in 2007, when it was officially separated from Rio Branco, through the alteration of 1992 State Law n° 1.066[30].

Rio Branco is the capital of Acre, located in the valley of the Acre River and around 40km from the Project Area, is today the most populous municipality in the state, with 413.418 inhabitants[31]. The city is located in the Western-most part of the country, bordering the countries of Peru and Bolivia, being the Brazilian state closest to the Asia-Pacific region.

29 https://www.amazonia.cnptia.embrapa.br/publicacoes_estados/Acre/Fase%202/Livro_Tematico_ZEE_Aspectos_socioeconomicos_Volume_5.pdf
30 Confederação Nacional de Municípios: http://www.cnm.org.br
31 https://cidades.ibge.gov.br/brasil/ac/rio-branco/panorama

The city is one of the first settlements to be developed in the region and was also built on the development of rubber plantations. It was elevated to municipality and state capital in 1920. Today, the city is anchored in public administration and forest extraction and has a somewhat consolidated transportation infrastructure. The municipality is, however, still marked by its social disparities. Rio Branco is also one of the cities in Brazil with the largest indigenous population, a trait that is visible in its cultural characteristics.

Porto Acre is located in the northeast of the Brazilian state o Acre and was originally a Bolivian municipality. It became a Brazilian town in 1903 after the Acre Revolution, which demanded a separation from Bolivia.

The table below brings information on some social parameters of the three municipalities[32].

Table 6: Social Parameters of the Municipalities of the Reference Region.

	Bujari	**Rio Branco**	**Porto Acre**
Area (ha)	Total Area: 303,478 Agricultural Area: 264,480 (87% of total)	Total Area: 883,515 Agricultural Area: 512,655 (58% of total)	Total Area: 260,442 Agricultural Area: 205,876 (79% of total)
Population	10,572 Rural: 56.6% Urban: 43.4%	419,452 Rural: 8.2% Urban: 91.9%	19,141 Rural: 86.8% Urban: 13.2%
Household income	Average salary: 1.3 times the minimum wage. 44.6% of the population earns half the minimum wage. 15.6% of the population has a formal work.	Average salary: 3.2 times the minimum wage. 36.4% of the population earns half the minimum wage. 25.9% of the population has a formal work.	Average salary: 1.9 times the minimum wage. 48.3% of the population earns half the minimum wage. 5.2% of the population has a formal work.
Education	Enrollment rate for 6- to 14-year-olds: 91.1%	Enrollment rate for 6- to 14-year-olds: 95.1%	Enrollment rate for 6- to 14-year-olds: 90.4%

[32] https://cidades.ibge.gov.br/

Sanitation	18.9% households with adequate sanitation.	56.7% households with adequate sanitation.	11.5% households with adequate sanitation.
Religion	Roman Catholic Apostolic Church and Evangelical Church	Roman Catholic Apostolic Church and Evangelical Church	Roman Catholic Apostolic Church and Evangelical Church

In this region, the economy is based on subsistence agriculture, cattle breeding, fish farming, rubber extraction, chestnut production, copaiba oil and the collection of wild seeds. Most of these kinds of crops are produced on a small-scale, on home gardens and consumed locally.

The State of Acre has 32.661 families settled by the agrarian reform distributed in 161 settlements. Of this total, 21.7% (5.518 families) reside in the municipalities of Bujari, Porto Acre and Rio Branco[33]. In the proximities to the project area, there are 18 settlements with have a population of 2,950 inhabitants[34]. There is also a State Forest Park, the Antimary State Forest, and an Environmental Protection Area (APA), the Igarapé São Francisco APA. The table below presents the lists of communities within the 20-km buffer of the project area. More information about them can be found in item 2.1.9.

Table 7: List of Community and Settlements

Community		Capacity of families	Nº of families living	Area (ha)
1	FLOE Floresta Estadual do Antimary	55	55	47,065
2	PA Abib Cury	8	6	118
3	PA Antonio de Holanda	107	105	2,418
4	PA Barro Alto	185	142	6,019
5	PA Carão	270	268	11,173
6	PA Espinhara	31	29	1,700
7	PA Espinhara II	167	155	5,986
8	PA Figueira	354	354	25,258
9	PA Itamaraty	187	177	8,800
10	PA Luz da Vida	23	19	380
11	PA Porto Acre	42	40	2,093
12	PA Tocantins	489	441	25,559

[33] https://painel.incra.gov.br/sistemas/index.php
[34] https://painel.incra.gov.br/sistemas/Painel/ImprimirPainelAssentamentos.php?cod_sr=14&Parameters%5BPlanilha%5D=Nao&Parameters%5BBox%5D=GERAL&Parameters%5BLinha%5D=1

13	PAD Humaitá	981	958	61,179
14	PAE Canary	1118	416	222,430
15	PAE Limoeiro	27	26	9,188
16	PE Polo Agrof. Dom Moacir	37	15	11,150
17	PE Polo Agrof. Wilson Pinheiro	53	47	330
18	PE Polo Leiteiro de Porto Acre	40	34	300

The social diagnosis performed by the project team in some of the communities indicated the presence of several deficiencies, such as poor-quality healthcare, in some cases the community health center does not have access to energy or specialized medical assistance, there was a specific need for a gynecologist and a pediatrician. In addition, part of the population lives below the poverty line or depends on government assistance for their survival. Communities do not have basic sanitation, not even to connection to the public water supply system, depending on the water tank truck to supply to supply reservoir or small dams. Regarding the women, most of them carry out agricultural activities for a source of income and completed only elementary school. More than half are already mothers, with an average of 2 children, and had the first one in adolescence, at age from 15 to 17 years old. The main economic activity performed in the communities is small-scale cattle ranching and agriculture. Most of the food cultivated is for their subsistence. A more complete description of the communities is in item 4.1.1.

In terms of area, the Conservation Units, Indigenous Lands and Settlement Projects represent 55.56% of the total land. The Settlement Projects were created, mostly, between 1977 and 1982, and occupy 7.66% of the State's land. The regions Alto Acre and Baixo Acre, have a higher concentration of Settlement Projects, 57% of the total. Their main activity is agriculture.[35]

The Igarapé São Francisco APA is a conservancy unit of sustainable use, managed by the Acre State Secretariat of Environment and created in 2005 due to two main environmental threats: the illegal deforestation of Amazon Forest and common heat and fire focus. It is majorly located in Rio Branco city (88,48%) but also englobes Bujari city (11,52%), in fact, a small fraction of the project area is in this APA. They still do not have a management plan[36].

The Antimary Forest State is also a conservancy unit of sustainable use, created in 1997, due to the same environmental threats. It is located majorly in Bujari territory (72,85%), but also in Sena Madureira city (27,15%). They have an approved management plan from 2014 and is also managed by the Acre State Secretariat of Environment[37].

[35] https://www.amazonia.cnptia.embrapa.br
[36] https://uc.socioambiental.org/pt-br/arp/4900
[37] https://uc.socioambiental.org/pt-br/arp/1160

The stakeholders' descriptions continue at section 2.1.9.

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

The project area is composed of four properties, Bella Aliança, Nova Uberaba, Guanabara Copacabana e Leblon and Ipanema farms, divided into four main areas. The figure below shows the properties, and the table presents information on each of them.

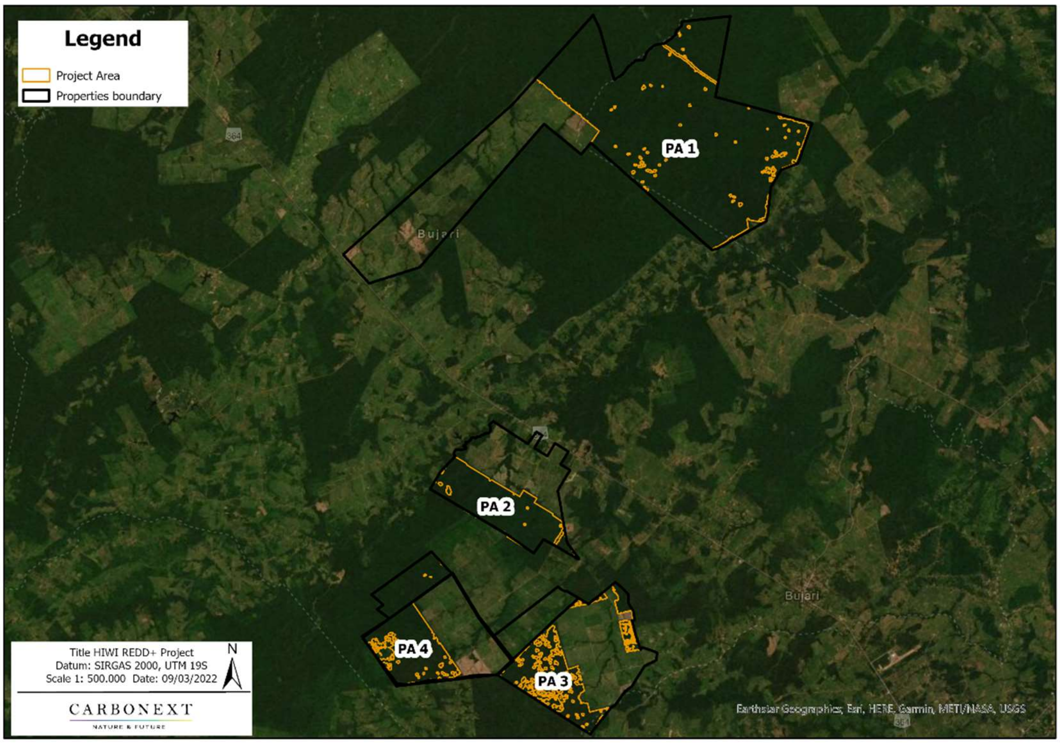


Figure 10: Project area in the properties' boundary (Source: Google Earth, 2020).

Table 8: PA Properties Information

Property	Project Zone	Total Area (ha)	Project Area (ha)	Ownership
Bela Aliança	PA-1	20,178.44	13,653.00	Bella Aliança Agropecuária LTDA
Ipanema	PA-2	4,786.22	2,395.00	Ipanema Agropecuária LTDA
Nova Uberaba	PA-3	5,431.36	1,749.00	Copacabana Agropecuária LTDA
Leblon 1 Copacabana 1	PA-4	6,191.41	2,708.00	Leblon Agropecuária LTDA
Guanabara	PA-4			
Total		36,587.43	20,505.00	

The first Project Area, called PA-1 Fazenda Bela Aliança, is located to the north of the buffer zone, into two municipalities: Porto Acre and Bujari.

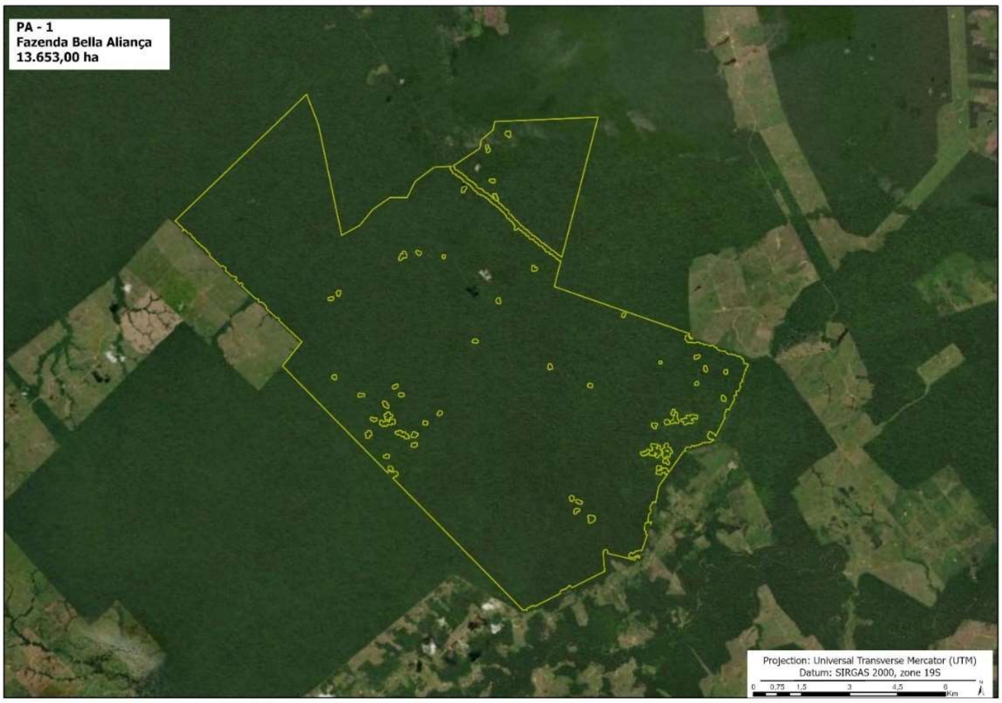


Figure 11: PA-1 Fazenda Bela Aliança (Source: Google Earth, 2022).

The second Project Area, called PA-2 Fazenda Ipanema and is located into central of the buffer zone, in the Bujari municipality.

Figure 12: PA-2 Fazenda Ipanema (Source: Google Earth, 2022).

The third Project Area, called PA-3 Fazenda Nova Uberaba (Copacabana), is located southeast of the Reference Region into two municipalities: Bujari and Rio Branco.

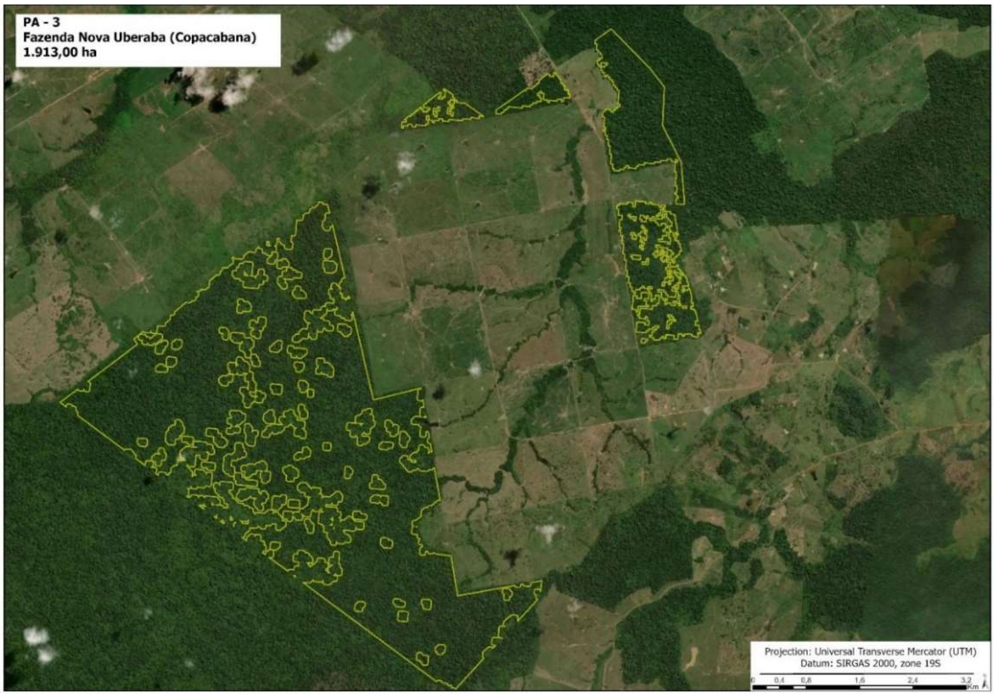


Figure 13: PA-3 Fazenda Nova Uberaba (Source: Google Earth, 2022).

The fourth Project Area, called PA-4 Fazenda Guanabara, is located southwestern of the Reference Region in the municipality of Bujari.

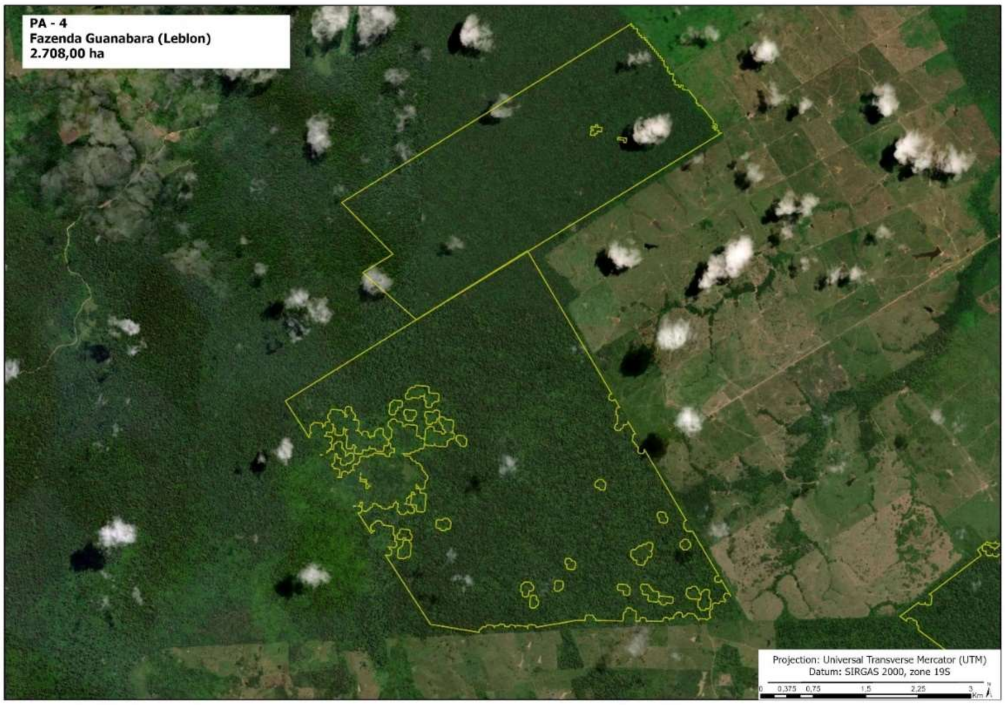


Figure 14: PA-4 Fazenda Guanabara (Source: Google Earth, 2022).

This is a grouped project, however, at this moment, there are no predicted instances to be added to the project area. In the case of new of new additions, the areas will be located within the Reference Region, as shown below.

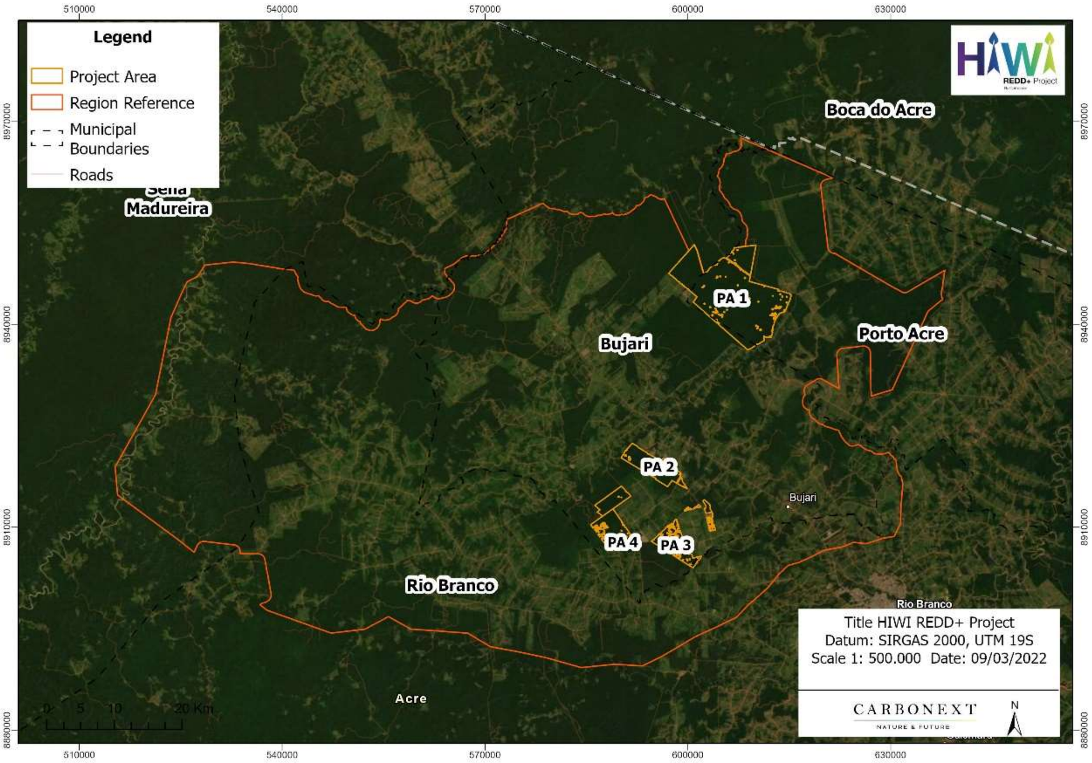


Figure 15: Project area in the Region Reference (Source: Google Earth, 2020).

The communities, Conservation Units and indigenous lands located within the 20 km buffer, as well as the ones located in the Reference Region are as in the images below.

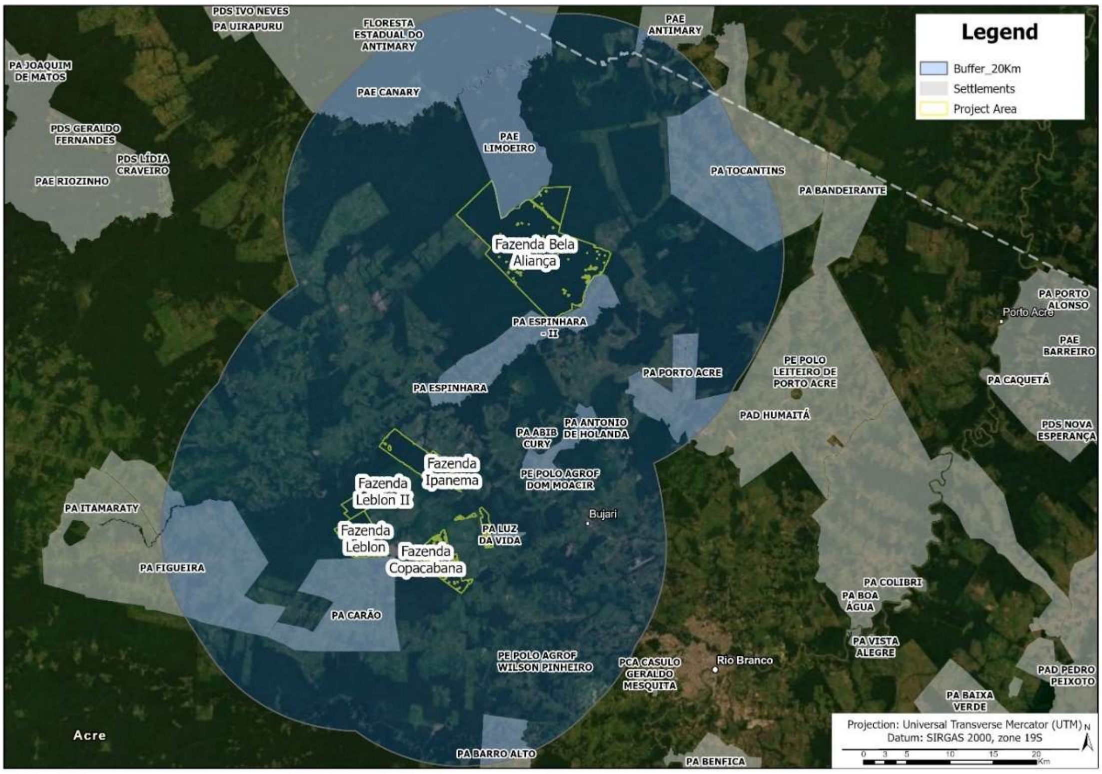


Figure 16: Communities in the Buffer Zone of 20Km

In the case of new instances, since the areas will be located inside the reference region, the communities impacted by the project will be among those listed below.

Table 9: Communities present inside the RR

Name	Municipal	Area (ha)	Number of Families
PDS LÍDIA CRAVEIRO	Sena Madureira	804.5867	24
PE POLO AGROF DOM MOACIR	Bujari	329.7371	50
PA CARÃO	Rio Branco	11172.8303	267
PAE LIMOEIRO	Bujari	11150.0000	17
PA ABIB CURY	Bujari	117.9924	6
PA LUZ DA VIDA	Bujari	380.0000	19
PA ITAMARATY	Rio Branco	8799.7779	183

PA FIGUEIRA	Rio Branco	25258.1364	354
PA ANTONIO DE HOLANDA	Bujari	2417.5826	106
PA ESPINHARA	Bujari	1700.0000	29
PA ESPINHARA - II	Bujari	5985.6354	156

The biodiversity HCV areas, identified in item 5.1.2, consist of the project area. The community HCV (item 4.1.3) are areas inside the communities. Thus, they are inside project zone areas already described above.

2.1.8 Stakeholder Identification (G1.5)

The project proponents assessed the local stakeholders identifying those that are potentially impacted, negatively or positively, by the project. The identification process started with the identification of community leaders and community associations, government and regional environmental entities, non-government organizations, research institutes, national parks, conservation areas, settlements, and organizations or groups with similar interests in the outcome of the project activities.

The identification analysis took into account the following criteria:

- **Geographic Location:** communities located inside the project area and in the surroundings.
- **Dependency on the Project Area:** Communities that use the project area and develop some type of activity in it.
- **Identification with forest conservancy:** Institutions, NGOs, federal/state/municipal bodies that works towards the forest conservancy and sustainable development.
- **Social Movements:** Institutions, NGOs, federal/state/municipal bodies that works towards the development of local communities.

Stakeholders were primarily analysed based off their influence, along with their rights, interests, and relevance to the Project, to ensure the HIWI REDD+ Project was properly aligned with the stakeholders.

As a first step in this identification process, it was conducted by the Carbonext technical team a mapping provided by the official government agencies to determine in the actors present in the area. Subsequently, it is verified that the Project Area does not overlap with the surrounding communities, using georeferenced information system (GIS) and official data from bodies as INCRA (National Institute of Colonization and Agrarian Reform)[38], IBGE (Brazilian Institute of Geography and Statistics)[39], FUNAI (National Indigenous Foundation)[40], ICMBio (Chico Mendes Institute for Biodiversity Conservation)[41], Imazon (Institute of Man and the Environment of the Amazon)[42] and FBDS (Brazilian Foundation for Sustainable Development)[43].

Followed to the identification, the stakeholders were divided into two groups: stakeholders relevant for the Public Community Consultation, and relevant for the Public Institutional Consultation. For the community consultation, 18 communities were identified inside the 20-km buffer, as show in the Figure 16 in the item below and described in Table 12 in the item below. For the institutional consultation, the institutions listed in Table 11 below were consulted.

Subsequently, onsite visits in the were conducted by a social professional, to inform about the project idea, its activities, the potential benefits to the communities and their participation in the project. Of the 18 communities, 7 were consulted, selected according to their level of dependence of the project area and access conditions. The weather conditions made the access to the other settlements impossible. Also, the internal community of farm workers was also consulted. More information on the selected settlements is in item 4.1.1.

To complement field information, a series of onsite interviews were conducted by the team, with a view to specifying and validate the secondary information previously collected and ensure that all relevant stakeholders were considered. The interviews were made individually or in a participatory meeting. Approximately 85 community members were consulted.

[38] https://www.gov.br/incra/pt-br
[39] https://www.ibge.gov.br/
[40] https://www.gov.br/funai/pt-br
[41] https://www.icmbio.gov.br/
[42] https://imazon.org.br/
[43] https://www.fbds.org.br/

Figure 17: Community Consultation

The institutional consultation was performed via email contact, where a summary of the project was sent to the stakeholders. The project was presented to one of the stakeholders, the Bujari Municipal Health Secretary, during a conference call.

Table 10: Total Number of People Interviewed

Total People Interviewed					
Settlement Name		1ª Visit JAN 2022	2ª Visit APR 2023	Gender	
				Male	Female
1	PA Antônio de Holanda	10	0	5	5
2	PA Carão	3	0	3	0
3	PA Dom Moacir	7	20	24	3
4	PA Espinhara II	9	12	11	10
5	PA Figueira	2	0	1	1
6	PA Limoeiro	5	0	4	1
7	PA Luz da Vida	2	0	2	0
8	Farm Workers	0	15	15	0
SUBTOTAL		**38**	**47**	**65**	**20**
TOTAL		**85**		**85**	

Consultations with all stakeholders shall continue throughout the Project Lifetime to analyze the impacts of project activities.

In the next section, the stakeholders identified in the process of mapping for both the reference area and the project area, as well as the information derived from interviews with the social professional in the area, are described.

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

Institutional Public Consultation

The stakeholders identified for the Institutional Public Consultation were consulted by email which had a resume of the project activities and objectives. They were all invited to comment and participate in the project. No comment has been received until this moment. The following stakeholders were considered:

Table 11: Description of Institutional Stakeholders – State and Municipal Bodies

Stakeholder	Description and Relevance to the Project	Distance to the PA (km)
Bujari City Hall[44]	Responsible for public management, promoting sustainable, social and economic development.	20
Environmental Secretariat of Bujari[44]	Responsible for carrying out activities related to environmental management, promoting environmental education, regulation, control, regularization, protection, conservation and recovery of natural resources	20
Environmental Protection Area of Igarapé São Francisco[45]	Approximately 300,000 hectares of Environmental Protection Area, located in the municipalities of Bujari and Rio Branco. It was created for the preservation and recovery of the remnants of the local biota, as well as promoting environmental education, scientific research, and the conservation of environmental, cultural, and historical values.	Borders with the PA

[44] https://www.bujari.ac.gov.br/
[45] http://semapi.acre.gov.br/apa-igarape-sao-francisco/ ; http://semapi.acre.gov.br/

Federal University of Acre (UFAC)[46]	Educational institution. Carries out research in the field of forestry engineering and sustainability.	45
Institute of Development of the Amazon (IDESAM)	Non-profit organization. Works to promote the valuation and sustainable management of natural resources in the Amazon, seeking alternatives for environmental conservation, social development and the mitigation of climate change.	Headquartered in Manaus/AM, however, they operate at the State of Acre as well.
Amazon Environmental Research Institute (IPAM)[47]	Non-profit scientific organization that works for the sustainable development of the Amazon. Has the purpose of consolidating the model of tropical development in the Amazon, through the production of knowledge, implementation of local initiatives and influence on public policies, in order to impact economic development, social equality and the preservation of the environment.	Headquartered in Belém/PA, however, they operate at the State of Acre as well.
Institute of Agricultural and Forestry Defense (IDAF)[48]	Ensuring animal and plant production in the State of Acre, with sanitary quality standards ensuring public health and effective participation in the market.	55
Municipal Secretariat of Education of Bujari[44]	Promote, implement, and maintain the education for the municipal population according to the Law of Directives and Bases of National Education (Lei nº 9.394/1996).	20
Municipal Secretariat of Sports, Culture and Leisure.[44]	Promote and support sports practices in the community and, provide means for healthy and constructive recreation to the community; promote the cultural development of the municipality by stimulating the cultivation of sciences, arts, and letters.	20

[46] https://www.ufac.br/
[47] https://ipam.org.br/pt/
[48] http://idaf.acre.gov.br/

Antimary State Forest[49]	A Conservancy Unit of Sustainable Use with 47,064 hectares, created in 1997 and located in Bujari and Sena Madureira municipalities, managed by the State Secretariat of Environment.	70
Rio Branco City Hall[50]	Responsible for public management, promoting sustainable, social and economic development.	44
Porto Acre City Hall[51]	Responsible for public management, promoting sustainable, social and economic development.	97
Bujari Municipal Health Secretary	Plan, develop, guide, coordinate and execute the municipal health policy.	20

As this is a grouped project, in the event of inclusion of new instances, it was defined that they will be located within the Reference Region. Thus, the list of institutional stakeholders already includes all the relevant ones, for the present and future PA.

Community Public Consultation

For the Community Public Consultation, the following stakeholders were considered:

Quilombola Communities

The research on quilombola communities was carried out for the State of Acre. According to the SEPPIR (Secretariat of Policies for the Promotion of Racial Equality)[52] database, the State does not have quilombola communities.

Indigenous Lands

In order to locate the indigenous lands (TI) that may be impacted by the project activities, the cartographic base of Indigenous Lands made available by ISA (Socio-Environmental Institute)[53] was consulted. There are no indigenous lands in the surrounding of the project.

Settlements

49 http://semapi.acre.gov.br/fe-antimary/
50 http://www.riobranco.ac.gov.br/
51 https://www.portoacre.ac.gov.br/
52 Source: http://monitoramento.seppir.gov.br/ (last visited in 31/01/2022)
53 Source: https://terrasindigenas.org.br/#pesquisa (last visited in 31/01/2022)

The following settlements were identified on the 20-km buffer from the PA:

Table 12: Description of Community Stakeholders – Settlements

Stakeholder		Distance to the PA (Km)	Description and Relevance to the Project
1	FLOE Floresta Estadual do Antimary	17,31	State Conservation Unit, dedicated to environmental conservation, sustainable production, research and the promotion of socio-economic and environmental development in the region. Its purpose is linked to improving the quality of life of the resident and its surroundings population.
2	PA Abib Cury	11,69	Consist in rural settlements where communities live and practice intensive agriculture as a form of income generation. The settlements guarantee the profitability of the farmer who lives in it, in order to avoid irregular occupations and any other predatory activity in conservation areas. For the project, they are relevant since they represent the communities that are going to be consulted and where project activities will be implemented.
3	PA Antonio de Holanda	17,35	
4	PA Barro Alto	14,38	
5	PA Carão	0,14	
6	PA Espinhara	5,71	
7	PA Espinhara II	0,62	
8	PA Figueira	10,66	
9	PA Itamaraty	17,39	
10	PA Luz da Vida	5,23	
11	PA Porto Acre	12,22	
12	PA Tocantins	9,72	
13	PAD Humaitá	10,69	
14	PAE Canary	12,09	
15	PAE Limoeiro	0,38	
16	PE Polo Agrof. Dom Moacir	9,9	
17	PE Polo Agrof. Wilson Pinheiro	11,76	
18	PE Polo Leiteiro de Porto Acre	27,55	

In order to contain the environmental devastation in the state of Acre, mainly by cattle ranching and predatory logging, Agroforestry Poles (Portuguese acronym "PA") were created in settlements. This concept of agroforestry pole is implemented with the training of families to develop sustainable activities for their income generation, such as: the production of vegetables, oilseeds, fruits, tubers (cassava is the flagship) and fruits in general, many of them regional. Intercropping with small animal creations, such as cut chicken or eggs and fish in tanks and dams. Thus, the use of areas of use discourages the opening of new forest areas.

The State of Acre has 32.661 families settled by the agrarian reform distributed in 161 settlements. Of this total, 16.9% (5.518) reside in the municipalities of Bujari, Porto Acre and Rio Branco (INCRA, 2017)[54]. Within the 20km radius of the project area there are located 18 settlements, as described above in the list of "Community Stakeholders – Settlements".

The settlement is mostly composed of Portuguese Brazilian and African descendants, from former ancient rubber tapers and extractivism nut collectors coming from northeastern Brazil and other Amazonian regions. In addition, the local community's ethnicity is further characterized by their Brazilian nationality and a common language (Portuguese Brazilian), along with shared religious beliefs (Christians), either Catholics or Evangelicals and customs such as hunting and agriculture. The resident population, according to gender, is roughly 54% are men and 46% are women, with the majority composed of the 30-39 age group[55].

Internal Project Community

The community of farm workers, that works in the project properties, including the project area, were consulted as one of the stakeholders, since they will be impacted by the project.

Two moments of public consultation were carried out in settlements in the 20km buffer zone. Approximately 85 people were consulted, including the settlement's communities and farm workers, either by individual questionnaire or through a participatory meeting. Of the 18 settlements, 7 were consulted and selected to be the focal group for the project activities. The selection was made according to 7 were consulted, selected according to their level of dependence of the project area and access conditions. The weather conditions made the access to the other settlements impossible. More information on the selected settlements is in item 4.1.1.

The tables below list the communities that were consulted trough individual questionaries and participatory meetings, informing the number of members and gender.

[54] https://painel.incra.gov.br/sistemas/index.php
[55] https://cidades.ibge.gov.br/brasil/ac/bujari/pesquisa/23/27652?detalhes=true

Table 13: Community members individually interviewed

Community	Men	Women	Nº of people that uses the PA
PA Carão	3	0	1
PA Espinhara II	5	4	3
PA Figueira	1	1	0
PA Limoeiro	4	1	0
PA Luz da Vida	2	0	0
PA Dom Moacir	5	2	0
PA Antônio Holanda	5	5	0
Farm Workers	15	0	0
Total	**40**	**13**	**4**

Table 14: Communities where participatory meetings were held.

Community	Woman	Man
PA Espinhara II	1	19
PA Dom Moacir	6	6
Total	**7**	**25**

From the community of farms workers, 15 were interviewed, all men.

One of the diagnosis's goals was to understand the use of natural resources in the community and the activities performed in the surrounding area of the project. Most of the interviewed depend on forest resources as a source of income and work with harvesting of non-timber forest products close to the project area. None claimed to exploit wood or to own large cattle ranching close to the project area. Of the total interviewed, 4 reported that they use the project area for subsistence activities, as extractivism, water collection, and non-predatory hunting. The use is made especially by members of the PA Espinhara II, by those that lives in the boundary with the project area.

An important role in the region's economy are the small-scale agriculture activities, mainly as a source of subsistence for families[56]. It should be noted that, according to the socio-economic diagnosis, the local communities living near the project area are mainly engaged in the production of crops as cassava, corn, rice and banana for local commercial markets.

In addition, these communities hunt and collect non-timber products, such as Brazil nut and açaí in the forest surrounding their farms as additional income, not being a largely subsistence livelihood. It is the case of these four people interviewed, who reported making use of the project area to Brazil nut's extractivism and hunting, a traditional activity that has already become a culture for the region.

[56] http://semapi.acre.gov.br/wp-content/uploads/sites/20/2020/04/Plano-de-Manejo-Florestal-Antimary.pdf

The diagnosis was also carried out for the socioeconomic characterization of the communities, in addition to identify the main problems, priorities and necessities. The table below brings the points of improvements identified in the communities. From this list, it was selected those that the project can improve through the project activities. A more complete result of the diagnosis is presented in item 4.1.1. The list of project activities is listed in item 2.1.11.

Table 15: Community Consultation Methods

	Method	1st Visit JAN 2022	2nd Visit APR 2022	Purpose of the Consultation
1	Structured Individual Interview	20	9	- Community Characterization; - Project presentation; - Understand the uses of Project Area by Communities Members; - Social-economic Diagnosis
2	Community Leadership Questionnaire	0	1	
3	Participatory Community Diagnosis	0	40	
4	Internal Farm Workers Community	0	15	
Total Number of People Consulted		85		

Table 16: Main problems, priorities and necessities identified by the communities

Main Problems Identified	Priorities
Low income	Access to rural finance credit
Difficulty of transportation on the roads during the rainy season	Improve secondary roads that allowed access
Frequent fall in electricity demand	Improve better delivery to access to electricity
Limited access to health services	Better support provided by the social agents
Scarce roads and access	Better infrastructure and maintenance service in bridges and roads
Lack of work	Access to job opportunities
Lack of technical assistance by governments	Improve production techniques
Limited access to educational establishments	More schools
Difficulty in tranportation	Improve the communitarian transportation in order to facilitate access to schools in urban area

2.1.10 Sectoral Scope and Project Type

Project Scope: Agriculture, Forestry and Other Land Use (AFOLU)
Project Category: Reducing Emissions from Deforestation and Degradation (REDD)
Type of Activity: Avoided Unplanned Deforestation & Degradation (AUDD)
Climate Community and Biodiversity (Version 3)
Reference of Methodology: Approved VCS Methodology for Avoided Unplanned Deforestation (VM0015) V.1.1
This is a grouped project.

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

Theory of Change is an evaluation tool that maps out the logical sequence of means-ends linkages underlying a project, stablishing the actions or strategies that will lead to the expected results, explicating how it can and will happen[57].

Using available information on the social and environmental previous conditions in the project area and surroundings gathered through the social and environmental diagnosis realized onsite, it was possible to identify the main problems and community demands. Afterwards, these problems were analyzed and project's activities, of which the execution would imply in benefits and at least in the partial solving of the problems, were suggested, considering climate, community, and biodiversity factors. This mapping was conducted in the HIWI Project context, and the problems, necessary activities, consequent benefits and expected results at a sequential period were designed and can be found in the workflow diagram bellow.

Further investigations can be conducted to enhance the current diagnosis and to help manage results achievement, considering a continuous improvement management methodology so that more robust activities, pertinent to the project's reality and objectives, can be designed and delivered to the area using the theory of change methodology.

The main objective of the Hiwi REDD+ Project is the conservation of the forest in the project area. Thus, the main actions will be to combat the agents of deforestation such as fire and illegal deforestation, that is the common practice. Considering that, associated with the actions, there is a need to improve the living conditions of the populations surrounding the project area, the HIWI REDD+ Project will also promote productive education, environmental education, infrastructure adaptations and improvements in local health, as detailed in the table that follow:

[57] https://www.forest-trends.org/wp-content/uploads/imported/sbia-part-1-pdf.pdf

Table 17: Project Activities and Expected Impacts

Project Activity	Expected Impact	Related SDG
Training on Fire Brigade	Increase the agility in fighting fires in order to reduce the impacts; Knowledge in fire control and management techniques. Prevention of forest fires Capacitate the community so they can be hired to fight fires when needed.	13. Climate Action; 10. Reduce Inequalities
Health and safety workshops/activities	Improved health and quality of life; Reduction of cases of infectious diseases.	3. Good Health and Well-Being
Activities for the economic development of low carbon production practices	Increase in general knowledge and technical training. Deforestation reduction, inside and outside the PA. Reduction on GHG emission	8. Decent Work and Economic Growth; 13. Climate Action
Educational workshops on environmental topics	Greater environmental awareness.	13. Climate Action
Creation of jobs position, directly or indirectly	Increase in income and quality of life.	10. Reduce Inequalities
Presence of women in the activities	Increase in women's income and empowerment.	5. Gender Equality
Fauna and Flora Inventory	Mapping and monitoring of flora and fauna species, including endangered ones.	15. Life on Land
Fire and deforestation monitoring via satellite	Identify events of illegal deforestation in order to take action as soon as possible, decreasing the deforestation.	15. Life on Land

Improvements in the infrastructure of the establishments and surveillance bases in the project area	Guarantee good working and housing conditions for the project workers.	8. Decent Work and Economic Growth
Provision of personal protective equipment for workers and work safety training.	Guarantee safety and good working conditions for the project workers.	8. Decent Work and Economic Growth
Implementation of Operating Procedures	Improvement of internal procedures and standardization	8. Decent Work and Economic Growth

These project activities will be achieved over the 30 years of the project, gradually, as the social, climate and biodiversity actions advance.

Currently, there is an official national jurisdictional REDD+ policies in the State of Acre, called System of Incentives for Environmental Services (SISA), it was created through State Law 2.308 [58]. However, the Hiwi REDD+ Project was not incorporated into the State of Acre's jurisdictional program. If in the future the Hiwi REDD+ Project is nested into the State of Acre's Jurisdictional REDD+ Program, then the Project will follow the requirements of Verra and the State of Acre.

In addition, the project proponents have frequently closely with the State of Acre's to position about the Hiwi REDD+ Project and to look out for new information, always present in forums of federal and state government discussions to contribute to the formulation of these policies and regulations, being promptly available to incorporate the project to the new officially established rules.

The Hiwi REDD+ Project intends to be validated and verified to the VCS and CCB Standards, a voluntary REDD+ program, and shall be regularly verified to both the VCS and CCB. The project submission at the Verra Registry system to issue and trade Verified Carbon Units (VCUs) helps to ensure the avoidance of GHG emissions being double counted.

The image below brings a diagram of the project's Theory of Change and the table present right after giver more details of the methodology that will be applied in order to achieve each goal.

[58] Lei_n._2.308_de_22.10.10_Cria_o_SISA_e_o_ISA.pdf (acre.gov.br)

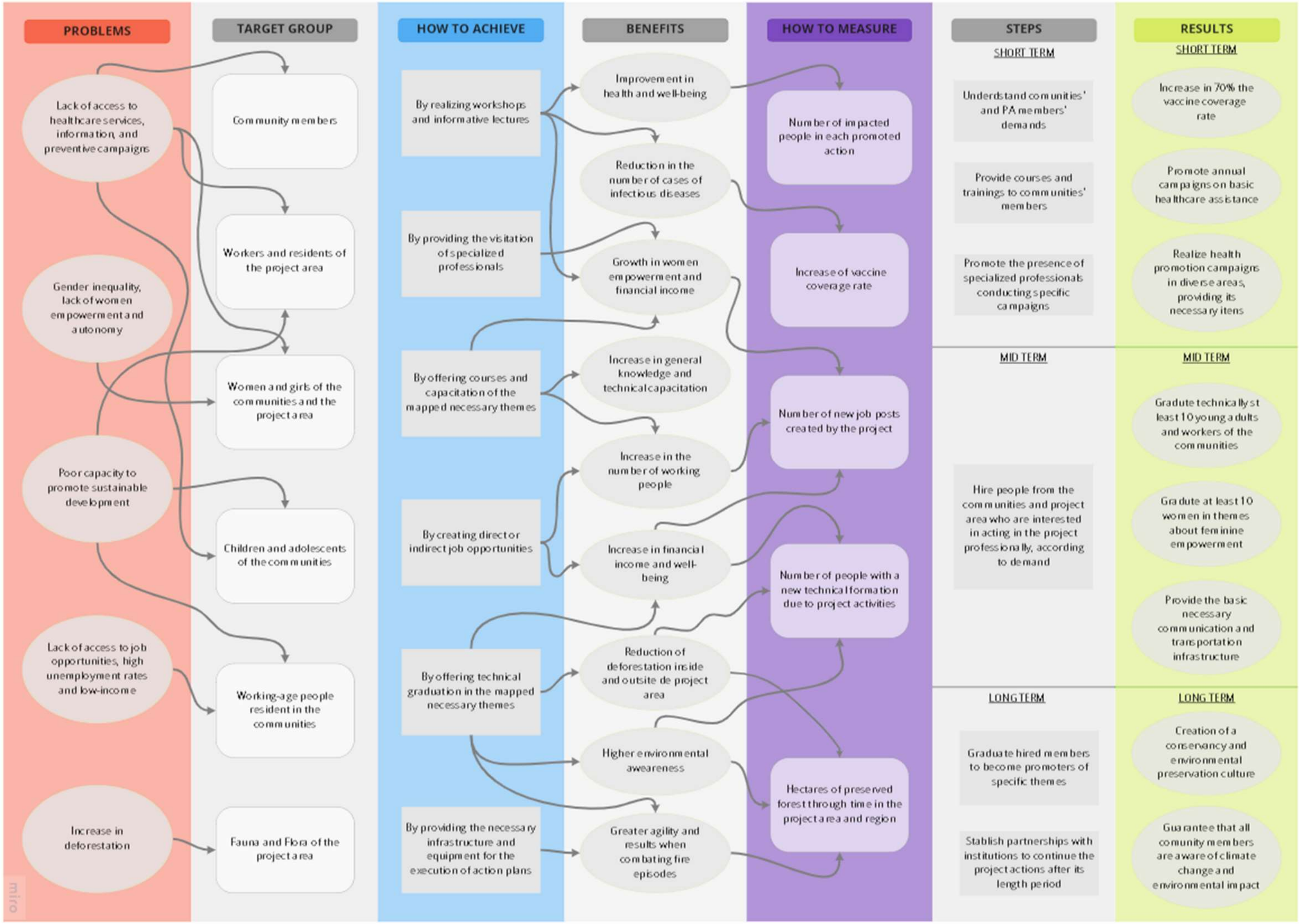


Figure 18: Project activity theory of change diagram flow

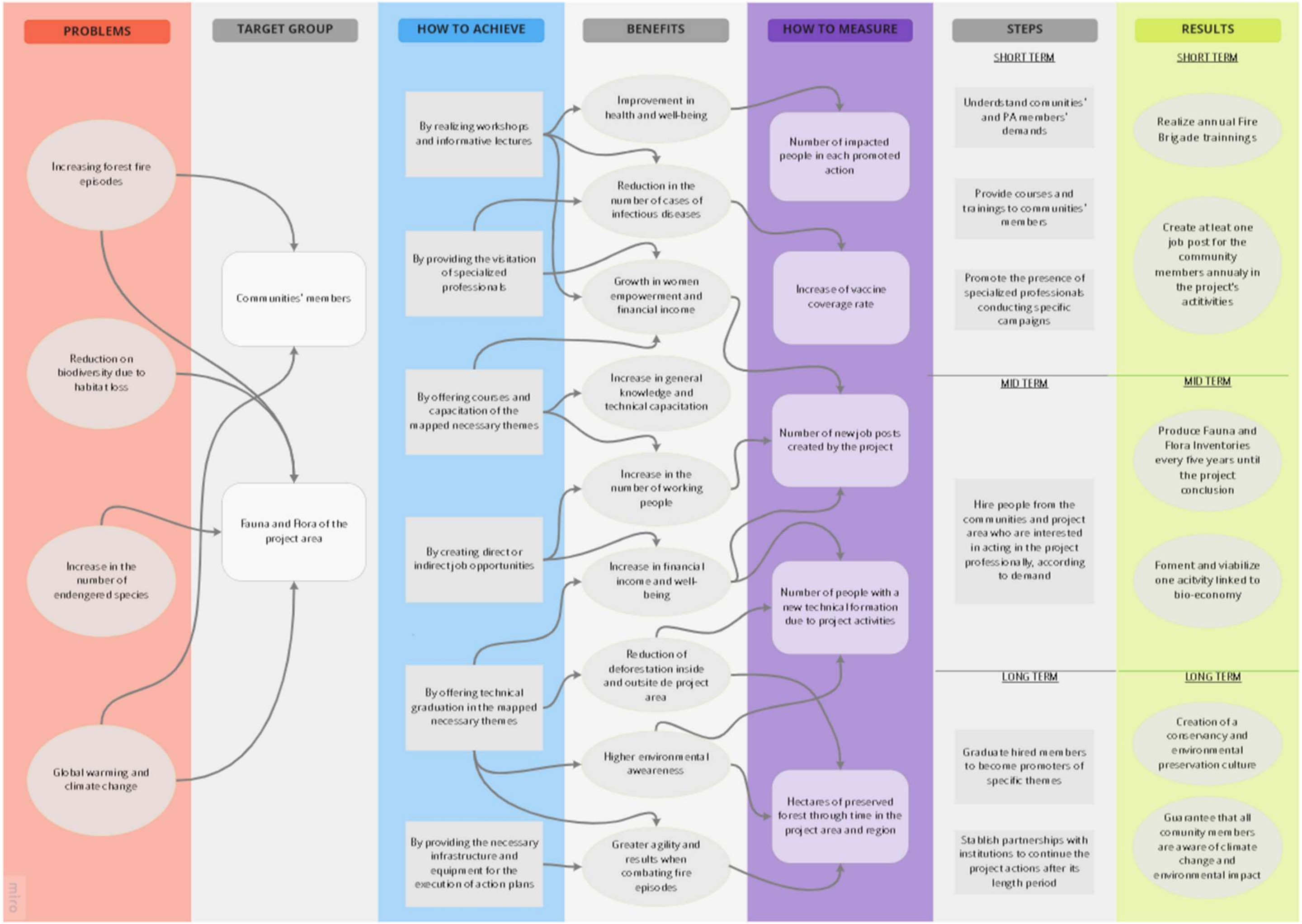


Figure 19: Project activity theory of change diagram flow (continuation)

Table 18: Detailed information of the Hiwi Theory of Change Methodology Application

Activity Description					
Category	**Benefits Category**	**Problem**	**Activity**	**Benefits**	**Methodology**
Community	Employment; Livelihoods; Health; Well-Being	Lack of access to healthcare services, information and preventive campaigns	Health and safety workshops/activities	Improvement of access to health services	Partnership with specialized organizations and the municipality; Hiring specialized professionals.
Climate; Community	Training; Employment; Livelihoods; Well-Being	Increase in fire episodes	Fire Brigade Training	Capacitate the community so they can be hired to fight fires when needed; Knowledge in fire control and management techniques.	Partnership with specialized organizations/companies; Hiring specialized professionals.
Climate; Biodiversity	Livelihoods; Biodiversity; Conservation	Increase in deforestation	Surveillance	Identification of illegal deforestation in order to take action as soon as possible, decreasing the deforestation.	Improving the ground monitoring system; Implementing remote sensing monitoring of the project area with a maximum frequency of 7 days
Community	Training; Well-Being; Health	Lack of standardization on the internal procedures	Operating Procedures Implementation	Improvement of internal procedures and standardization	Implementation of the Operating procedures and training the workers on them using specialized professionals.
Community	Employment;	Lack of access to job opportunities, high unemployment rates and low-income	Jobs Position	Increase of employment rate	Increasing the technical knowledge on activities that generate income; Hiring the community members and local people to work in the project.

Activity Description					
Category	**Benefits Category**	**Problem**	**Activity**	**Benefits**	**Methodology**
Community	Training; Employment; Livelihoods; Well-Being	Gender inequality, lack of women empowerment and autonomy	Gender Equality	Increase women empowerment in communities	Partnership with organizations for women economic development; Encourage women to participate in the project activities.
Community; Biodiversity	Biodiversity conservation; Community	Non-identification and non-monitoring of the HCV	HCV	Protection of the HCV identified	For the community HCV: identification with the community members, mapping and protection. For the biodiversity HCV: identification and mapping with the inventory professionals, followed by monitoring and protection.
Community	Training; Employment; Livelihoods; Well-Being	Lack of knowledge in activities for the economic development of low carbon production practices	Activities for the economic development of low carbon production practices	Increase in general knowledge and technical training; Increase of production and income.	Partnership with specialized organizations/companies; Hiring specialized professionals.
Climate; Community; Biodiversity	Training; Employment; Livelihoods; Well-Being	Lack of awareness on environmental topics	Educational workshops on environmental topics	Improve knowledge and preservation and decrease of deforestation	Educational activities with specialized professionals.
Community	Livelihoods; Well-Being	Identification of the need for improvement in some properties' infrastructure.	Infrastructure Improvement	Guarantee good working and housing conditions for the project workers, according to the Brazilian Regulatory Norms (NRs).	Hiring specialized labour to adequate the infrastructure.

Activity Description					
Category	**Benefits Category**	**Problem**	**Activity**	**Benefits**	**Methodology**
Biodiversity	Biodiversity conservation	Reduction on biodiversity habitat loss and increase in the number of endangered species	Fauna, Flora and Biomass Inventory	Mapping and monitoring of flora and fauna species, including endangered ones	Partnership with specialized organizations/companies; Hiring specialized professionals.

2.1.12 Sustainable Development

The GHG Crediting Period is 30 years (2019 to 2049) during which net revenues from carbon payments will be used to further develop and implement surveillance and social activities that will yield net positive impacts to the climate, communities, and biodiversity of the area.

The Hiwi REDD+ Project Complies with the logic of the environmental priorities defined by the Brazilian Federal Administration, which, during COP 14 held in Poznan, Poland, in December 2008, declared a deforestation reduction goal of 70% by the year 2018, and following that, further goals of achieving zero illegal deforestation by 2030, and offsetting of greenhouse gas emissions originating from legal removal of vegetation. The latter are elements of the Brazilian NDC, which the country aims to adopt within the framework of the Paris Climate Accords (COP-21)[59]. Ever since, the Brazil has committed to reduce its emissions in 37% by 2025 and 43% by 2030, when compared with 2005 levels. It has also pledged to end illegal deforestation by 2030[60]. In order to attain this goal, it will be necessary to join government initiatives with independent actions, such as that proposed under the present project, but it's not mandatory that the Hiwi project gives account for the Brazilian government about the actions taken on the national SDGs.

Due to the increase in deforestation in the Legal Amazon, the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm; Plano de Ação para a Prevenção e Controle do Desmatamento na Amazônia Legal) came into effect, starting mitigation and ongoing actions to reduce deforestation[61]. The PPCDAm goals are as follow[62].

1) Promote land tenure regularization;

[59] MMA: http://redd.mma.gov.br/pt/redd-e-a-indc-brasileira
[60] UNFCCC, 2021: https://www4.unfccc.int/sites/NDCStaging/Pages/All.aspx
[61] Brazilian Government: https://www.gov.br/agricultura/pt-br/acesso-a-informacao/acoes-e-programas/ppa/plano-plurianual-ppa-2016-2019-1/relatorio_avaliacao_programa_2050-mudanca_do_clima.pdf
[62] LivroPPCDamePPCerrado_20JUN20184fase.pdf (www.gov.br)

2) Promote territorial planning, strengthening protected areas;
3) Promote accountability for environmental crimes and infractions;
4) Implement shared forest management;
5) Prevent and combat the occurrence of forest fires;
6) Improve and strengthen forest cover monitoring;
7) Promote sustainable forest management;
8) Promote the sustainability of agricultural production systems;
9) Implement normative and economic instruments to control illegal deforestation.

The Hiwi REDD+ Project contributes with goals 4), 5), 6) and 7).

At the international level, the Hiwi REDD+ Project complies with the logic of the environmental priorities defined by the Brazilian Federal Administration at COP 14 in December 2008, where a deforestation reduction goal of 70% by the year 2018 was declared, and following that, further goals of achieving zero illegal deforestation by 2030, and offsetting of greenhouse gas emissions originating from legal removal of vegetation. The latter are elements of the Brazilian NDC, which the country aims to adopt more firmly within the framework of the Paris Climate Accords (COP-21)[63]. To attain these goals, an essential component will be to ally government initiatives with independent actions such as that proposed under the present project.

Going into more detail, the Hiwi project is aligned with Brazil's commitments to the UN Sustainable Development Goals (SDGs). Firstly, on the environmental side, Brazil has made commitments to SDG 13 – "Take urgent action to combat climate change and its impacts" – aligning its national goals[64] with the UN's, for example UN goal 13.3[65]:

- 13.3: Improve education, increase human and institutional awareness and capacity on climate change, its risks, mitigation, adaptation, impacts, and early warning systems

The project activities involving technical qualification, training in sustainable cattle ranching and other activities of low carbon production, and community development in the form of participative workshops, aim to increase the collective understanding of climate change and the importance of the forest. This intervention at the small-scale level has broader objectives, for a collective transformation of cultural relations lifestyles of the local community and the economy, in its relation to the environment.

Regarding goal 13, the Hiwi REDD+ project involves the conservation of a predicted 20,505.00 hectares of forest over its lifespan and it is an essential activity for climate change mitigation.

[63] MMA: http://redd.mma.gov.br/pt/redd-e-a-indc-brasileira
[64] IPEA: https://www.ipea.gov.br/ods/ods13.html
[65] ODS Brasil: https://odsbrasil.gov.br/

Perhaps most importantly, the project is aligned with SDG 15 regarding Terrestrial Ecosystems, which was adopted into the Brazilian goals as follows: “15.1. By 2020, to conserve at least 30% of the Amazon, through systems of conservation units provided for in the Law on the National System of Conservation Units (SNUC), and other categories of officially protected areas such as Permanent Preservation Areas (APPs), Legal Reserves (RLs) and indigenous lands with native vegetation (…)”. The present project’s direct conservation of APPs and RLs, as well as synergistic actions with the surrounding Conservation Units are strongly aligned with this national goal.

Brazilian SDG goal 15.2, regarding sustainable forest management, tree plantation and restoration of forests, which stipulates to “eliminate illegal deforestation in all Brazilian biomes by 2030, expand the area of forests under sustainable environmental management and recover 12 million hectares of degraded forests and other forms of native vegetation, in all biomes and preferably in Permanent Preservation Areas (APPs) and Legal Reserves (RLs) and, in areas of alternative land use, expand the planted forest area by 1.4 million hectares”, is directly supported by the Hiwi project’s following activities:

- Monitoring of illegal land occupation, illegal logging, and illegal deforestation;
- Ultimate goals of avoided deforestation of 20,505.00 hectares of Amazon rainforest over 30 years on private lands, preserving APPs and RLs.

On the socio-economic front, Brazil adopted “UN Goal 1: End poverty in all its forms everywhere”, “UN Goal 3: Ensure a healthy life and promote well-being for everyone, at all ages”, and “UN Goal 8: Promote inclusive and sustainable economic growth, employment and decent work for all”, and, with the most relevant Brazilian sub-goals to the project being the ones described in the table below, together with the project activity that is related to each SDG.

Table 19: Project Activities and the SDGs

SDG	Project Activities
SDG 1.1: “By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than PPC$3.20 a day”;	The project will create permanent and temporary job posts, involving local people and community members, as well as relevant monitoring and indicators.
SDG 1.2: “By 2030, reduce proportion of men, women and children of all ages living in monetary and non-monetary poverty by at	Monitoring of equal opportunities relating to gender in the project indicators; development of activities for women empowerment; workshops,

least half, in all its dimensions, according to national definitions";	trainings and other activities focused on the development of the community members.
SDG 3.4: "By 2030, reduce premature mortality from non-communicable diseases by one third through prevention and treatment, and promote mental health and well-being"	Workshops on health, well-being and nutrition will be given to employees and the community, aiming to raise awareness about non-communicable diseases and the importance of having healthy habits.
SDG 8.3: "Promote development with the generation of decent work; formalization; the growth of micro, small and medium companies; entrepreneurship and innovation";	The creation of the predicted jobs, mentioned above, is also aligned with Brazilian SDG 8.3 in that, given the reality of the region, it will certainly involve the formalization of informal jobs.
SDG 8.4: "Increase the efficiency of the use of global resources in consumption and production, and strive to decouple economic growth from environmental degradation, in accordance with the Action Plan for Sustainable Production and Consumption (PPCS)."	The organization of training events focusing on forest management and activities for the economic development of low carbon production practices, such as sustainable cattle raising.

2.1.13 Implementation Schedule (G1.9)

During the project lifetime, from the development to implementation, some important dates and milestones will take place, such as introductory meeting dates, start and end dates of each project activity, start and end dates of the GHG accounting period, monitoring program, verification program, etc. The table below presents these milestones.

Table 20: Implementation Schedule

Date	Milestone(s) in the project's development and implementation
August 2019	Project Start Date

August 2019	Start of the GHG accounting period
2019 – 2049	Ground monitoring of the project area
July 2020	Construction of Surveillance Base
2021 - 2022	Purchase of monitoring vehicles
2021	Ground survey
Nov 2021	Contract signing for the development of REDD+ project
Feb 2022	First introductory meeting with the community
Feb 2022	Institutional Public Consultation
April 2022	Second meeting with the community
2022 - 2049	Fire and deforestation monitoring via satellite
2022 - 2049	Health and safety workshops/activities
2022 - 2049	Fire Brigade Training, once a year
2023 - 2049	Educational workshops on environmental topics
2023 - 2049	Activities for the economic development of low carbon production practices *, once a year
2023 – 2049, every 2 years	Fauna Inventory
2023 – 2049, every 5 years	Flora Inventory
2023 – 2049, every 10 years	Biomass Inventory
At least once before every verification	Mapping and monitoring of community indicators
According to the frequency stablished on the monitoring plan performed after the fauna and flora inventory	Mapping and monitoring of flora and fauna parameters

August 2049	End of crediting period

* Capacitation may include trainings on topics such as sustainable cattle ranching, agroforestry, and others, according to the community's necessities.

2.1.14 Project Start Date

The Project Start Date is the 31st of August 2019.

The start date is evidenced by the start of activities to improve the surveillance system, with the purchase of vehicles used to monitor the area. This action was driven by the occurrence of two invasions in two of the properties, Bela Aliança, in 2018, and Ipanema in 2019. The timeline of the first activities implemented aiming the increase the protection of the project area is listed in the table below.

Table 21: Timeline of the first protection activities

Date	Description	Comments
15/11/2018	Invasion	BO Bela Aliança
26/02/2019	Invasion	BO Fazenda Ipanema
31/08/2019	Purshace of 4x4 car	Used in the ground monitoring and property preservation
03/07/2020	Construction of Surveillance Base	Surveillance Base located in entrance of the Ipanema, Copacabana and Leblon properties.
15/04/2021	Motorcycle Purshace	Used in the ground monitoring and property preservation
08/10/2021	Invasion	BO Fazenda Ipanema
21/10/2021	Purshace of 4x4 car	Used in the ground monitoring and property preservation
04/11/2021	Land survey	Ground survey
15/01/2022	Land survey	Ground survey
21/02/2022	Quadricycle purchase	Used in the ground monitoring and property preservation
11/04/2022	Purshace of 4x4 car	Used in the ground monitoring and property preservation

2.1.15 Benefits Assessment and Crediting Period (G1.9)

Start date: 31/08/2019

End date: 30/08/2049

30 years.

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

There is no difference between the GHG emissions accounting, climate adaptive capacity and resilience, community, and/or biodiversity assessment and periods.

2.1.17 Estimated GHG Emission Reductions or Removals

Year	Estimated net GHG emission reductions (tCO2e)
2019	7,314
2020	51,078
2021	61,271
2022	63,684
2023	65,694
2024	64,810
2025	70,368
2026	77,424
2027	85,939
2028	77,165
2029	84,300
2030	87,889
2031	92,605
2032	92,030
2033	93,238
2034	87,871
2035	94,290
2036	99,954
2037	91,604
2038	92,373
2039	87,895
2040	90,806
2041	100,689
2042	97,578
2043	104,118
2044	97,620
2045	102,358
2046	106,883
2047	101,836
2048	100,158
2049	111,679
Total estimated ERs	2,642,522
Total number of crediting years	30
Average annual ERs	88,084

2.1.18 Risks to the Project (G1.10)

The table below lists all identified risks for the project and the actions taken in order to mitigate the risks. No risks nor negative impact were identified to be caused by the project on the climate, community and biodiversity. However, in the case of the project discontinuity or inefficiency of the project activities, the climate, community, and biodiversity benefits might be affected.

Table 22: Project Risks

Identified Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
Project Non-Permanence Risk*	Discontinuity of the project activities on climate, community and biodiversity.	To ensure the continuity of the project some actions are taken: contract between the project proponents signing the commitment with the project activities during its entire lifetime; engagement with the community to maintain their participation and project management; project proponents have the necessary funds to maintain the project activities until the start of the GHG revenue[66]; team of specialists working on field and in the project PD and verifications, as presented in section 2.4.3.
Illegal deforestation inside the project area	Deforestation inside the project area	Ground patrols twice a month, remote sensing monitoring of the project area with a maximum frequency of 7 days in order to identify illegal deforestation as soon as possible and take action. A 'Operating Procedure for Property Control and Fire Fighting' is being implemented.
Inefficiency of project activities	Poor results on climate, community, or biodiversity aspects, differing from what was	Guarantee that the local specific needs are being considered when designing and proposing activities; monitoring of

[66] Evidence presented for the auditors

	expected previously as a result from project activities	indicators to quantify and qualify obtained results; collect feedback from stakeholders involved.

*more details on the project risk analysis will be available on the Non-Permanence Risk Report.

Regarding external risks that might affect the community, climate and biodiversity benefits, the identified risks and mitigation actions are listed in the table below.

Table 23: External Risks to the Project Benefits

Identified Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
Increase of natural fires during the dry season	Increase of greenhouse gas emission; fire in the project area and communities' area; impact on the biodiversity.	Fire brigade training for the farm workers and community members.
Invasion in the project area and communities' areas	Illegal deforestation inside the project area and communities' areas, causing impact on the climate, biodiversity and community well-being.	Ground and remote monitoring of the project area. Activities of social and economic development in the communities, in order to increase the presence of the community members inside the community area, increasing the protection of the settlements.
Increase of climate change effects	Climate change impacts on the communities' life and well-being; decrease of biodiversity.	Establishment of the Emergency Fund for Adaptation to Extreme Weather Events. This fund will be used in the cases of adverse weather events and its implementation will begin with the emission of carbon credits, after the project verification.

2.1.19 Benefit Permanence (G1.11)

To maintain and enhance climate, community and biodiversity benefits beyond the project lifetime, a set of actions will be taken, such as trainings, inventories, educational workshops, monitoring, as described in item 2.1.11. With respect of the financial support, the proponents have the funds needed to maintain the project activities until the first verification[67]. After that, the project fund will come from the revenues obtained from the sales of carbon credit.

Climate

The project activities focused on climate benefits have as goal decrease deforestation and, as consequence, GHG emissions. For that, a more constant and effective monitoring of the project area will be maintained during the project lifetime. Also, training on activities for the economic development of low carbon production practices, such as sustainable cattle ranching, and educational workshops on environmental topics will be offered for the community located in the surroundings of the project area, as mentioned in 2.1.11 Project Activities and Theory of Change (G1.8).

Community

The community activities are designed to enhance the community's life quality. For that, trainings and workshops in topics that will bring knowledge to improve the subsistence activities carried out, such as sustainable cattle ranching. Workshops on health, safety and educational talks will also be carried out, among others. Continuous communication and consultation will be maintained though the project lifetime to ensure that the activities are reaching the goals and to hear recommendations, complaints and to implement necessary changes, as mentioned in 2.1.11 Project Activities and Theory of Change (G1.8).

Biodiversity

For the biodiversity activities and benefits, a third-party team will be hired to develop an inventory of fauna and flora, producing a more exact diagnosis of the area, and, as consequence, enhancing the project assertiveness and effectiveness, as mentioned in 2.1.11 Project Activities and Theory of Change (G1.8).

Information regarding the actions taken to mitigate the projects risks are described in the section above, 2.1.18.

[67] Financial evidence will be provided to the auditor. The value needed to maintain the project until the emission of credit is mentioned in the Non-Permanence Risk Report.

2.1.20 Financial Sustainability (G1.12)

Funding for project activities is secure by funds from the project proponents from the start date until the first verification (see Non-Permanence Risk Report). After that, the revenues from GHG emissions reductions will provide an additional flow of funds for the implementation and achievement of the project's climate, community and biodiversity benefits. The financial forecast of the project revenue from GHG emissions reduction is presented in the financial additionality. Evidence of the proponents' funds will be made available to the audit team.

2.1.21 Grouped Projects

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

This is a grouped project. Hiwi REDD+ is an AFOLU project activity designed to include REDD Avoided Unplanned Deforestation (AUD) components. In this sense, this project activity is designed to include more than one "project activity instance", such as the accession of new communities or landowners to the project across its lifetime. Thus, this grouped project is designed to allow the expansion of the project activity, after the project validation.

This grouped project has one clearly defined geographic area within which project activity instances may be developed, which is defined using geodesic polygons, corresponding to the current Reference Region. The determination of baseline scenario and demonstration of additionality were based upon the initial project activity instances (4 farms), that are presented in this PD for validation. For inclusion of new geographic areas, it will be demonstrated that such areas are subject to the same baseline scenario and rationale for the demonstration of additionality as the geographic area that does include initial project activity instances.

A single baseline scenario is determined for the entire designated geographic area (Reference Region), in accordance with VM0015 methodology. The additionality of the initial project activity instances was demonstrated for each designated geographic area, in accordance with the methodology applied to the project. All factors relevant to the determination of the baseline scenario or demonstration of additionality (i.e., common practice; laws, statutes, regulatory frameworks or policies relevant to demonstration of regulatory surplus; historical deforestation rates) were assessed across the grouped project geographic area and respective Reference Region.

The project proponent has defined the capacity limit for this project activity in terms of the Reference Region. If exceptionally a new instance is located outside the Reference Region, it will be guaranteed that all limit premises will respect the same conditions of similarity of historical deforestation rates as applied in the Reference Region to the initial project instances.

For this grouped project, the following set of eligibility criteria for the inclusion of new project activity instances has been defined, which is applicable for VM0015 REDD AUD activities, and the geographic area demarcated by the Reference Region:

1) Meet the applicability conditions set out in the methodology applied to the project: all the applicability criteria mentioned in VM0015 shall be met for any new instance: a) baseline activities shall include unplanned deforestation; b) project activities shall include one or a combination of the eligible categories defined in the description of the scope of the methodology (table 1 and figure 2 of VM0015); c) new instances may include different types of forest systems meeting the definition of "forest"; d) at the date of inclusion in this project, the new instance shall include only land qualifying as "forest" for a minimum of 10 years prior to the project start date; e) The project area can include forested wetlands (such as bottomland forests, floodplain forests, mangrove forests) as long as they do not grow on peat.

2) Adopt and apply the project activities, technologies or measures specified in the project description: all new instances to be included in this project activity will necessarily be assessed using the same satellite imagery and field techniques as applied for the first 4 instances, as described in the PD.

3) All new instances shall be subject to the baseline scenario determined in the project description for the specified project activity and geographic area.

4) All new instances shall be subject to the same community and biodiversity without-project scenarios as determined for the project.

5) All new instances shall have characteristics with respect to additionality that are consistent with the initial instances for the specified project activity and geographic area. For example, the new project activity instances must have financial, technical and/or other parameters (such as the size/scale of the instances) consistent with the initial instances, or face the same investment, technological and/or other barriers as the initial instances.

6) All new instances shall be subject to the same processes for stakeholder engagement described in G3 and respect for rights to lands, territories and resources including free, prior and informed consent described in G5.

7) All new instances shall have similar monitoring elements.

In addition, new project activity instances shall:

1) Preferentially occur within the Reference Region (as mentioned above any instance to be included outside the Reference Region will undergo all the required similarity assessments).

2) Comply with all the set of eligibility criteria for the inclusion of new project activity instances (cited above).

3) Be included in the monitoring report with sufficient technical, financial, geographic and other relevant information to demonstrate compliance with the applicable set of eligibility criteria and enable sampling by the validation/verification body.

4) Be validated at the time of verification against the applicable set of eligibility criteria mentioned above.

5) Have evidence of project ownership, in respect of each project activity instance, held by the project proponent from the respective start date of each project activity instance (i.e., the date upon which the project activity instance began reducing or removing GHG emissions).

6) Have a start date that is the same as or later than the grouped project start date.

7) Be eligible for crediting from the start date of the instance through to the end of the project crediting period (only).

Where a new project activity instance starts in a previous verification period, no credit may be claimed for GHG emission reductions or removals generated during a previous verification period and new instances are eligible for crediting from the start of the next verification period. Where inclusion of a new project activity instance necessitates the addition of a new project proponent to the project, such instances shall be included in the grouped project within five years of the project activity instance start date. The procedure for adding new project proponents will respect the rules of the VCS Program document Registration and Issuance Process.

AFOLU non-permanence risk analyses will be assessed for each new geographic area. Activity-shifting, market leakage and ecological leakage assessments will be reassessed where new instances of the project activity are included in the project.

1) The geographic area within which all project activity instances shall occur is delineated with the Reference Region set in this PD.

2) The determination of the baseline for the project activity is in accordance with the requirements of the methodology applied to the project.

3) The demonstrations of additionality for the project activity are in accordance with the requirements of the methodology applied to the project.

4) A set of eligibility criteria for the inclusion of new project activity instances at subsequent verification events is defined in this PD (above in this topic).

5) A description of the central GHG information system and controls associated with the project and its monitoring is provided in the Monitoring Plan.

It is important to notice that the Leakage Management areas originally inserted in the project design will be priority to recruit new project instances. If the new instances involve the original Leakage Management areas, new areas shall be identified and adopted to manage leakage.

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

The project scalability is delimited by the geographic area, in this project defined as the reference region. If exceptionally a new instance is located outside the Reference Region, it will be guaranteed that all limit premises will respect the same conditions of similarity of historical deforestation rates as applied in the Reference Region to the initial project instances. Also, the eligibility criteria described in the section above shall be met. The landowner of the new instance shall have enough financial funds to maintain the instance activities until the beginning of revenue from GHG emissions reductions.

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

The risks associated with the non-continuity of benefits is reduced given that the project activities proposed for the new instances will be developed by Carbonext's technical team, which has the technical capacity to determine the strategies and activities of the project, in addition to offering technical support to the landowners for the proper execution of the activities and monitoring. Thus, the continuous technical and scientific accompaniment performed by Carbonext during the project duration generates a support framework for monitoring, reporting and verification issues, which ensures the quality of the work and a continuous process of adjustment and improvement.

2.2 Without-project Land Use Scenario and Additionality

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

The present project activity has not been implemented to generate GHG emissions for the purpose of their subsequent reduction, removal or destruction. Instead, this project only foresees the reduction of emissions that would occur in the Project Area, as demonstrated from historical deforestation records taken from a Reference Region that meets all requirements of similarity defined in the VM0015 methodology. In this context, it is important to point out that historical deforestation in the Reference Region over the historical reference period could not be controlled by the project proponent in any way. Thus, there was no activity implemented to forge emissions for subsequent reduction prior to its start date.

In order to identify the land use scenarios without the project, the VCS approved tool VT0001 - Tool for the Demonstration and Assessment of Additionality in VCS, was applied. Forest is expected to be converted to non-forest land in the baseline scenario. The region faces a high deforestation pressure, being the main post-deforestation use cattle ranching.

Analysis of land use, via project analysis of Mapbiomas data, indicate that pasture is the main post-deforestation land use in the Reference Region, representing almost 39% of the RR, as seen in the table below. Pastureland accounts virtually all (over 99%) the deforested land occupation in the reference region. Thus, it is clear that pasture is the land use scenario without the project.

Table 24: Land Use in the RR in 2019

Classes	Area (ha)	% of Total Area
Other non-forest vegetation	1,774	0.30%
Water	1,688	0.29%
Forest	330,462	56.24%
Pasture	228,090	38.82%
Urban Area	25,550	4.35%
Total	**587,592**	**100.00%**

The baseline scenario identified is further discussed in Section 3.1.4, where it is presented the analysis of deforestation, vector agents and underline causes.

2.2.2 Most-Likely Scenario Justification (G2.1)

The most-likely scenario to occur is cattle ranching. As mentioned above, 39% of the land use of the Reference Region is pasture (image below). Bujari has 36.80% of its area used for pasture, for Porto Acre and Rio Branco, the percentage is of 45.11% and 27.17%, respectively[68]. Also, the region is facing a rising in deforestation due to cattle ranching activities, with an 8.3% increase of cattle heads from 2020 to 2021[69]. The municipality of Rio Branco has the highest cattle herd in the State, with 14% of the total[70]. Bujari also presented an increase of 13.4% from 2018 to 2020[71]. More information is provided in Section 3.1.5.

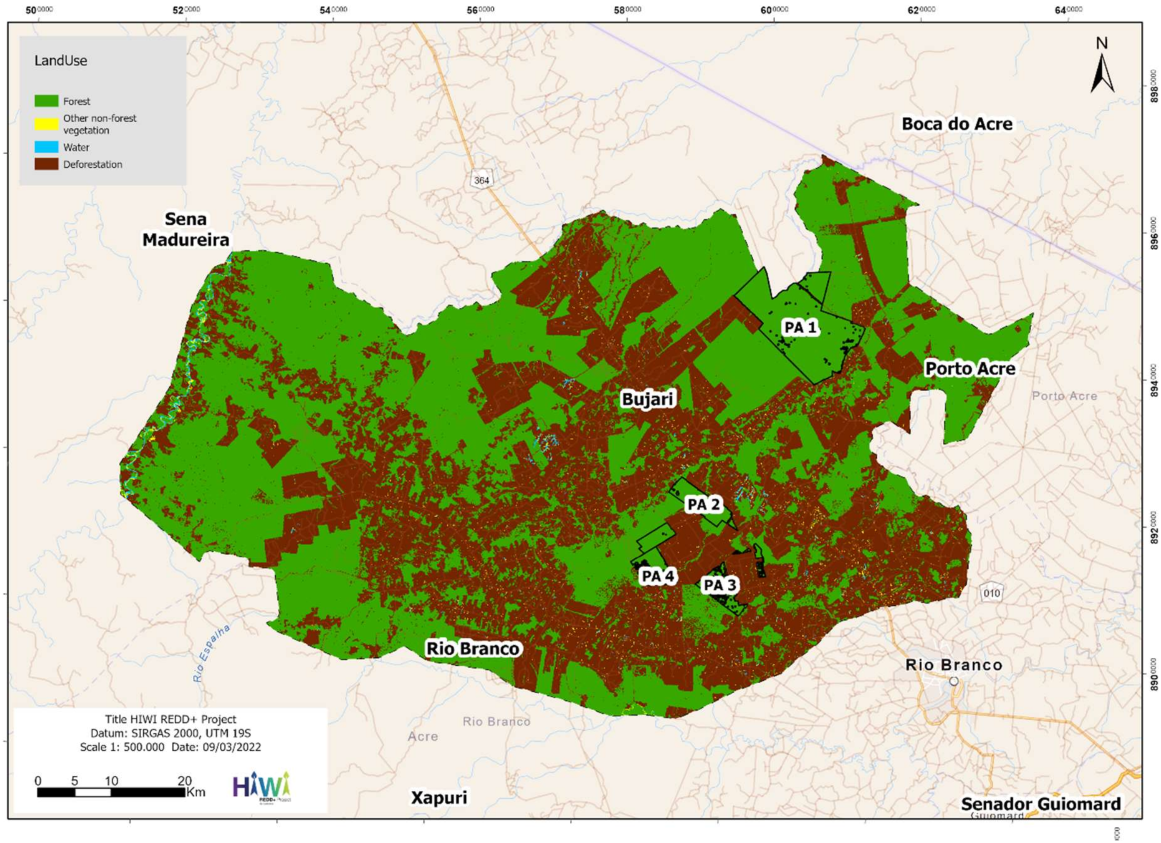


Figure 20: Land use in the Reference Region

2.2.3 Community and Biodiversity Additionality (G2.2)

Although Acre is one of the least-deforested Amazonian states, government data show the number of cattle in there increased by 8.3% in 2020, putting the state's herd size at more than 3.8 million, or four times its human population. The cattle industry is a key driver of Acre's economy and aligns with the state's aims of

68 Atlas das Pastagens (ufg.br)
69 Rebanho bovino no Acre já é quatro vezes maior que o número de habitantes; desmatamento cresce - Amazônia Notícias e Informação (amazonia.org.br)
70 Rebanho bovino no Acre já é quatro vezes maior que o número de habitantes; desmatamento cresce - Amazônia Notícias e Informação (amazonia.org.br)
71 IBGE | Cidades@ | Acre | Bujari | Pesquisa | Pecuária | Aquicultura

promoting and expanding agricultural development within the region, however, the cattle growth management is currently not sustainable[72].

In 2018, the Brazilian Ministry of Environment defined in an official document the regions that surround the Project Area, near Bujari city, had been classified as of “extremely high biological importance” and of “extremely high action priority”[73]. Earlier in that decade, the Ecological and Economical Zoning of Acre State listed Bujari city as one of the most critical municipalities when considering an indicator that relates deforestation area, forest area, and population size, due to the high intensity of natural land cover alteration[74].

Data from Mapbiomas, universities and other entities show that the loss of Acre’s forests over the past 10 years is strongly correlated with the annual increase in land designated for cattle, suggesting a link between the two. In 2020, 84,925 hectares (209,854 acres) were deforested in Acre; that same year, land designated for cattle and livestock in the state increased by an almost identical amount: 84,735 hectares (209,384 acres). This tendency of increase in cattle growth can lead to further environmental damages. In fact, the year 2021 recorded the highest deforestation rate in 18 years. This represents a great threat to the biodiversity of the State, one of the richest of Brazil[75].

The communities present in the surrounding area of the project depend on forest resources as a source of income and work with harvesting of non-timber forest products close to the project area, as stated in Table 74. Due to the poor quality of roads (figure below), especially in the rainy season, some communities have to interrupt the selling of products for some months of the year. The cattle and crops cultivated are mainly for subsistence. The communities also identified problems such as limited access to education and health services. The project activities are predicted to enhance the communities’ well-being and socioeconomical conditions, as presented in item Project Activities and Theory of Change (G1.8). Without the project's activities, it is expected that communities will continue to have precariousness in meeting their basic needs.

[72] https://amazonia.org.br/rebanho-bovino-no-acre-ja-e-quatro-vezes-maior-que-o-numero-de-habitantes-desmatamento-cresce/#:~:text=Dados%20oficiais%20mostram%20que%20o,o%20desenvolvimento%20agr%C3%ADcola%20na%20regi%C3%A3o.
[73] http://areasprioritarias.mma.gov.br/2-atualizacao-das-areas-prioritarias.
[74] Ecological Economic Zoning of Acre State, phase II, 2010.
[75] https://news.mongabay.com/2022/01/cattle-boom-in-brazils-acre-spells-doom-for-amazon-rainforest-activists-warn/

Figure 21: Car stuck in the mud due to the quality of the roads

Considering that the project region is at risk of deforestation due to the cited motives above, the HIWI REDD+ Project climate, community and biodiversity benefits of conservation would not occur without the project's activities. The benefits include the following:

- Protection and conservation of 20,505.00 hectares;
- Creation of jobs position, directly or indirectly;
- Increase of life quality and access to health care in the communities;
- Monitoring of fauna and flora species, including endangered ones;
- Technical capacity building in different topics.

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

Not applicable. No community and biodiversity benefits will be used as offsets.

2.3 Stakeholder Engagement

2.3.1 Stakeholder Access to Project Documents (G3.1)

The Hiwi Project is adamant about ensuring that the local communities and other stakeholders are fully informed about the Project and what it entails. This will be done by providing a printed copy of the Project at its headquarters for local consultation and clarification. The Project Description will also be available online in the VCS website for anyone who wishes to read the document in full.

Carbonext, one of the Project's Proponents, also provides a specific page for the Project in its website[76], where it summarizes Project's key points and most recent happenings in a digestible manner, for those who cannot read the PD in full. This information and any other news regarding the Project will also be disclosed through Carbonext's newsletter, which is sent out every other week to those who wish to subscribe to it for free.

Information regarding the Project will also be distributed orally to the local communities, through local visits and meetings that will occur prior, during, and post Project implementation (Figure 22). This is done to ensure that all can have access to the information and ask any questions that may arise. It is important to note that the activities to be developed by the Project were previously validated by the local community, who voiced their concerns and demands through social visits, and told the Project Proponents which activities they think should be developed in the Project Area.

Figure 22: Project presentation for the communities

76 https://carbonext.com.br/

2.3.2 Dissemination of Summary Project Documents (G3.1)

Summary Documents regarding the Project will be translated to Portuguese to ensure that all can gain knowledge regarding the Project Activities to be developed in the Project Area. These documents will be shared will all levels of administration through consultative workshops and training sessions.

The project description and project documentation, as well as monitoring reports, will be public available at VERRA website[77]. Stakeholders will also have access to project details during the public comment period and at the public consultations held through the project lifetime. For the communities that have no access to the internet, a translated hard copy will be made available in strategic locations, such as communities associations.

2.3.3 Informational Meetings with Stakeholders (G3.1)

During the period from January to February 2022, onsite visits were carried out in order to present the project to the communities and to better understand what the relation of the surrounding community to the project area is. The onsite visits were conducted by a social specialist who applied a questionnaire gathering information of the livelihoods and their social needs. A questionnaire was filled by those interviewed with information on their main livelihoods and social needs.

Figure 23: Community Onsite Visits

[77] https://registry.verra.org/

Local residents within the 20-kilometer buffer of the project area were interviewed, most of them depend on forest resources for their income and work with harvesting of non-timber forest products. None claimed to exploit wood or to own a large cattle livestock close to the project area. Regarding the main needs of the region, the most common topics were health, education and energy distribution and the poor quality of roads, especially in the rainy season, as shown in the figure below.

Figure 24: Social analyst in the access road to the community settlements in Bujari/AC. Source: Carbonext, 2022

A second visit to the communities took place in April, 2022. The information gathered in these meetings was extremely relevant to determine the activities that will be developed within the project area, which can benefit the communities regarding their life quality, and social and economic development of the region. The activities proposed according to the result of the community consultation is presented in item Stakeholder Consultations (G3.4).

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

During the community consultations, information on the benefits of the project was provided to the community members. The consultation was held by a social specialist, who communicated in a manner that all presents could understand. No costs, being financial, social, cultural, environmental, of human rights or of rights to lands territories and resource, will be passed on to the communities. All the project activities will be funded by the project proponents. On the contrary, the activities are planned to increase the community well-being. Also, as stated in item 2.1.18, the project is not expected to cause risks for the communities. Impacts of the project discontinuity or inefficiency on the project's expected benefits for the communities, as well as external risks, were identified and mitigation action were designed, as shown in the table below. The list of benefits expected is presented in item 4.2.1.

During the project lifetime, an ongoing communication with the community will be held, in order to keep providing information on the project activities and to have an open channel for suggestions and comments. Results of this communication will be made available at the monitoring reports.

Table 25: Risks and Costs to the Community Benefits

Potential impact of risk on community benefits	Risk or Cost	Aspect impacted	Actions needed and designed to mitigate the risk
Discontinuity of the project's community activities.	Risk	Positive impacts planned to happen due to the project activities for the community's well-being and socioeconomic development.	To ensure the continuity of the project some actions are taken: - contract between the project proponents signing the commitment with the project activities during its entire lifetime; - engagement with the community to maintain their participation and project management; - project proponents have the necessary funds to maintain the project activities until the start of the GHG revenue[78]; team of specialists working on field and in the project PD and verifications, as presented in section 2.4.3.
Poor results on community aspects, differing from what was expected previously as a result from project activities	Risk	Positive impacts planned to happen due to the project activities for the community's well-being and socioeconomic development.	Guarantee that the local specific needs are being considered when designing and proposing activities; monitoring of indicators to quantify and qualify obtained results; collect feedback from stakeholders involved.

[78] Evidence presented for the auditors

Potential impact of risk on community benefits	Risk or Cost	Aspect impacted	Actions needed and designed to mitigate the risk
Increase of natural fires during the dry season	Risk	Social, cultural, environmental and economic aspects.	Fire brigade training for the farm workers and community members to decrease the impacts of fire events.
Invasion in the project area and communities' areas	Risk	Social, cultural, environmental and economic aspects.	Ground and remote monitoring of the project area. Activities of social and economic development in the communities, in order to increase the presence of the community members inside the community area, increasing the protection of the settlements.
Increase of climate change effects on the communities' life and well-being.	Risk	Social, cultural, environmental and economic aspects.	Establishment of the Emergency Fund for Adaptation to Extreme Weather Events. This fund will be used in the cases of adverse weather events and its implementation will begin with the emission of carbon credits, after the project verification.

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

The method of communication on validation and verification process with the communities living around the project is mainly through meetings, where the project is presented orally, and a questionnaire is applied to measure the satisfaction level with the implementation of the project. Communication on verification will be presented annually or before any new verification. Other institutional stakeholders were communicated about the project through email[79], where a material of the project was sent attached. The stakeholders were invited to comment on the project. As more visits are still taking place, additional information may be added in this section the PD.

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

Site visit will be communicated in the consultations held prior to every verification, as well as through communication channels, like email, phone contact or, in more isolated communities, by radio. The project proponents have a direct contact[80] with community representatives, to whom the site visits will be communicated. The communication will happen in a timely manner, with at least a couple of weeks in advance. The interviews are done by a direct and independent communication between communities and other stakeholders or their representatives and the auditor and are facilitated according to the audit plan sent by the auditors.

2.3.7 Stakeholder Consultations (G3.4)

During the of institutional public consultations, stakeholders were invited to comment on the project activity. Until now, no comments on the project were received. Thus, no change on the project design originated from the stakeholder consultation was made.

During the community consultation, points of improvement were mapped, and the community was consulted on how the project could assist them. The information gathered in these meetings were taking into account for the definition of the project activities. The result of the consultations and diagnosis is presented in item Stakeholder Descriptions (G1.6, G1.13), at Table 74, and the evidence will be available to the auditors.

[79] Evidence will be presented to the auditors
[80] Evidence will be presented to the auditors

Figure 25: Stakeholder Consultation

From the stakeholder's consultation and community diagnosis, the project activities were designed, in order to attend some of the necessities identified, as presented in the table below.

Table 26: Project Activities Design according to the Community needs

Points of Improvement	Project Activity
Low income	Trainings on different topics, in order to increase the technical knowledge and possibility of new jobs positions.
Limited access to health services	Health and safety workshops/activities
Lack of work	Creation of jobs position, directly or indirectly
Lack of technical assistance by governments	Trainings on different topics, in order to increase the technical knowledge

2.3.8 Continued Consultation and Adaptive Management (G3.4)

The project has an ongoing communication and consultation channel between the project proponents and communities and other stakeholders. The communication happens through the project team in the field and also in the office, the latter being by email and telephone. An Operation Procedure for this ongoing communication is being implemented, in order to guarantee the best flow of communication and effectiveness. Before every verification, the communities and other stakeholders will be contacted and consulted in order to receive updates on the project activities and results, but also to give inputs and considerations on the project.

2.3.9 Stakeholder Consultation Channels (G3.5)

The consultations are undertaken directly with the communities and other stakeholders or their legitimate representatives. They take place in a location of easy access to the community and the project is presented in full to the participants by social specialist. For the stakeholders that the project was presented by email, a project summary with adequate level of information was sent and they were invited to comment on the project.

Figure 26: Stakeholder consultation for the community

A banner containing information on the project was available during the consultation, containing a map with the project area and main information on the project, such as location, name of the farms, expected benefits and project contact. During the meeting, the community had an open space to ask questions and give suggestions on the project.

Figure 27: Information Banner made for the community consultations

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

The consultations with the community and stakeholders were organized in a way to ensure adherence and a full understanding of the subject. The community members were informed of the date in advance to organize a participatory meeting, where information for the socioeconomical diagnosis was gathered. The meetings with the communities took place in a location of easy access, all inside the community, and were conducted by a specialist, in order to communicate the content in a culturally appropriated way so that all those present could understand. As mentioned in previous topics, due to the weather and roads conditions, only the communities closer to the project area were consulted. However, it is expected that those are the communities that will be affected more by the project and its activities. They were invited to comment and to question the project.

Figure 28: Project presentation, with the presence of women and men

As shown in item 2.1.9, the consultation reached 85 people, 60 men and 20 women, reaching 24% of woman participation.

2.3.11 Anti-Discrimination Assurance (G3.7)

Carbonext has a Code of Ethics and Organizational Conduct in which prohibits any type of abuse or harassment, whether moral, sexual or discriminatory. It does not allow:

- Investments of a sexual or moral nature;
- Exposure of inappropriate material or any other inappropriate conduct;
- Verbal or written offenses;
- Humiliating treatment or threats;
- Jokes, nicknames or any offensive reference to sex, race, age, color and religion.

Owners and others involved the project design are audited within administrative and judicial bodies, through certificates and declarations, in order to verify the involvement with inappropriate conduct that could implicate any risk to the project.

For the project farm workers, the Code of Ethics and Organizational Conduct is being implemented. The Code has been developed and the implementation and training of the workers is expected to be finished by 2023, for the second monitoring report.

2.3.12 Feedback and Grievance Redress Procedure (G3.8)

The project's feedback and grievance redress procedure will be present during the project lifetime. All stakeholders and community were informed of the project email[81] account, to where they can inform any kind of grievances. Communities also have a direct contact with the field workers and our social specialist carries periodical visits to the communities. In the occasion of any conflict or grievance, our team has all the necessary mechanisms to mediate and resolve it. Complaints will be responded within 15 working days from the receipt of the communication. The Feedback and Grievance Redress Operation Procedure is being implemented, in order to guarantee the best flow of communication and effectiveness. The implementation and training of the workers on this procedure is expected to be finished by 2023, for the second monitoring report.

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

Stakeholders and community have a direct communication channel with the project team, in which they can give feedbacks or report grievances. Meetings with the communities are held annually, with the purpose of gathering feedbacks and guarantee the project activities' quality. They are also invited to contact the field workers and monitors whenever they have something to report.

For the project new workers, the Feedback and Grievance Redress Operation Procedure will be publicized in the hiring onboarding. For the current workers, the procedure will be presented in trainings, expected to be finished by 2023, for the second monitoring report.

Feedbacks and grievance received during the public comment period will be publicly available in the project description.

[81] redd.hiwi@carbonext.com.br

2.3.14 Worker Training (G3.9)

During the community consultation, it was raised information on the communities' main needs and how the project can assist in the improvement of their life quality and socioeconomic condition. A relevant set of training are being organized and planned to take place periodically to build useful skills and knowledge. Also, with the purpose of decrease GHG emission and increase the community participation on the project implementation, workshops and specific trainings on sustainable farming and sustainable forest management will be offered. The trainings will be held by specialized personnel, whenever possible, by local labour, and the participants will receive certificates attesting their participation.

2.3.15 Community Employment Opportunities (G3.10)

Employment opportunities will be offered without any discrimination of gender, age, religion, marital status or ethnicity. The selection will be made according to the person that better qualifies for the requirements of the position. Women and elderly will be encouraged to apply for the position. Once hired, the worker(s) will go through a training process and a trial period, that lasts 3 months. All the workers hired will be registered.

The Recruitment and Integration Operation Procedure is being implemented, in order to guarantee the effectiveness of the procedure. The implementation and training of the workers on this procedure is expected to be finished by 2023, for the second monitoring report.

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

In Brazil, workers' rights and safety are guaranteed by well-defined laws, such as the Consolidation of Labor Laws (CLT) Law No. 5.452/43, recently amended by law No. 13.467/2017 (labor reform).

The CLT has Brazilian Regulatory Norms (also known as NR) that are cited in Chapter V, Title II, and were approved by Ordinance no. 3214, in June 1978. The Brazilian Regulatory Norms (NR) regulate and provide guidance on mandatory procedures related to occupational safety and health.

The main NR regulations for the project are the following:

- NR 4- Specialized Occupational Health and Safety Services (Last update: MTPS Ordinance No. 510 of April 29, 2016);
- NR 5- Internal Commission for Accident Prevention. (Last updated: SIT Ordinance No. 247 of July 12, 2011);
- NR6: Personal Protective Equipment – PPE;
- NR23: Fire Protection;

- NR 28: Deals with the inspection and penalties that can be applied to companies that do not comply with the other rules established by the Federal Government
- NR31: Safety and health at Work in Agriculture, Livestock forestry, forestry and Aquaculture[DO|C2]
- ILO Declaration on Fundamental Principles and Rights at Work;
- Conventions 87 and 98: Dealing with union freedom and protection of the right to union and collective bargaining.
- Convention 11: Right to Organize in Agriculture;

The project proponent complies with laws and regulations. New workers will be presented with these laws and norms as part of the Recruitment and Integration Operation Procedure. Current workers will go through a training on the topic. The full implementation and training of the workers on this procedure is expected to be finished by 2023, for the second monitoring report

2.3.17 Occupational Safety Assessment (G3.12)

For the project implementation, the risks presented in the table below were identified. Operation Procedures for activities that presents any kind of risk are being implemented in order to minimize those risks, and all necessary trainings in health and safety will be provided. First-aid kits will be available, and the use of personal protective equipment will be mandatory. The Operating Procedures will be in accordance with the Brazilian Regulatory Norms (NR), that regulates and provide guidance on mandatory procedures related to occupational safety and health. The main NR regulations for the project are the following:

NR4: Specialized Occupational Health and Safety Services;

NR5: Internal Commission for Accident Prevention;

NR6: Personal Protective Equipment – PPE;

NR20: Occupational Safety and Health with Flammable and Combustible

NR23: Fire Protection, and

NR31: Safety and health at Work in Agriculture, Livestock forestry, forestry and Aquaculture

Table 27: Risks caused by the project implementation and measures taken to minimize them.

Activity	Risks	Measures to minimize the risk
Fire Fighting	Burns, dehydration, exposure to extreme heat	Training on fire fighting will be offered every year prior to the fire season. Personal Protective Equipment and First-Aid Kits will be made available. An Operational Procedure for the activity is being implemented, containing the guidelines that shall be followed in the events of fires, such as maximum exposure duration, use of PPE, among others.
Handling diesel for fuelling the vehicle	Explosion, fuel inhalation and contact with the eyes.	Training NR20, provision of Personal Protective Equipment and First-Aid Kits.
Health campaigns	Generation of hazardous waste	Provision of specialized storage and collection for hazardous waste.
Ground monitoring	Conflicts with deforestation agents	The Operating Procedure for Property Control and Fire Fighting will establish the conduct that should be used during the ground monitoring and how to act in the events of encounter with invaders. All involved in ground monitoring activities will be trained on the procedure.
Maintenance activities	Injuries by handling of tools and machinery	Use of Individual Protection Equipment, trainings the workers on the techniques, performed by a professional.

2.4 Management Capacity

2.4.1 Project Governance Structures (G4.1)

Carbonext is responsible for all the activities necessary to develop the Project Description in the standards and methodology compatible with the project, for the calculation of the generation of carbon credits and the assistance for the project validation and verification under VCS/CCB and registration process. The team responsible for the mentioned activities is divided into four principal interconnected areas (Figure 29):

I. Legal Department: Legal team specialized in legal matters of the properties, proponents, land tenure, and others. This analysis is made through certificates from the federal and state court of justice, presence of land conflicts, overlaps with public areas and possible risks of expropriation

II. REDD+ Project Development Analysts: Technical team specialized in the development of REDD+ projects, being the main responsible for the project design, selection of activities, determination of specific objectives, to provide technical support to the owner and to monitor that the activities are being carried out correctly.

III. GIS (Geographic Information System): Team responsible for determining and reviewing the project baseline, deforestation dynamics, project leakage and monitoring via satellite images the occurrence of deforestation in the project area.

IV. Social Analysts: Team responsible for socioeconomic analysis, engagement and articulation with communities and other stakeholders, development and implementation of social activities and indicators, in addition to monitoring socio-economic indicators.

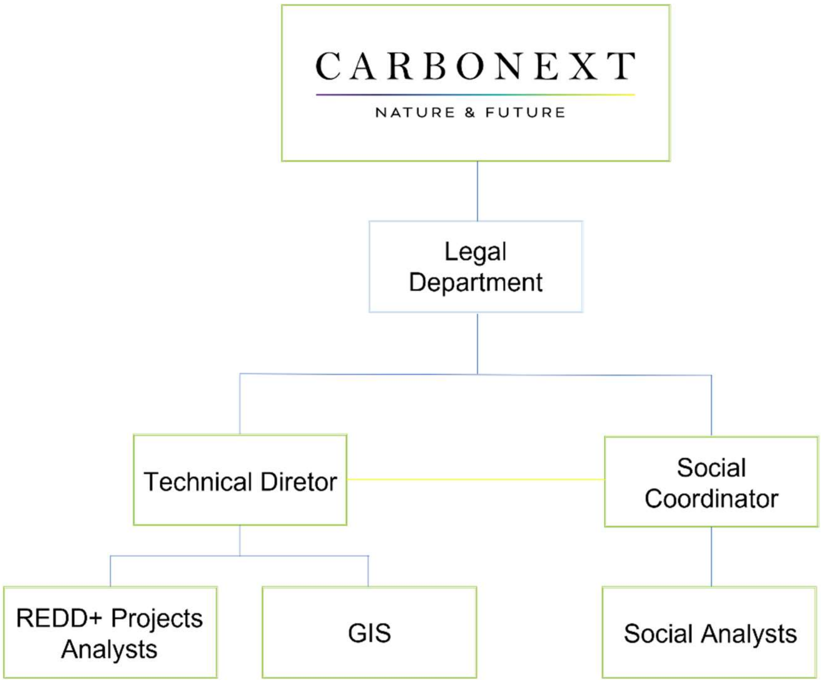


Figure 29. Carbonext internal Governance Structure in Project Management

After the project is developed by Carbonext, the Project Activities Governance is also coordinated by Carbonext together with the owner of the properties. Both are responsible for monitoring the project area in order to avoid any invasions, changes in the biome or any other activity that could lead to deforestation and loss of biodiversity. The mutual contact between proponents will be maintained continuously during the project period. The communities and other stakeholders are essential to the development of the activities and is expected to have a participatory process to build the actions according to the communities' characteristics and needs.

Regarding the actions proposed by the project, Carbonext and other proponents will manage and execute them according to the activities and the planning/schedule. The development of the project actions and activities will count on specialists such as biologists and teachers in environmental education, physicians in medical actions, local leaderships etc. This means, professionals in each area of workshops and proposed activities.

2.4.2 Required Technical Skills (G4.2)

Carbonext's technical team has experienced professionals in several areas of knowledge necessary for the planning and monitoring of the project, such as forestry engineers, social workers, biologists, oceanographers, geoprocessing analysts and other related areas, as described in the section below.

Carbonext will carry out the monitoring of carbon stocks from deforestation rates and greenhouse gas emissions produced or avoided during the project, which will be developed by a specialized team that has previous experience with other REDD projects. In addition, it has a team of social specialists, who have the necessary skills to engage the community and stakeholders, so the team will be able to ensure community participation, designing activities and monitoring socioeconomic indicators.

For the fauna and flora inventory, a third-party team will be hired to collect data in the field and generate the diagnosis report. Preference will be given to local teams that has knowhow of local conditions, but this activity will only take place after the first verification of the project and emission of carbon credits.

2.4.3 Management Team Experience (G4.2)

Carbonext was founded in 2010 with the objective of preserving the Amazon Forest through the elaboration of REDD+ carbon credit projects. Since then, the company has designed three REDD+ projects according to the VCS standard and have conserved more than 315,000 hectares to date, with new projects in progress. In addition, Carbonext has a multidisciplinary technical team, composed of forest engineers, biologists, ecologists, geographers, social workers, and others that integrate a skilled team of researchers and specialists able to conduct the project activities.

For more information about Carbonext, visit our website: https://carbonext.com.br/.

Below are summaries of the expertise of the technical team dedicated to the validation and monitoring of the Hiwi REDD+ Project.

Name	Janaina Dallan
Position	Carbonext CEO
Education	Degree in Forestry Engineering from Luiz de Queiroz College of Agriculture (ESALQ) and a Master's in business of the environment
Resume summary	She has been working with the carbon market since 2001 on projects around the world and, as CEO of Carbonext, she is directly involved in coordinating the development and implementation of carbon credit projects. Throughout her career, she has managed UNFCCC CDM (Clean Development Mechanisms) projects through several international companies such as Golder Associates, Global Energy Partners, Orbeo / Societé Generale, One Carbon and Ecofys. She is currently a member of the United Nations Framework Convention on Climate Change (UNFCCC), in which she has been a member of the Registration and Issuance Team (RIT) since 2013, she is president of the Brazil Alliance for Nature-Based Solutions and is a member of the experts for the Taskforce for Scaling Voluntary Carbon Markets (TSVCM).
Contact Information	janaina@carbonext.com.br
LinkedIn	https://www.linkedin.com/in/janainadallan/

Name	Luiz Fernando de Moura
Position	Technical Director
Education	Forestry Engineer by Luiz de Queiroz College of Agriculture (ESALQ) the M.Sc. and Ph.D. in Wood technology by the Université Laval (Quebec, Canada).
Resume summary	He is responsible to coordinate the technical group at Carbonext, working with projects for the Carbon Markets including Forestry projects. Dr. de Moura had participation in the preparation of "Energia Verde

	Carbonization Project - Mitigation of Methane Emissions in the Charcoal Production of Grupo Queiroz Galvão, Maranhão, Brazil", registered on March 21, 2011. Dr. de Moura has also participation as project designer in Florestal Santa Maria REDD Projet, Fortaleza Ituxi REDD project, UNITOR REDD project and Evergreen REDD project.
Contact Information	luiz.moura@carbonext.com.br
LinkedIn	https://www.linkedin.com/in/luiz-fernando-de-moura-6077089/

Name	Francy Rosy Nava
Position	REDD+ Leader
Education	Degree in Environmental Engineering from the State University of Pará.
Resume summary	She is responsible for leading the team of analysts in the development of this project. Experience in developing REED+ projects, having participated in the elaboration of VCS – ID832 Cikel Brazilian Amazon REDD APD Project Avoiding Planned Deforestation. She has experience with prospecting and analysis of feasibility of carbon projects in the Amazon and Audit Internal for Sustainable Projects. Throughout her career, she has articulated public policies for the development of productive low-carbon economies in the State of Pará to reduce pressure on the State's forests.
Contact Information	francy.nava@carbonext.com.br
LinkedIn	https://www.linkedin.com/in/francy-nava-47950397/

Name	Alice Dias da Cruz
Position	REDD+ Analyst
Education	Degree in Sanitary and Environmental Engineering from Federal University of Santa Catarina.

Resume summary	Experience in developing REED+ projects, having participated in the elaboration of Unitor REDD+ and Evergreen REDD+ projects. Previous experiences in sustainability consultancy and GHG inventory.
Contact Information	alice.cruz@carbonext.com.br
LinkedIn	https://www.linkedin.com/in/alice-dias-da-cruz

Name	Aline Ramos de Sousa
Position	REDD+ Analyst
Education	Bachelor in Environmental Engineering (FOC) and M.Sc. in Science and Environmental Technology (UFABC)
Resume summary	Experience working as independent expert in non-profit sector and on socio-environmental projects focusing on education, agriculture, climate change and sustainability. Experience with engagement of multiple stakeholders; mediation of relations between government and civil society; using environmental and climate management instruments.
Contact Information	aline.sousa@carbonext.com.br
LinkedIn	linkedin.com/in/alineramossousa

Name	Luana Misae Hoshi Pinto
Position	REDD+ Analyst
Education	MBA in Environmental Management and Technologies (Poli/USP) and Bachelor in Environmental Engineering (UNESP)
Resume summary	Experience with business consultancy and project management; digital marketing and stakeholder relationship; innovation in public policies; sustainability projects and ESG impact analysis.
Contact Information	luana.misae@carbonext.com.br
LinkedIn	https://www.linkedin.com/in/luanamisae/

Name	Daniela Paes da Rocha
Position	Remote Sensing & GIS Analyst

Education	Geographic Information Systems and Remote Sensing from the Public University of Navarra and master in biosystems engineering from the Fluminense Federal University, in natural systems with an emphasis on microclimate. Forestry Engineer graduated from the Federal Rural University of Rio de Janeiro.
Resume summary	Experience with remote sensing and routines GIS, processes and solutions for conservation projects, land use and land cover management, forest management and forest integrity monitoring.
Contact Information	daniela.rocha@carbonext.com.br
LinkedIn	https://www.linkedin.com/in/danielapaesdarocha/

Name	Paula Dias Ho
Position	REDD+ Analyst
Education	Degree in Biological Sciences by the University of São Paulo (USP) with an experience with Science Without Boarders from CNPq in the Ludwig Maximillian's University (Munich, Germany). Currently studying Sustainability and Circular Economy by the Pontifical Catholic University of Rio Grande do Sul (post-graduation/ MBA).
Resume summary	Experience as laboratory technician with benthonic meiofauna in the project of characterization of the Santos Bay (Brazil) by Petrobras in the University of São Paulo. Paula also worked as an educational assistant in the biology discipline at Escola Viva School, in São Paulo.
Contact Information	paula.ho@carbonext.com.br
LinkedIn	https://www.linkedin.com/in/paula-dias-ho-1a54951b9/

Name	Franciele Salvador
Position	Legal Manager e Compliance Officer
Education	Lawyer by the Cenecista College of Joinville
Resume summary	Responsible for managing Carbonext's legal group, working as a strategic support in projects for the Carbon Markets. Previous experience working in large companies, as well as specializations in Business Law, Compliance, Contract: Business Vision and Practice.
Contact Information	franciele.salvador@carbonext.com.br
LinkedIn	https://www.linkedin.com/in/franciele-salvador/

Name	Rui Almeida
Position	Social Project REDD+ Coordinator
Education	Graduated in Education, attending post-graduation course in project management, attending master's course in Conflict Management.
Resume summary	Experience in projects in the Amazon with traditional communities, quilombolas and indigenous peoples. Experience with the implementation of a financial fund in quilombola communities. Sustainable development, social dialogue, and land and conflict mediation. Training in Nonviolent Communication and advanced knowledge of social dialogue tools, digital technologies, communication methodologies and development of support material for communication projects.
Contact Information	rui.almeida@carbonext.com.br
LinkedIn	Rui Almeida | LinkedIn

Name	Levi Rocha Andrade
Position	REDD+ Analyst
Education	Agriculture and Livestock Technician Post Graduation Technologist in Managerial Processes. UNINTER University Center Training in Defensive Driving, First Aid, Management and Leadership, Fighting Forest Fires, Participation in Environmental Certification FSC and Ceflor.
Resume summary	Field Supervisor, leadership and teamwork in Forestry activities, elaboration of operational procedures, planning, hiring and training of staff, area cleaning, opening and construction of forest roads, soil preparation, planting and replanting, property acquisition, supervision of activities area cleaning, soil preparation, planting, replanting, maintenance of eucalyptus forests. Forestry supervisor, activities of soil preparation, planting, replanting, maintenance of eucalyptus forests. Agricultural Technician. Training, supervision of agricultural projects, technical assistance and rural extension of agricultural producers/livestock. Main crops/activities attended: pineapple, pumpkin, dry rice, coffee, coconut, beans (irrigated), papaya, manioc, watermelon, tomato, pasture formation, beef and milk cattle.
Contact Information	levi.andrade@carbonext.com.br
LinkedIn	https://www.linkedin.com/in/levi-rocha-de-andrade-715616192/

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

As mentioned in section 2.4.2, for the fauna and flora inventory, a third-party company or independent specialists will be hired to carry out data collection in the field, giving preference to local teams that know the local reality. These activities will take place after the first verification report, so the contracted team has not yet been defined.

For the implementation of the project activities, partnerships might be established according to the necessity of specialized professional. This is the case for the fire brigade trainings, health monitoring activities, technical workshops and others.

With respect to other capacities necessary for project development, no technical or administrative gaps have so far been identified that need to be filled by an entity. However, if during the monitoring work, the need to contract the services of independent professionals or companies to carry out the work is identified, the project team will take the necessary steps to find, contract and then manage any subcontractors. In addition, the project team will determine the time, resources, and level of participation of any external entities that provide services to the project in accordance with the internal processes.

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

Carbonext has a financial department that is responsible for taking care of the company's financial health, so that it can run its operation on a regular basis in addition to being able to execute projects without running financial risks. To this end, the company has an annual budgeting process that is periodically reviewed in order to give managers visibility of what the main expenses will be for the period, including expenses related to the execution of projects. In this way, a monetary amount is set aside for each project that will be executed, in order to avoid any cash flow risk.

Thus, the project proponents have the necessary funds to maintain the project activities until the start of the GHG revenue, as presented in the Non-Permanence Risk Report[82].

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

In Brazil, the two main legal instruments that aim to prevent acts of corruption and unethical attitudes are (i) Law 12,846/2013 (Anti-Corruption Law); and (i) Law 8,429/1992 (Administrative Misconduct Law).

Law no. 12,846/2013, known as the Anti-Corruption Law, establishes rules regarding the administrative liability and civil liability of legal entities in the case of practice of acts against the public administration,

[82] Evidence presented to the auditors

national and/or foreign. Under Law 8,429/1992, administrative improbity is an immorality qualified by the dishonesty and acts of bad faith by the public agent.

Both practices, in addition to the legal risks, could represent enormous reputational risk to the project and to all that are involved. Due to this risks, Carbonext Legal Due Diligence aims to verify and, if possible, mitigate any involvement of the landowner (partner) with such practices.

The clearance certificates examined by Carbonext's legal team (applicable for all the project proponents/partners and real estate assets) during the Legal Due Diligence process cover a large spectrum of jurisdictional and administrative matters, such as, for example, consultation before State Courts of Justice and Superior Courts, State and Federal Public Prosecutors, Environmental Agencies, Protest Registry Offices, Real Estate Registry Offices, etc., significantly reducing the chances of both debts and/or acts of corruption (regarding the landowner partner or the real estate assets) go unnoticed. Eventual discovery of relevant debts and/or acts of corruption involving the landowner (partner), is one of the many reasons for the termination of the intended partnership, as provided for in the contract.

Carbonext also has an Anti-Corruption Policy and a Code of Ethics and Organizational Conduct in place to ensure non-involvement with corruption[83].

2.4.7 Commercially Sensitive Information (Rules 3.5.13 – 3.5.14)

Some information required by the VCS and CCB standards is considered confidential or commercially sensitive and cannot be made public by the project proponent. This information will be supplied to the audit team, but not available for the public. The documents are:

- Agreements and contracts between the parties involved;
- Financial evidence of the proponents' funds for the project;
- Property Right Documents.

[83] Anti-corruption policy and code of ethics and organizational conduct in force: https://carbonext.com.br/governanca-corporativa/

2.5 Legal Status and Property Rights

2.5.1 Statutory and Customary Property Rights (G5.1)

For the implementation and development of the project, the business model and type of contract adopted by Carbonext is the partnership agreement, a modality in which the possession (and liabilities) and property (and liabilities) remain with the landowner (partner).

However, in order to guarantee the maintenance of the project, the contract provides "the right of first refusal" in the acquisition of the property by the Carbonext. Said right guarantees that if the owner wishes to sell the property, he must first offer it to Carbonext. However, if Carbonext do not exercise the right of first refusal, the third party that will/shall acquire the real estate asset must fully observe/comply with the carbon project, until its termination. In this way, the maintenance of the project and the generation of credits is protected.

Considering the maintenance of the project, another important aspect is the verification of eventual of liens/encumbrances and possible rights of third parties that may threaten the real estate asset disposition in some way. At this point, we can indicate as possible risks environmental fines and unpaid taxes, disputes over possession (possessory actions), disputes over property ("usucapião"), succession disputes (inventory not finalized with disputes over real estate assets), guarantees recorded in the real estate record files (mortgage, fiduciary alienation, etc.). In general, these are situations that at some point may imply a change in ownership of the real estate asset, leading to the termination of the project. In this sense, Carbonext conducts the Legal Due Dililgence, aiming to verify risk scenarios, protecting, as much as possible, these occurrences.

The project development depends, among many others, on the legal premise that there are no real (real estate asset) or personal (landowner) matters that would make the project unfeasible.

2.5.2 Recognition of Property Rights (G5.1)

All the real estate assets in which the project will be developed are private (with some exceptions treated particularly, lawfully) property rights are recognized, respected and supported by Brazilian Law. Information regarding the ownership and number of registration (real estate record file) of each real estate asset is listed in the table below. Documentation will be made available to the auditors.

Table 28: Property Rights

Property	Total Area (ha)	Project Area (ha)	Ownership	Rural Property Registration Certificate (CCIR)
Bela Aliança	20,178.44	13,653.00	Bella Aliança Agropecuária LTDA	012.025.023.540-8
Ipanema	4,786.22	2,395.00	Ipanema Agropecuária LTDA	012.025.046.558-6
Nova Uberaba	5,431.36	1,749.00	Copacabana Agropecuária LTDA	012.025.046.566-7
Leblon 1 Copacabana 1	6,191.41	2,708.00	Leblon Agropecuária LTDA	012.025.073.926-7
Guanabara				
Total	36,587.43	20,505.00		

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

The project will not trespass nor affect other private or public real estate assets, traditional communities or environmental protection areas. Traditional communities eventually bordering the project area were consulted[84].

The consent necessary for the development of the project is as required by Brazilian legislation for all transactions in general, this is, the landowner partner must be a fully capable agent, willing to voluntarily execute the project, free from defects of consent.

The contract was widely and freely negotiated, being accepted and signed by those who had the legal powers to do so, as demonstrated by the partnership agreement signed.

2.5.4 Property Rights Protection (G5.3)

Project activities will not cause involuntary removal or relocation of property rights holders from their lands or territories, neither will force right holders to relocate activities important to their culture or livelihood. On the contrary, the project activities will help protect the community lands and their culture. The project area does not overlap with any community area or other lands. Also, no activity besides monitoring and preservation is undertaken in the project area. Thus, there will be no relocation of activities.

During the community consultation, some families that live in the boundary with the project reported to use the project area in order to obtain supplies for their subsistence, such as water, food. The use is sporadically, only when needed, in order to assist in their subsistence. A process of communication and

[84] Evidence available at the audit

approval is being implemented, so that the use of the project area by the community members can happen in a more formalized and organized way.

2.5.5 Illegal Activity Identification (G5.4)

In the baseline scenario, the scenario without the project faces the threats of illegal deforestation followed by cattle ranching, which is a strong activity in the region. In order to reduce these activities, the project will train the workers and community members to monitor the area. Also, the project has remote monitoring by satellite images from different sensors (Sentinel and Landsat) and radar images (Sentinel), with a maximum frequency of 7 days. This allows the project proponents to identify any illegal trespassing and take action.

Data from Mapbiomas[85] shows that in the state of Acre, of 29,038 deforestation alerts, only 34 had authorization, resulting in 161,750.74 ha deforested without authorization or control, confirming that illegal deforestation is a common practice.

Other illegal activity present in the area is land invasion and land-grabbers. Properties near the project area have already faced the presence of such actions[86]. This land situation ends up causing a chain reaction of irregularities, such as illegal logging, and consequently increases the pressure for deforestation in the area.

More information on the illegal activities present in the region will be detailed in this PD.

2.5.6 Ongoing Disputes (G5.5)

Another premise of the Legal Due Diligence is the verification of eventual ongoing disputes in the project area and also matters related to agrarian reform, deviation from the social function of property or even non-compliance with environmental legislation.

2.5.7 National and Local Laws (G5.6)

National Laws:

There is no specific governing legislation in Brazil for carbon credit projects n or even for the carbon credits generated. Therefore, projects must be aligned with the laws and principles that govern the legal sphere.

[85] Mapbiomas Alerta | Monitor da Fiscalização
[86] https://agazetadoacre.com/2013/10/noticias/geral/2013-10-31-21-02-09/

In this context, there is a hierarchy between norms in the Brazilian legislation, which starts with the Federal Constitution. All branches of law applicable to the carbon-generating project and the applicable rules have their origin, foundation, and validity in the Federal Constitution.

When we talk about Environmental Law and the Environment, Article 225 of the Constitution is the basis for all norms, principles, objectives, and policies. The National Land Policy begins with article 184. Furthermore, rights such as possession, property, and free enterprise are also based on the Federal Constitution.

Thus, considering the premises contained in the brief explanation above, there are several rules applicable, directly, and indirectly, to the project generated from carbon credits, each one regulating a specific aspect.

- **Law 11. 284/2006** - Provides for the management of public forests for sustainable production, institutes the Brazilian Forest Service - SFB. Among other topics, this law deals with the management of public forests for sustainable production; Direct management; Forest concessions; Management and inspection bodies; Principles and concepts (http://www.planalto.gov.br/ccivil_03/_Ato20042006/2006/Lei/L11284.htm);

- **Law 12.651/2012 (Forest Code)** - The Forest Code establishes general rules on the protection of vegetation, Permanent Preservation areas and Legal Reserve areas, forest exploitation, the supply of forest raw materials, control of the origin of forest products and the control and prevention of forest fires. In addition, it provides economic and financial instruments to achieve its objectives. Creates the CAR which was later regulated by MMA Normative Instruction No. 2 of May 5, 2014 (http://www.planalto.gov.br/ccivil_03/_ato2011-2014/2012/lei/l12651.htm);

Regarding the Forest Code, the following definitions of the Brazilian Forest Code stand out as being relevant:

> "*III – Legal Reserve (LR): area located inside a rural estate, excluding the Area of Permanent Preservation, necessary for sustainable use of natural resources, conservation and recovering of ecological processes to conservation of biodiversity and to shelter and protection of native fauna and flora.*
>
> *VI – Legal Amazon: the States of Acre, Pará, Amazonas, Roraima, Rondônia, Amapá and Mato Grosso, and the regions located to the North of parallel 13ºS, in States of Tocantins and Goiás, and to the West of meridian 44ºW, of the State of Maranhão.*"

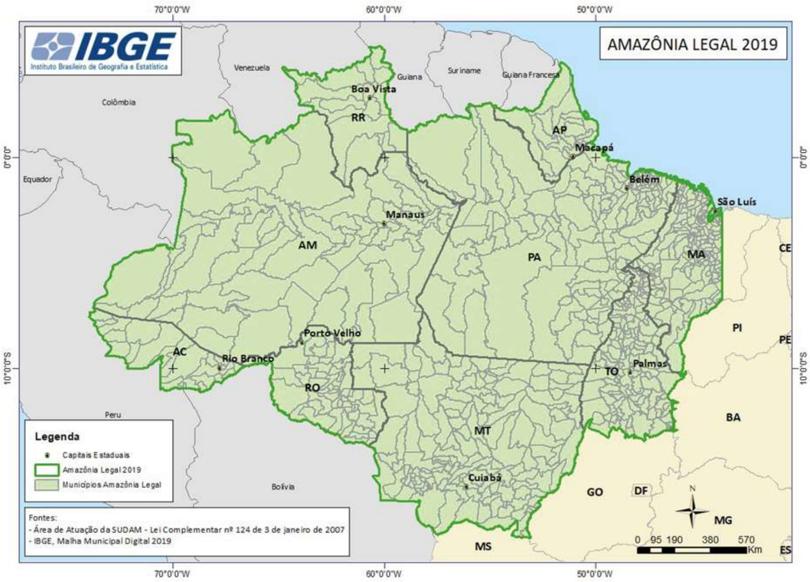


Figure 30: The Brazilian Legal Amazon States Acre (AC), Amapá (AP), Amazonas (AM), Maranhão (MA), Mato Grosso (MT), Pará (PA), Rondônia (RO), Roraima (RR), Tocantins (TO). Source: IBGE (2019).

The Legal Reserve (LR) must be registered in property deed in the Real Estate Registry Office: its location must be publicly known, and future landowners must know where it is located, its boundaries and frontiers. The LR can be located anywhere inside a rural estate. Brazilian Forest Code determines that, once allocated, LR may not be changed even in cases of real estate transfer, land dismembering or area rectification.

The LR allocation is a prerequisite to obtaining permission to exploit the native vegetation existing inside the rural estate. In order to obtain this Permit for Forestry Stewardship, the landowner must previously register the location of the LR in land property documents through the Real Estate Registry Office, before suppressing any kind of native vegetation.

According to Provisory Measure No. 2166-67 (Medida Provisória nº 2.166-67) of August 24, 2001:

“*Article 16. The forests and other types of native vegetation, excepting those located in Areas of Permanent Preservation, as well as those not subject to the politics of restricted use or subject to specific legislation, are susceptible to suppression, as long as a portion of vegetation is preserved, as Legal Reserve, at a minimum:*

I – eighty percent (80%), in rural estates located in forest zones located in the Legal Amazon.”

However, according to article 13: When indicated by the state Ecological-Economic Zoning - ZEE, carried out according to a unified methodology, the federal public power may:

I - reduce, exclusively for regularization purposes, through recomposition, regeneration or compensation of the Legal Reserve of properties with consolidated rural area, located in a forest area located in the Legal Amazon, to up to 50% (fifty percent) of the property, excluding the priority areas for the conservation of biodiversity and water resources and ecological corridors.

State Law No. 1,904 of 06/05/2007 establishes the Ecological-Economic Zoning of the State of Acre and provides that if the property is in Zone 1 of the ZEE (art. 6), which is a zone of consolidation of sustainable systems (art. 4) the RL, excluding APPs, may be reduced to 50% (Article 7 and Article 40).

Bujari is located in the region of BR-364 in Acre, beginning of BR-317, a place classified as Zone 1, as defined by article 6.

“Art. 6th Zone 1 is composed of areas of direct influence of highways BR-364, BR-317 and border regions, the oldest occupation in the State, associated with new fronts of expansion and conversion of forest areas for the development of agricultural activities, being also occupied by family farming in settlement projects and agroforestry poles, small producers in possessions, small, medium and large properties with agricultural activities, as well as forest areas of large rubber plantations, legal reserves of small, medium and large properties and preservation areas permanent."

Thus, the Hiwi project, located in Bujari and in Zone 1 of the ZEE in the State of Acre, complies with the State Law of 1904/2007 and with the Forest Code (art. 13), with RL equivalent to 50% of the area of the property. In this case, the project properties present the following percentage of Legal Reserve:

Table 29: Properties' Legal Reserve Areas

Property	Project Zone	Total Area (ha)	Legal Reserve Area (ha)	Legal Reserve %
Bela Aliança	PA-1	20,178.44	14177.9438	70%
Ipanema	PA-2	4,786.22	2659.3935	56%
Nova Uberaba/Copacabaa	PA-3	5,431.36	2752.1579	51%
Leblon 1 Copacabana 1	PA-4	2,001.63	1001.5103	50%
Guanabara	PA-4	4,189.78	2092.0768	50%

- **Law 9,433/1997 (The National Policy on Water Resources)** - The National Policy on Water Resources is stablished based on the assumption that water is a limited natural resource, with economic value and public domain. Likewise, the management of water resources must always provide for the multiple use of water, and the management of water resources must be decentralized and count on the participation of the Public Power, users and communities (http://www.planalto.gov .br/ccivil_03/leis/l9433.htm);

- **Law 12,305/2010 (National Solid Waste Policy)** - The National Solid Waste Policy brings together the set of principles, objectives, instruments, guidelines, goals and actions adopted by the Federal Government, alone or in cooperation with states, the Federal District, municipalities or individuals, with a view to the integrated management and environmentally appropriate management of solid waste. This is a milestone in Brazilian environmental legislation, as it is the first federal standard created with a focus on the problem of solid waste. Thus, the afore mentioned law deals with relevant issues related to social, environmental, and economic interests in practically all activities. It includes as instruments the environmental, sanitary and agricultural monitoring and inspection, technical and financial cooperation between the public and private sectors for the development of research on new products, methods, processes and technologies of management, recycling, reuse, waste treatment and final disposal environmentally sound tailings; scientific and technological research; environmental education, among others (http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2010/lei/l12305.htm);

- **Law 12,187/09 (National Policy on Climate Change - PNMC)** - The PNMC's objectives are to make economic and social development compatible with the protection of the climate system, the reduction of anthropogenic greenhouse gas emissions in relation to their different sources , the strengthening of human removals by sinks of greenhouse gases in the national territory, the implementation of measures to promote adaptation to climate change by the 3 (three) spheres of the Federation, with the participation and collaboration of economic and social agents stakeholders or beneficiaries, in particular those especially vulnerable to its adverse effects; the preservation, conservation and recovery of environmental resources, with particular attention to the great natural biomes considered National Heritage; the consolidation and expansion of legally protected areas and the encouragement of reforestation and the recomposition of vegetation cover in degraded areas; and encouraging the development of the Brazilian Emissions Reduction Market – MBRE (http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2009/lei/l12187.htm);

- **Decree no. 9,578/2018** - Provides for the National Fund on Climate Change (FNMC), dealt with in Law no. 12,114, of December 9, 2009, and the National Policy on Climate Change, dealt with in Law n. 12,187, of December 29, 2009. Among the topics covered by the decree is the application of FNMC resources to projects to reduce carbon emissions from deforestation and forest degradation, with priority for natural areas threatened with destruction and relevant to conservation strategies biodiversity (art. 7, V) (http://www.planalto.gov.br/ccivil_03/_ato2015-2018/2018/decreto/d9578.htm);

- **Resolution no. 001/1986 of CONAMA** - Deals with Environmental Licensing. It is an administrative procedure through which the Public Administration establishes conditions and limits for the exercise of certain activities (http://www.ibama.gov.br/sophia/cnia/legislacao/MMA/RE0001-230186.PDF);

- **Law 9,985/2000 (SNUC Law)** - This Law establishes the National System of Nature Conservation Units - SNUC, establishes criteria and norms for the creation, implementation and management of conservation units and presents a series of important concepts for a proper understanding of conservation units (http://www.planalto.gov.br/ccivil_03/leis/l9985.htm);

- **Law 6,938/1981 (National Environmental Policy)** - The National Environmental Policy has the objective of preserving, improving and recovering the environmental quality conducive to life, aiming to ensure conditions for socio-economic development, the interests of national security and the protection of human dignity;

- **Law 10.406/2002 (Civil Code)** - Deals with various rights and obligations, including possession, property and legal business (http://www.planalto.gov.br/ccivil_03/leis/2002/l10406compilada.htm);

- **Law 6.015/1973** (Public Records Law) - The law deals with public records and, especially, in its chapter V it refers to the registration of rural properties, through which the ownership of rural property is demonstrated (http:/ /www.planalto.gov.br/ccivil_03/leis/l6015compilada.htm).

State Laws:

- **State Constitution** - Specifically in articles 206 and 207, the environmental regulation of the State of Acre begins;
- **Law No. 1,117/94 (State Environmental Policy)** - Provides for the State Environmental Policy, its implementation and monitoring, setting objectives, guidelines and basic standards for the protection, conservation and preservation of the environment and environmental resources, as a premise improving the population's quality of life (https://www.legisweb.com.br/legislacao/?id=116194);
- **Law 2,308/2010** - Creates the State System of Incentives for Environmental Services - SISA, with the objective of promoting the maintenance and expansion of the supply of ecosystem services and products, including the sequestration, conservation, maintenance and increase of stock and the decrease in the flow of carbon (https://www.legisweb.com.br/legislacao/?id=116550);

- **Law 1,426/2001** - Provides for the preservation and conservation of the State's forests, institutes the State System of Protected Natural Areas, creates the State Forestry Council and the State Forest Fund and other measures. (https://www.legisweb.com.br/legislacao/?id=116287);

International Agreements:

- Convention on the International Trade in Endangered Species of Wild
- Flora and Fauna, 1973.
- Cartagena Protocol on Biosafety to the Convention on Biological
- Diversity, 2000.
- International Tropical Timber Agreement, 1994.
- United Nations Convention on Biological Diversity, 1992.
- United Nations Framework Convention on Climate Change, 1992.
- United Nations Declaration of the Rights of indigenous Peoples, 2007.
- The Kyoto Protocol to the Convention on Climate Change, 1997.

2.5.8 Approvals (G5.7)

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

Approvals for the project were obtained internally within the structure of the proponents, being approved by the partners and boards of both companies, in addition to having been approved regarding the legal and technical feasibility.

Although there is no specific need for approval by any administrative agency, it is worth mentioning that the project was built and will be conducted strictly within the legal dictates and, consequently, within all the regulations and principles of administrative entities in Brazil, such as IBAMA, FUNAI, INCRA, ICMBIO, Palmares Cultural Foundation, etc.

Local stakeholders and communities were also consulted and there was no manifestation against or disapproval of the project, as already mentioned in the section 2.1.9.

2.5.9 Project Ownership (G5.8)

The Hiwi REDD+ Project was developed and implemented through a partnership between the project proponents: Copacabana Agropecuária Ltda, Leblon Agropecuária Ltda, Ipanema Agropecuária Ltda, Bella Aliança Agropecuária Ltda, and Carbonext Tecnologia em Soluções Ambientais Ltda. All project proponents are project owners. The properties ownership is presented in the table below. The partnership between the project proponents was established in a legal contract agreed and signed by the proponents Copacabana Agropecuária Ltda, Leblon Agropecuária Ltda, Ipanema Agropecuária Ltda, Bela Aliança Agropecuária Ltda and Carbonext Tecnologia em Soluções Ambientais. The contract also states the rights over the carbon credit generated, being all project proponents carbon credit owners.

The contract and the ownership documents of the properties included in the Project will be available for the auditing. In summary, information about the property's ownership can be found in the table 29. The detailed location of the properties is presented in the item 2.1.7.

Table 30: Project properties' ownership

Property	Ownership
Nova Uberaba Farm	COPACABANA AGROPECUÁRIA LTDA., CNPJ 12.308.431/0001-07
Guanabara Copacabana and Leblon Farm	LEBLON AGROPECUÁRIA LTDA., CNPJ 12.308.347/0001-85
Bela Aliança Farm	BELA ALIANÇA AGROPECUÁRIA LTDA, CNPJ 06.954.773/0001-93
Ipanema Farm	IPANEMA AGROPECUÁROA LTDA., CNPJ 12.335.867/0001-87

2.5.10 Management of Double Counting Risk (G5.9)

The project does not seek nor has received any form of environmental or social credit, including any tradable climate, community or biodiversity unit. For details on how double counting is avoided, see section 2.5.15.

2.5.11 Emissions Trading Programs and Other Binding Limits

Not applicable. The project's GHG emission reductions and removals will not be used for compliance under trading programs or mechanisms.

2.5.12 Other Forms of Environmental Credit

The project has not sought or received another form of GHG-related environmental credit, including renewable energy certificates.

2.5.13 Participation under Other GHG Programs

The project has not been registered nor is seeking registration under any other GHG programs.

2.5.14 Projects Rejected by Other GHG Programs

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

2.5.15 Double Counting (G5.9)

The project neither has nor intends to generate any other form of GHG-related environmental credit for GHG emission reductions or removals claimed under the VCS Program. The VCS Program has a central project database, which lists each approved project. The VCS Project Database is the central storehouse of information on all projects validated to VCS criteria and all Verified Carbon Units issued under the program. Every VCU can be tracked from issuance to retirement in the database, allowing buyers to ensure every credit is real, additional, permanent, independently verified, uniquely numbered and fully traceable online. This project has not been registered under any other credited activity, and no VCUs have been assigned to the project area so far. Thus, any possibility of double

3 CLIMATE

3.1 Application of Methodology

3.1.1 Title and Reference of Methodology

For this project, Approved VCS Methodology VM0015 - Version 1.1, 3 December 2012 - Methodology for Avoided Unplanned Deforestation was applied.

The tools VT0001 Tool for The Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities – Version 3.0, and AFOLU "Non-Permanence Risk Tool" VCS Version 4, Procedural Document, 19 September 2019, v4.0. were used.

3.1.2 Applicability of Methodology

The table below brings the applicability conditions and how the project meets the condition.

Table 31. Applicability Conditions for Project

Applicability conditions	Project meet description
Baseline activities may include planned or unplanned logging for timber, fuel-wood collection, charcoal production, agricultural and grazing activities as long as the category is unplanned deforestation according to the most recent VCS AFOLU requirements	The baseline activities do not include planned nor unplanned logging.
Project activities may include one or a combination of the eligible categories defined in the description of the scope of the methodology	According to Table 1 from VM0015, (Table 32 below) the eligible category to this project activity falls into category A, as it involves protection of forest without logging, and the baseline consists of deforestation in old-growth forests without logging (performing clear cut). For this type of project activity, the carbon balance is represented as shown in the figure below.
The project area can include different types of forest, such as, but not limited	The project is an area covered only by forest for at least 10 years before the Project start date: the date when

Applicability conditions	Project meet description
to, old-growth forest, degraded forest, secondary forests, planted forests and agro-forestry systems meeting the definition of "forest"	activities are initiated to protect against the risk of future deforestation. The Project Area meets the internationally accepted definition of forest, which may include mature forests, secondary forests, and degraded forests. More specifically, according to the Decision 11/CP.7 of the Marrakesh Accord, the following definition of forests is adopted (UNFCCC, 2002) : (a) "Forest" is a minimum area of land of 0.05-1.0 hectares with tree crown cover (or equivalent stocking level) of more than 10-30 per cent with trees with the potential to reach a minimum height of 2-5 meters at maturity in situ. A forest may consist either of closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground or open forest. Young natural stands and all plantations which have yet to reach a crown density of 10-30 per cent or tree height of 2-5 meters are included under forest, as are areas normally forming part of the forest area which are temporarily un-stocked as a result of human intervention such as harvesting or natural causes but which are expected to revert to forest.
At project commencement, the project area shall include only land qualifying as "forest" for a minimum of 10 years prior to the project start date	Were analyzed project area images starting 10 years prior to project start date from 2009 to 2019 to identify the forest areas according to Brazil forest definition.

Applicability conditions	Project meet description
The project area can include forested wetlands (such as bottomland forests, floodplain forests, mangrove forests) as long as they do not grow on peat. Peat shall be defined as organic soils with at least 65% organic matter and a minimum thickness of 50 cm. If the project area includes a forested wetlands growing on peat (e.g. peat swamp forests), this methodology is not applicable	The Project Area does not include forested lands growing on peat, as stated in section 2.1.5 of the present PD. The Project Area is area is composed by the following soil types, none of which meet the criteria for turf, cited in the VM0015 methodology: • Red-yellow Dystrophic Argisols (PVAd) • Pallic Chromic Luvisols (TCp) • Orthic Chromic Luvisols (TCo) • Eutrophic Ta Haplic Gleysolis (GXve)

Table 32. Scope of the VM0015 methodology (Table 1 of the VM0015)

			PROJECT ACTIVITY	
			Protection without logging, fuel wood collection or charcoal production	Protection with controlled logging, fuel wood collection or charcoal production
BASELINE	Deforestation	Old-growth without logging	**A**	**B**
		Old-growth with logging	**C**[1]	**D**[1]
		Degraded and still degrading	**E**[1]	**F**[1]
		Secondary growing	**G**[1]	**H**[1]
	No-deforestation[2]	Old-growth without logging	No change	Degradation
		Old-growth with logging	IFM	IFM-RIL
		Degraded and still degrading	IFM	IFM
		Secondary growing	No change	Degradation

1. Accounting for carbon stock increase in the project scenario is optional and can conservatively be omitted.
2. If the baseline is not deforestation, the change in carbon stocks is not covered in this methodology.

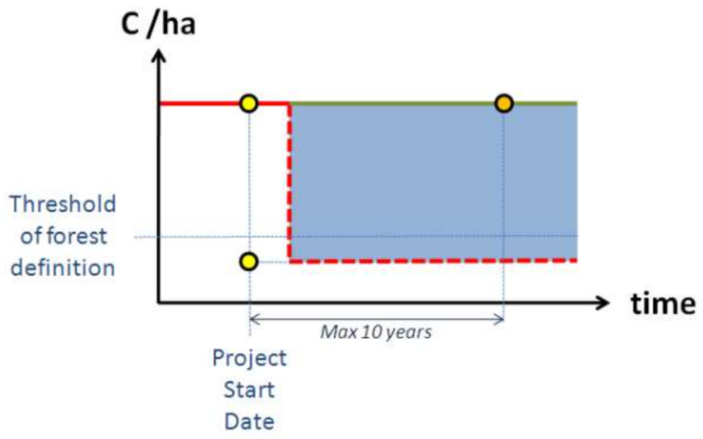


Figure 31. Carbon balance in project category A of VM0015 methodology

In this context, it is demonstrated that the VM0015 methodology is applicable to the proposed AUD project activity.

As mentioned in section 3.1.1 of this PD, “VT0001 Tool for the demonstration and assessment of additionality in VCS agriculture, forestry and other land use (AFOLU) project activities”, Version 3.0, 1 February 2012, Sectoral Scope 14, was used in this project. The tool is applicable to this project, according to statements below:

a) The project activity does not lead to violation of any applicable law, even if the law is not enforced;

b) There is a baseline methodology to provide for a stepwise approach justifying the determination of the most plausible baseline scenario.

Section 3.1.1 of this VCS-PD also mentions the use of AFOLU “Non-Permanence Risk Tool” VCS Version 4, Procedural Document, 19 September 2019, v4.0, which is mandatory to be applied to GHG removals or avoided emissions through carbon sinks.

3.1.3 Project Boundary

Step 1.1 from VM0015 - Spatial boundaries

Step 1.1.1 from VM0015 - Region of reference

For delimitation of the Reference Region boundary and future deforestation projection, the main drivers of deforestation were defined:

Accessibility of forests: The Reference region has a vast and dense network of primary, secondary and tertiary roads, as well as navigable rivers. The nearest locations of these paths will have a greater potential of deforestation.

Distance from Deforestation (Proximity to forest edges): Given the accessibility and physiographic conditions, regions near the ancient deforestation and communities, districts, municipal centers also tend to have a higher probability and risk of future deforestation.

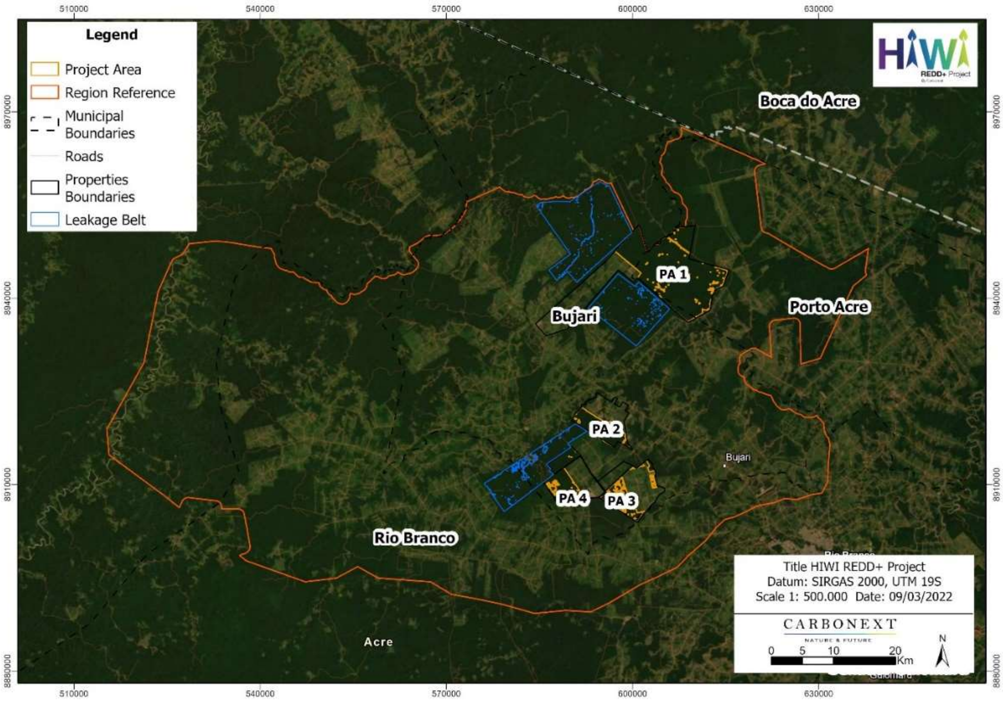


Figure 32 - Location of Reference Region, Project Area, Leakage Belt

The Reference Region is the spatial demarcation for gathering information on rates, agents and patterns related to deforestation, which is used for historical analysis of land use change and projection of future deforestation, and its monitoring.

The Reference Region was defined based on the dynamics of deforestation as well as physical and ecosystem aspects of the landscape and its similarity to the Project Area. To define its spatial boundaries, protected areas (indigenous lands and protected areas) were excluded from the Reference Region, as these are public areas with different agrarian and legal attributes compared to a private property.

The following are the main criteria used in defining the Reference Region:

a. Absence of a national or sub-national baseline in the region of the Project Area.

b. In view of the item a), the municipal boundaries with the greatest influence on the regional context were used to define the boundaries of the Reference Region.

c. Information on the agents, patterns, land ownership and other drivers of deforestation in the region were used to delimit the Reference Region.

d. The Reference Region encompasses an area larger than the Project Area.

e. The existing baseline covers at least the length of the baseline period (10 years) and is not outdated.

f. The existing baseline shows the location of deforestation annually.

g. The spatial resolution of existing baseline is equal to the smallest mappable unit considered in the monitoring period.

h. The methods used are transparent, free for consultation and follow the precepts of VM00015 methodology, version 1.1.

As a result, we obtained a Reference Region of 587,591.52 ha, which includes the Project Area of 20.505,00 hectares. VM0015 recommends that when the Project Area is under 100,000 hectares, the Reference Region must be 20 to 40 times larger than the Project Area. In this case, the Reference Region is 28 times larger the Project Area that follows the suggestion from VM0015 page 18, footnote 5.

To define the reference region the main criteria determined by the VM0015 on page 18 was followed to demonstrate that the project area characteristics meet the reference region characteristic:

3.1.3.1 Agents and drivers of deforestation:

Agent groups: In the absence of the present REDD+ project, it is assumed that the property would undergo deforestation at the same intensity, carried out by the same agents and motivated by the same drivers, as that which occurs in the Reference Area. There is historical evidence, by Mapbiomas[87] images. The

[87] https://mapbiomas.org/

Mapbiomas platform is an initiative of the third sector to monitoring the vegetation in Brazil in all biomes that produces annual mapping of land cover and use. Is a collaborative network, formed by ONG's, universities and technology startups, that produces annual mapping of land cover and use since 1985, validates and prepares reports for each deforestation event detected in Brazil. Regarding the acquisition, pre-processing, classification, post-classification, and evaluation of the accuracy of satellite images are described in detail in the item 3.1.4.1.3.

According with the Mapbiomas data, the same deforestation pressures which apply to the Reference Region also act on the Project Area. The main agents come from extensive and intensive livestock, which is the main group of agents of deforestation in the region. In addition, Acre's cattle herd grew 21% between 2019 and 2020. With this growth, the state reached 3.5 million head of cattle. The data were published in the Municipal Livestock Survey (PPM), of the Brazilian Institute of Geography and Statistics (IBGE).

3.1.3.2 Landscape configuration and ecological conditions:

Forest types: The map below shows the forest topology on reference region. Open Ombrophylous Forest represents 95% of reference region forests and 100% of project area, IBGE[88]. Table 33 and Table 34 below show the forest areas and typologies for the Reference Region (RR) and Project Area (PA). Therefore, it meets the methodology requirement for this specific similarity criterion, that states: "At least 90% of the project area must have forest classes or vegetation types that exist in at least 90% of the rest of the reference region".

[88] Base Contínua de Mapeamento da Vegetação do Brasil – escala 1:250.000, disponível em BDIA – IBGE: https://bdiaweb.ibge.gov.br/#/consulta/vegetacao, acessado em 15/02/2022.

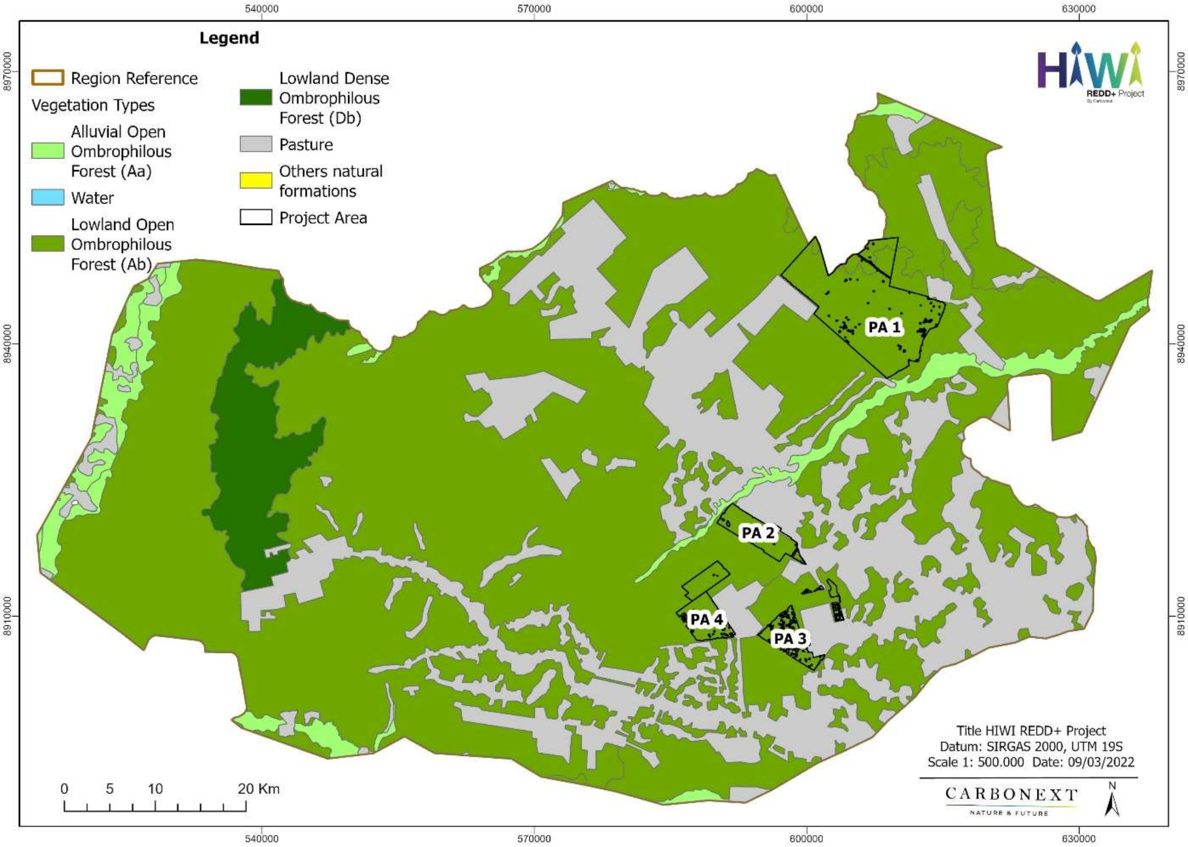


Figure 33 - Forest typologies in the Reference Region

Table 33 - Forest typologies in the Reference Region

Vegetation Class		**Reference Region**		
		Area (ha)	**% Of Total**	**% Cumulative**
#1	Open Ombrophilous Forest	552,416	95%	95%
#2	Dense Ombrophilous Forest	25,175	5%	100%
Total		577,591	100%	

Table 34 - Forest typologies in the Project Area

Vegetation Class		Project Area		
		Area (ha)	% Of Total	% Cumulative
#1	Open Ombrophilous Forest	20,505.00	100%	100%
Total		20,505.00		

3.1.3.2.1 Elevation:

To classify the altitude of the Project Area and the Reference Region, in accordance with methodology criteria, which requires similarity of 90% between both areas, a mosaic of digital elevation models was prepared using scenes 09S69_ZN,10S69_ZN; in TIFF format, provided by Topdata - INPE. The map below shows the elevation levels of the RR and PA. The following graphs show the elevation distributions (Nº. of pixels/ Altitude) in the Project Area (red) and Reference Region (blue), demonstrating the similarity between them. The mean elevation of the project area is of 195.75 meters. The parameter in the reference region has an average value of 198.81 meters. This is in accordance with methodology criteria, which requires similarity of 90% between both areas.

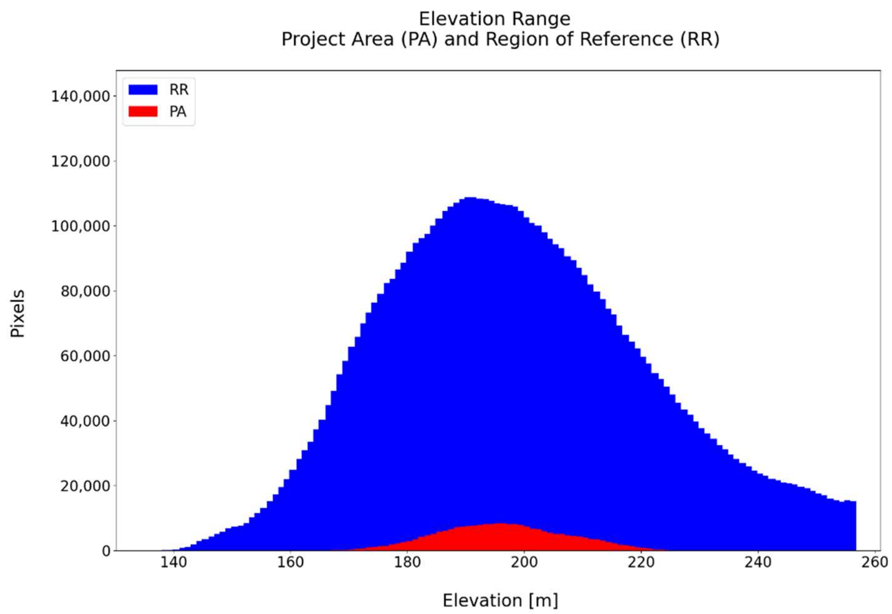


Figure 34: Elevation Range in the RR and PA

Table 35 - Elevation in the Reference Region and Project Area

Elevation (m)			
Area	10% min	mean	10% max
PA	165.00	195.75	230.00
RR		198.81	

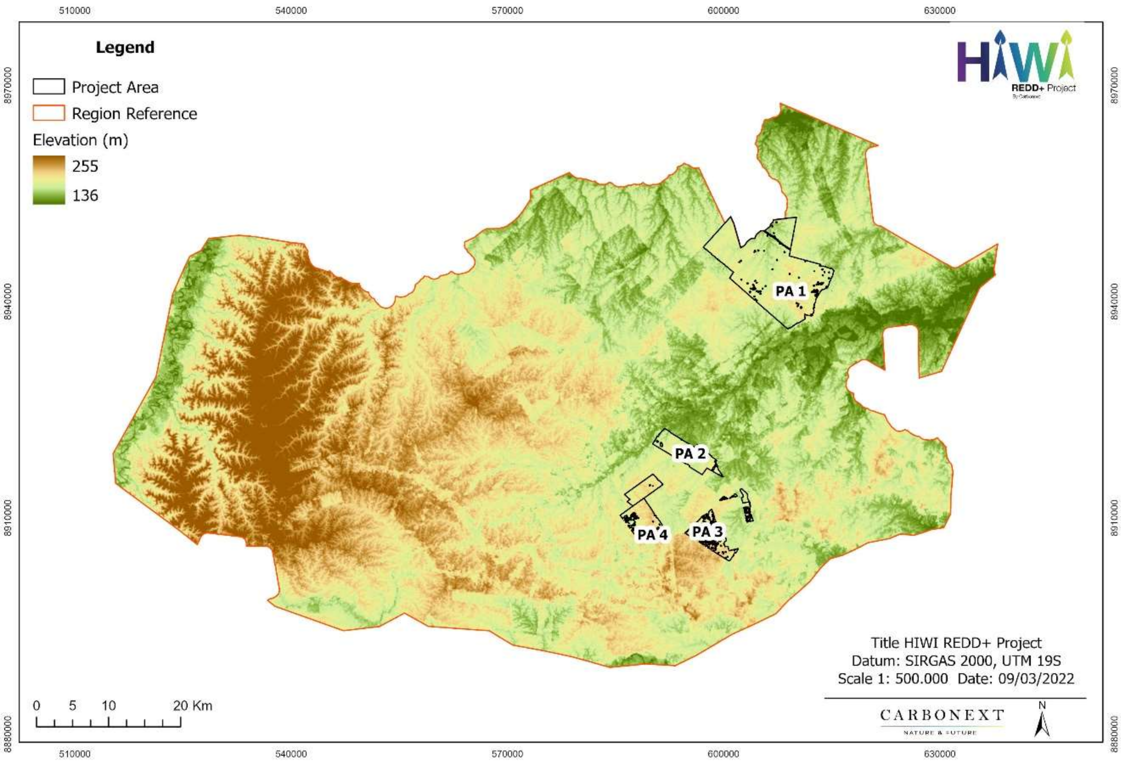


Figure 35 - Elevation in the Reference Region and Project Area

In this analysis, our main goal was to prove that the elevation in the PA is within the range of elevation in RR, so justifying that elevation factor would not hinder deforestation inside the PA in a different way it could affect deforestation in the RR. The fact that the PA has lower elevation than RR indicates that it can be more susceptible to deforestation than RR itself and the estimates can be seen as conservative.

3.1.3.2.2 Slope

To analyse slope within the Project Area and the Reference Region, in compliance with methodology criteria, which require 90% similarity between the areas, a mosaic of digital elevation models was created using scenes 09S69 -SN, 10S69_SN; in TIFF format, sourced from Topdata - INPE, in which each pixel represents the average slope of the land. Project Description: VCS Version 4.0 86 The map below shows the similarity of the slope classes in the Reference Region and Project Area; and in the following Tables, these classes were quantified for both areas. For both the Project Area and Reference Region, 100% of the areas are represented by the following classes: Flat, Slightly undulating, and Undulating; the most prevalent class was "Flat", which covers 74 – 76% of both areas.The mean slope of the project area is of 5.75 degrees. The parameter in the reference region has an average value of 6.50 degrees. This is in accordance with methodology criteria, which requires similarity of 90% between both areas. In the reference region.

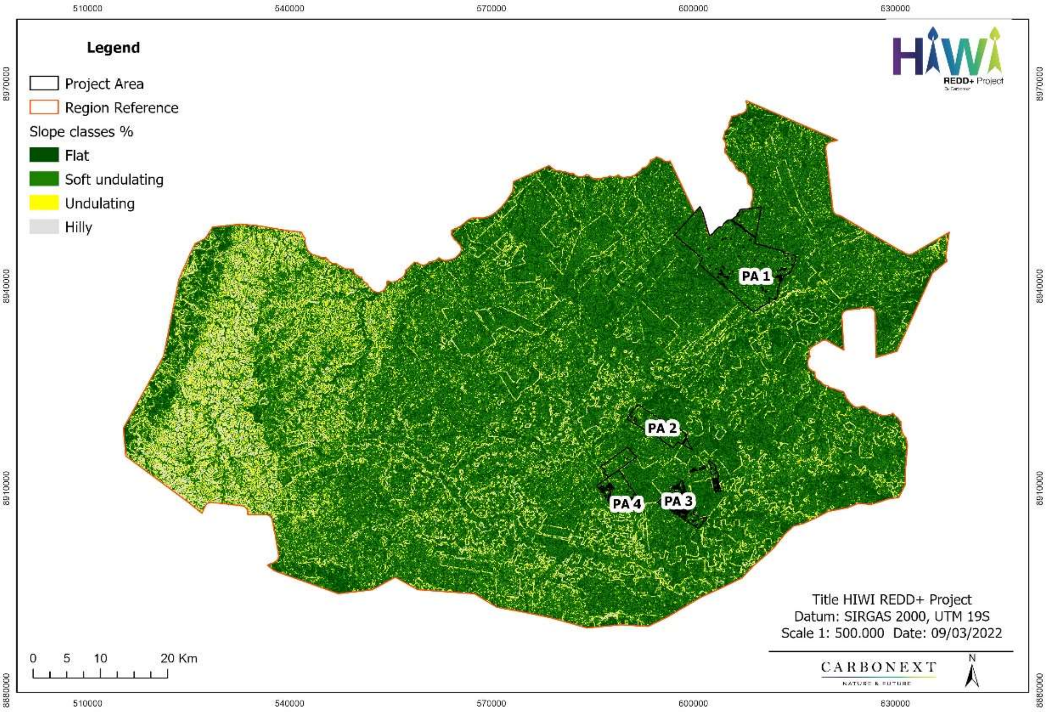


Figure 36 - Slope in the Reference Region and Project Area

Table 36: Slope in the Reference Region and Project Area

Region of Reference			
N	**Slope class**	**Area (ha)**	**Area (%)**
1	Flat	420.687,40	71,66%
2	Slightly undulating	130.417,39	22,22%
3	Undulating	35.000,84	5,96%
4	Hilly	730,61	0,12%
5	Mountainous	0,00	0,000%
6	Steep	0,00	0,000%
	Total	**587.035,24**	**100,000 %**

Project Area			
N	**Slope class**	**Area (ha)**	**Area (%)**
1	Flat	12.687,40	61,38%
2	Slightly undulating	7.050,22	34,11%
3	Undulating	927,84	4,49%
4	Hilly	3,54	0,02%
5	Mountainous	0,00	0,000%
6	Steep	0,00	0,000%
	Total	**20.505,00**	**100,000%**

Conclusion regarding slope class: the same three slope classes cover 100% of both the Project Area and the Reference Region, specifically: Flat, Slightly undulating, and Undulating. Thus, the assessment of slope similarity is superior to 90% and meets methodology requirements.

3.1.3.2.3 Rainfall

To assess the climate and its similarity between the Project Area and the Reference Region, we used a study by World Clim. The data were created by Steve Fick and Robert Hijmans, represent average monthly climate data for 1970-2000. The Figure below shows a map of the climate classification of the Project Area and Region of Reference.

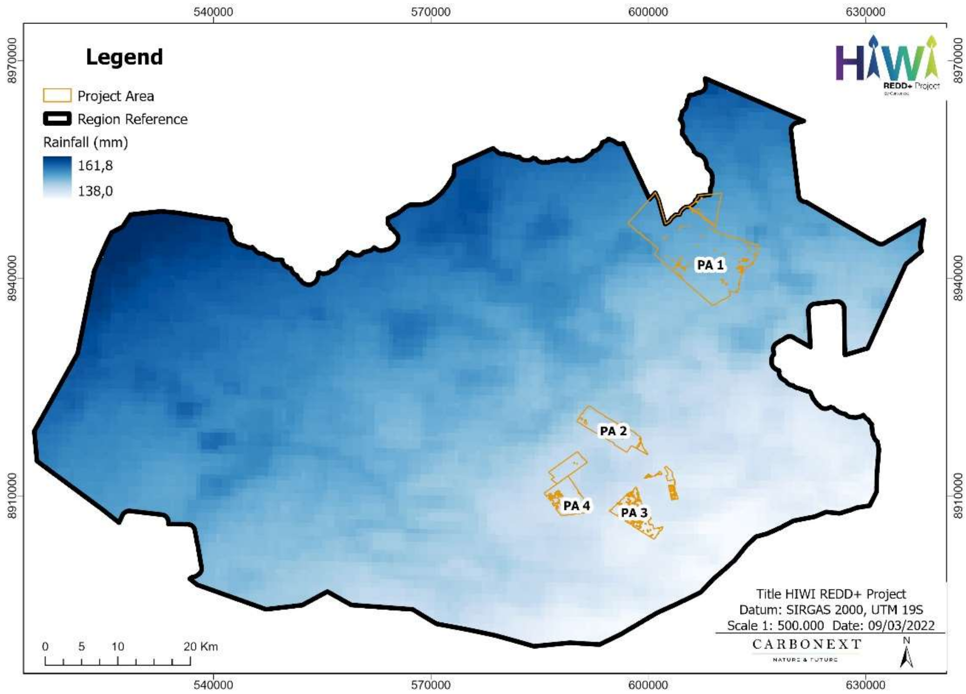


Figure 37: Climate and rainfall analysis in the Reference Region and Project Area

Conclusion on rainfall climate similarity: The two project areas show no distinctions as to climatic variables, being therefore 100% similar, in that they both fall entirely within a Tropical monsoon climate (Am) zone, having the same annual average temperatures above 25°C, and monthly rainfall above 147,7 mm.

Precipitation (1970-2000 average prec. *in mm*)*			
area	10% min	mean	10% max
PA	140,33	147,79	152,50
RR		150,39	

PA: Project Area; RR: Reference Region

Fonte: WorldClim 2, 2017[1]

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

3.1.3.3 Socio-economic and cultural conditions:

In regards of the socio-economic and cultural conditions, following VM0015, the project's area is also alike of the reference region, e.g. legal status of the land, land tenure, land use, enforced policies and regulations.

Legal status of the land: the project area consists of private properties, the dominant legal status observed in the RR;

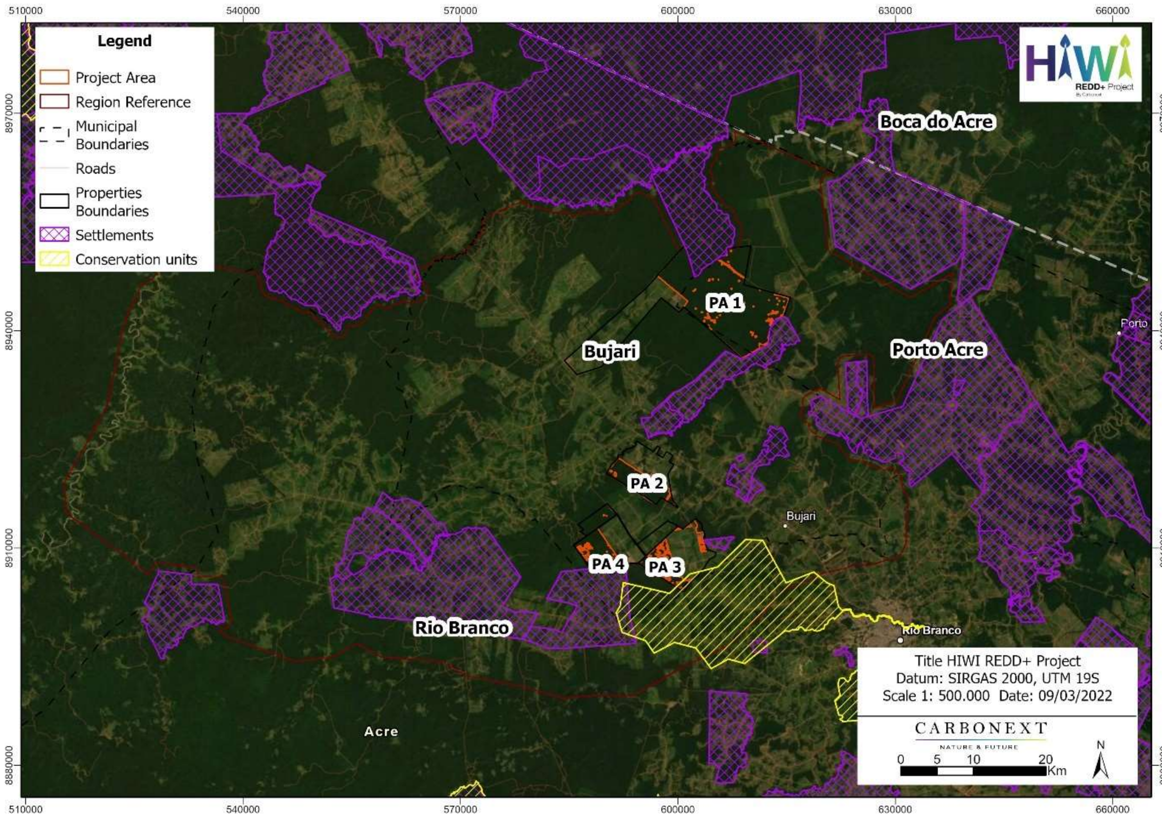


Figure 38 - Land use map of the project region, showing the Project Area, Conservation Units, Settlements, Indigenous Territories, and private lands.

Land tenure: the land tenure is public and private which can be observed in the reference region.

Land use: current and projected classes of land-use (forest and non-forest) in the project area are the same found in the reference region.

Enforced policies and regulations: entire project area and reference is the same federative unit in Acre – Brazil, therefore, the same policies, laws and regulation are applied to reference region and project area.

Step 1.1.2 from VM0015 - Project Area

The project area, according to VM00015, is an area covered only by forest for at least 10 years before the Project start date: the date when activities are initiated to protect against the risk of future deforestation. The procedure excluded the deforested areas and included only areas covered in forest at start date: 31/08/2019.

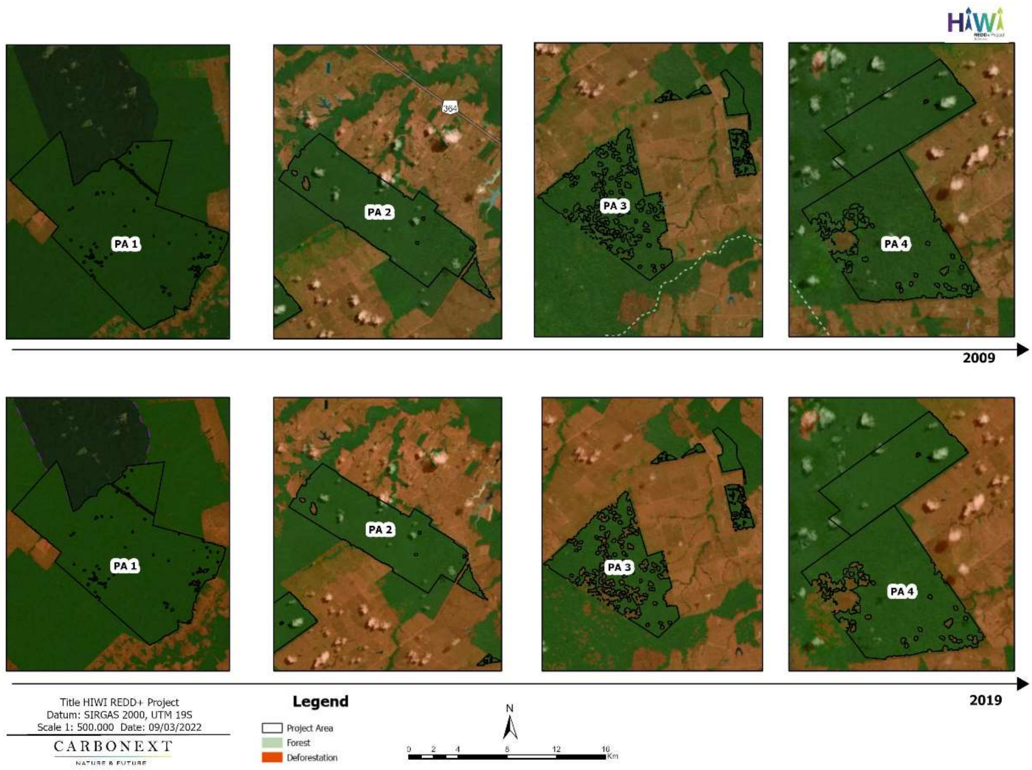


Figure 39: Land use and area from 2009 to 2019.

As a result, we obtained an area of 20,505.00 hectares of forest as the Project Area. The geographic limits of the project area within properties are shown on the map below.

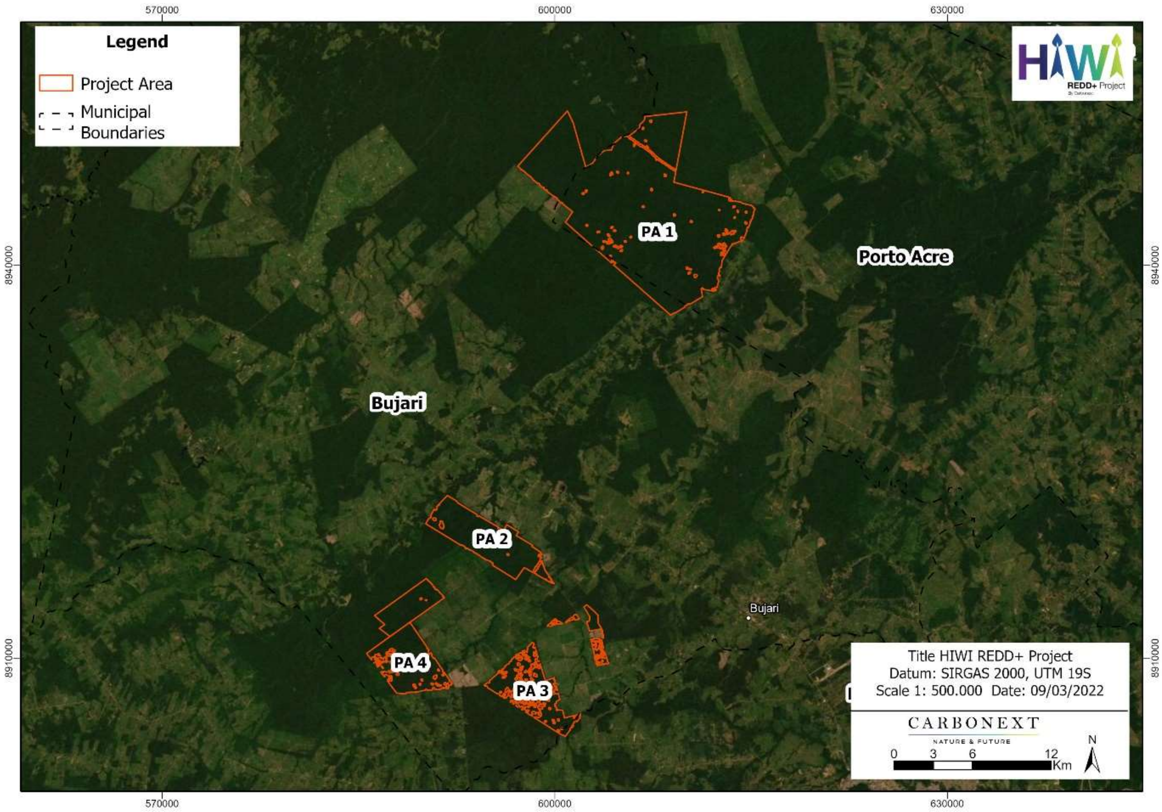


Figure 40 - Geographic limits of the project area.

The boundaries of each project area are described below, with the information of the vertices of the polygons of each AP

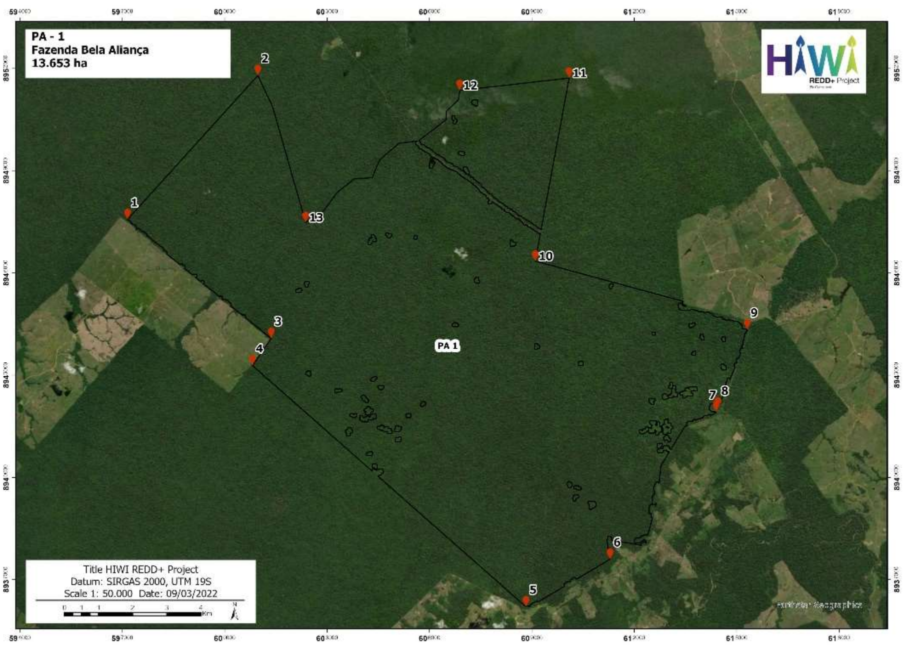


Figure 41: Geographic limits of the project area _ PA 1.

PA_1	LONGITUDE	LATITUDE
1	597152.53 m E	8947565.62 m S
2	600971.80 m E	8951793.36 m S
3	601362.82 m E	8944078.89 m S
4	600815.47 m E	8943281.85 m S
5	608829.00 m E	8936203.71 m S
6	611289.85 m E	8937596.66 m S
7	614400.79 m E	8941927.15 m S
8	614448.45 m E	8942040.23 m S
9	615308.08 m E	8944333.21 m S
10	609098.99 m E	8946346.08 m S
11	610092.50 m E	8951716.40 m S
12	606885.51 m E	8951355.62 m S
13	602372.00 m E	8947483.00 m S

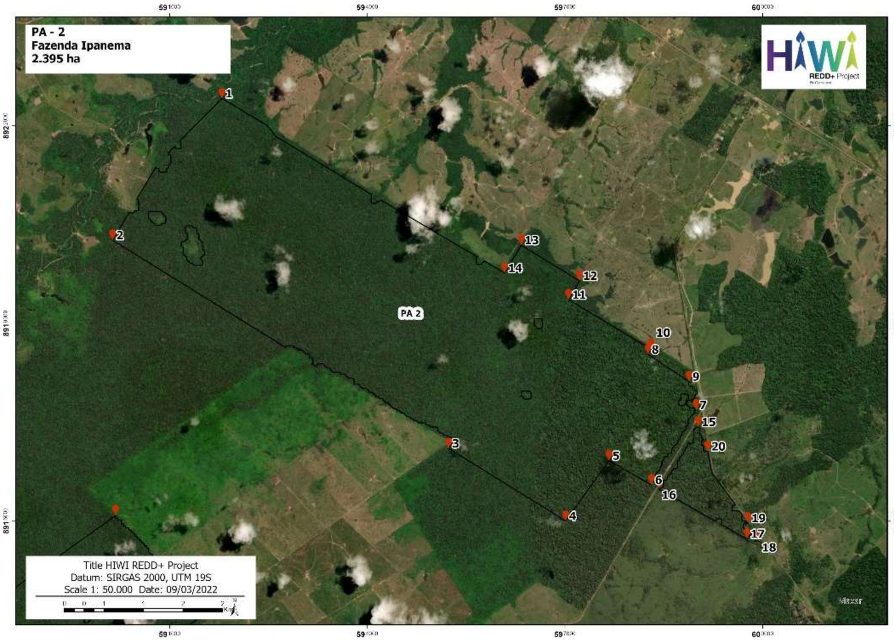


Figure 42: Geographic limits of the project area _ PA 2.

PA 2	LONGITUDE	LATITUDE
1	591795.41 m E	8922415.01 m S
2	590136.93 m E	8920262.60 m S
3	595234.98 m E	8917100.38 m S
4	597011.58 m E	8915998.30 m S
5	597670.14 m E	8916913.80 m S
6	598315.38 m E	8916546.59 m S
7	598993.33 m E	8917684.35 m S
8	598883.93 m E	8918116.01 m S
9	598263.68 m E	8918526.49 m S
10	598307.79 m E	8918609.43 m S
11	597056.01 m E	8919359.82 m S
12	597221.43 m E	8919644.41 m S
13	596338.25 m E	8920186.70 m S
14	596085.75 m E	8919765.10 m S
15	599024.33 m E	8917427.08 m S
16	598432.46 m E	8916489.43 m S
17	599765.47 m E	8915727.53 m S
18	599950.57 m E	8915691.25 m S
19	599778.80 m E	8915966.44 m S
20	599169.78 m E	8917054.78 m S

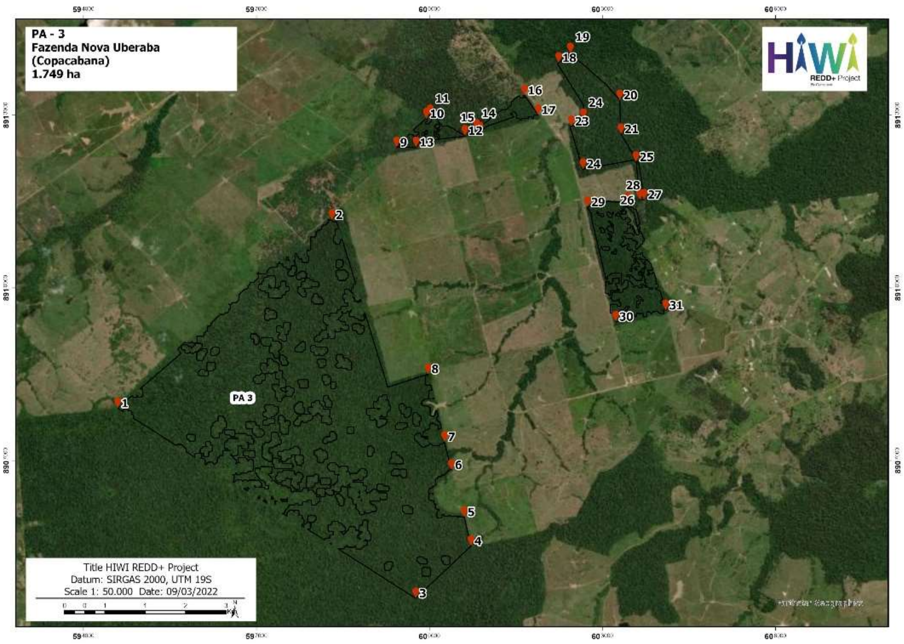


Figure 43 - Geographic limits of the project area _ PA 3.

PA 3	LONGITUDE	LATITUDE
1	594596.57 m E	8907911.35 m S
2	598308.94 m E	8911180.08 m S
3	599761.00 m E	8904607.00 m S
4	600722.00 m E	8905516.00 m S
5	600602.00 m E	8906021.00 m S
6	600382.09 m E	8906838.23 m S
7	600262.84 m E	8907327.19 m S
8	599976.00 m E	8908502.00 m S
9	599432.30 m E	8912441.77 m S
10	599770.00 m E	8912442.00 m S
11	599946.00 m E	8912941.00 m S
12	600013.00 m E	8913002.00 m S
13	600615.00 m E	8912644.00 m S
14	600818.00 m E	8912747.00 m S
15	600877.00 m E	8912700.00 m S
16	601648.89 m E	8913344.46 m S
17	601885.00 m E	8913004.00 m S
18	602242.00 m E	8913910.00 m S
19	602445.00 m E	8914074.00 m S

20	602670.00 m E	8912934.00 m S
21	603301.00 m E	8913260.00 m S
22	602460.00 m E	8912808.00 m S
23	603322.00 m E	8912673.00 m S
24	602663.00 m E	8912064.00 m S
25	603582.00 m E	8912189.00 m S
26	603723.00 m E	8911533.00 m S
27	603649.00 m E	8911527.00 m S
28	603438.00 m E	8911484.00 m S
29	602741.00 m E	8911404.00 m S
30	603229.00 m E	8909414.00 m S
31	604097.00 m E	8909611.00 m S

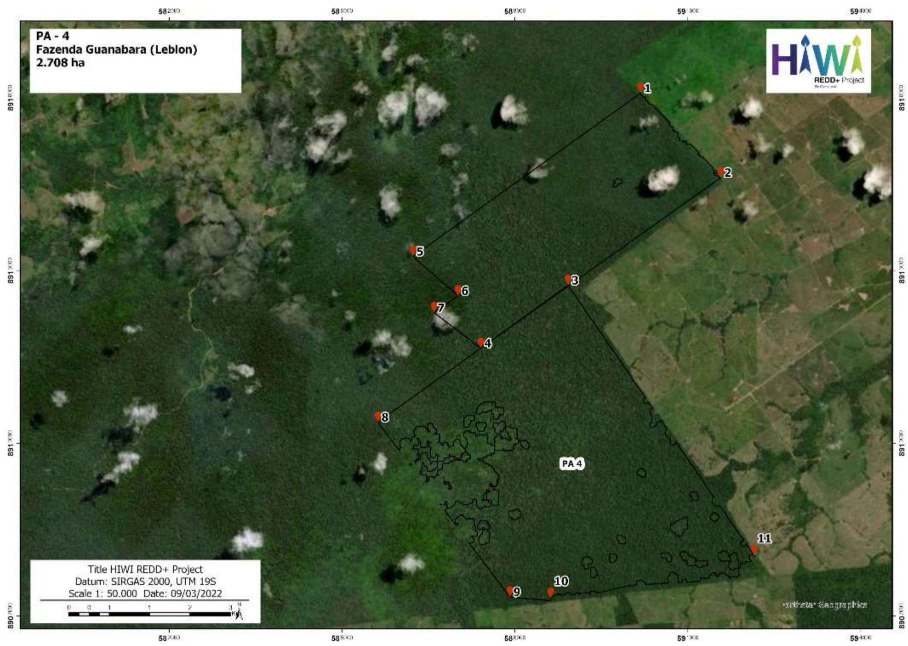


Figure 44 - Geographic limits of the project area _ PA 4.

PA 4	LONGITUDE	LATITUDE
1	590181.43 m E	8916082.18 m S
2	591570.61 m E	8914615.05 m S
3	588922.11 m E	8912743.06 m S
4	587409.59 m E	8911649.72 m S
5	586230.14 m E	8913245.53 m S
6	587010.26 m E	8912561.15 m S

7	586597.23 m E	8912268.14 m S
8	585624.00 m E	8910364.00 m S
9	587913.27 m E	8907329.62 m S
10	588620.44 m E	8907306.89 m S
11	592149.00 m E	8908049.00 m S

Step 1.1.3 from VM0015 - Leakage Belt

The leakage belt is the land area or land areas surrounding or adjacent to the project area in which baseline activities could be displaced due to the project activities implemented in the project area.

To define the boundary of the leakage belt, Opportunity cost analysis (Option I) was tested, in accordance with Approved VCS Methodology VM0015 "Methodology for Avoided Unplanned Deforestation", Version 1.1, 3 December 2012

Opportunity cost analysis (Option I) is applicable where economic profit is an important driver of deforestation. To test the applicability of Option I, historical records have shown that at least 80% of the deforested area in the reference region (or some of its strata) during the historical reference period has occurred at locations where deforesting was profitable for cattle ranching activities. In this context, literature studies, surveys and other credible and verifiable sources of information were used to demonstrate profitability of the main products of deforestation in the region: cattle.

Based on Opportunity cost analysis (Option I) rationale, leakage can only occur in areas outside the project area where the total cost of establishing and raising cattle and transporting the products to market is less than the price of the products (i.e., opportunity costs are > 0). To identify this zone, the following steps were applied:

a) List the main land-uses that deforestation agents are likely to implement within the project area in the baseline case: in the baseline case of this project, deforestation is carried out to obtain timber to finance cattle ranching.

b) Find credible and verifiable sources of information on the following variables:

$\boldsymbol{S\$x}$ = Average selling price per ton of the main product (living cattle) that would be established in the project area in the baseline case:

Considering that the volume of timber from illegal deforestation is not reliably registered in any country statistics, living cattle was considered as the main and final product of deforestation in this assessment. Living cattle is usually sold and transported to slaughterhouses in the region.

The average selling price of living cattle was obtained from Brazil Agriculture and Livestock Confederation (Confederação da Agricultura e Pecuária do Brasil, CNA): R$ 19,096.81/ton[89]. Nevertheless, there is a great variety of fees and taxes [90] that must be discounted from the sale price. The discount on total selling price has been reduced, resulting in a total of R$ [17.941,46]/ton return on selling price after taxes.

$\boldsymbol{SPxi}$ = Most important points of sale (spatial locations) for each main product Px in the reference region.

In this assessment, it was considered that the most important selling points for living cattle are slaughterhouses in the region, along the BR-364 and AC-010 highways.

$\boldsymbol{PCxi}$ = Average in situ production costs per ton of product

The average production costs of living cattle were obtained from Brazil Agriculture and Livestock Confederation (Confederação da Agricultura e Pecuária do Brasil, CNA): R$ 15,483.11/ton [91] to obtain the net margin is necessary discount the IRPJ and CSLL[92] from the difference between the sales price and production cost resulting in R$ 1,622.51/ton. The transportation cost is the net margin multiplied by 40% (percent foreseen in "sharecropper's agreement" for paying the landowner), which results in R$ 649.00/ ton for transportation.

$\boldsymbol{TCv}$ = Average transport cost per kilometre for one ton of product using the most typical transport technology available to the producer.

The most typical means of transportation available for cattle producers in the region is road transport by truck. Transportation costs are estimated at R$ 4.41/km and R$ 328.28 to load and unload the truck according to National Terrestrial Transportation Agency (Agência Naciona de Transportes Terrestres, ANTT) freight chart[93]. This cost indicates that cattle could be transported at approximately [73] km by road. Considering that up to a distance of 73km it will still be profitable for livestock production; we generate a

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[89] https://www.cnabrasil.org.br/sevicos/custos-producao (accessed in 10/02/2022)
[90] PIS: 0% (https://www.campograndenews.com.br/artigos/produtor-rural-pessoa-juridica-x-pis/pasep-e-cofins); COFINS: 0% (https://www.campograndenews.com.br/artigos/produtor-rural-pessoa-juridica-x-pis/pasep-e-cofins); ICMS: 4,0% (https://online.sefaz.am.gov.br/silt/Normas/Legisla%C3%A7%C3%A3o%20Estadual/Resolu%C3%A7%C3%A3o%20GSEFAZ/Ano%202019/RG%20003_19.htm);INSS/FUNRURAL: 2,05% (https://www.agrolink.com.br/colunistas/funrural--o-imposto-que-o-produtor-rural-nao-pode-esquecer-_448507.html).
[91] https://www.cnabrasil.org.br/sevicos/custos-producao (accessed in 10/02/2022)
[92] IRPJ: 25% (http://www.planalto.gov.br/ccivil_03/leis/l8541.htm); CSLL: 9% (Receita regulamenta alterações de alíquotas da CSLL — Português (Brasil) (www.gov.br)).
[93] https://www.in.gov.br/en/web/dou/-/resolucao-n-5.959-de-20-de-janeiro-de-2022-375504795)

resulting surface that represents the potential profitability of livestock in the reference region. BR 364, one of the main highways in Acre and closest to the project area, was used as the main parameter for the construction of the buffer.

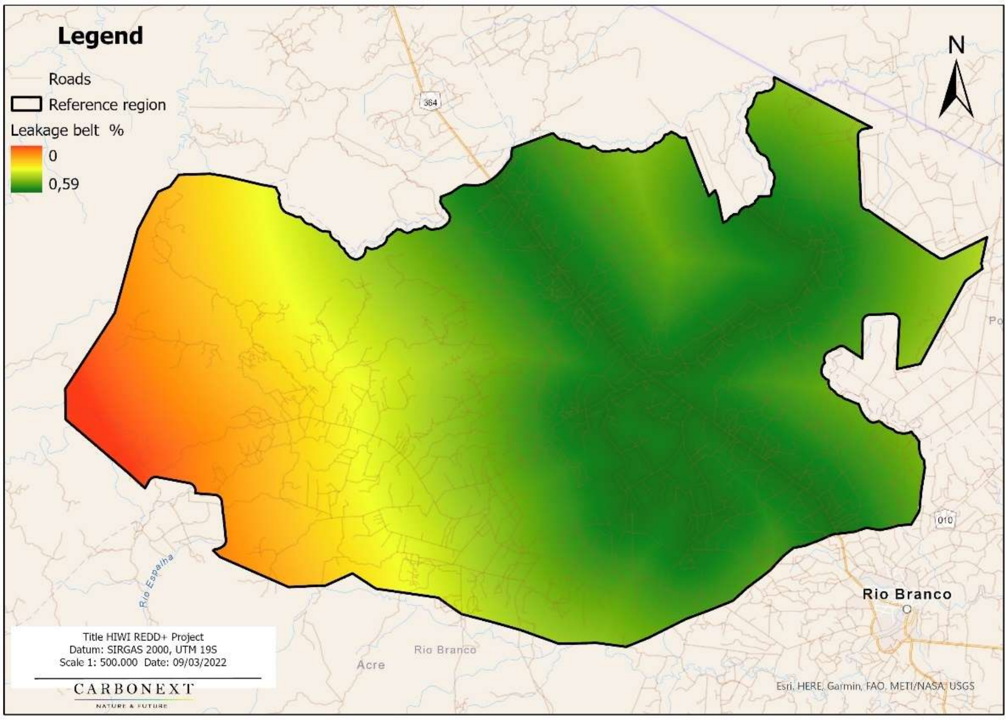

Figure 45 – Leakage belt n the Reference Region considering that up to 7km it will still be profitable for livestock production.

In addition to the profitable areas, a second filter was carried out considering the lowest cost to reach the main frigde in Rio Branco. Therefore, areas with the shortest distance to reach BR 364, the areas with the highest density of roads and forested areas adjacent to the PA were considered.

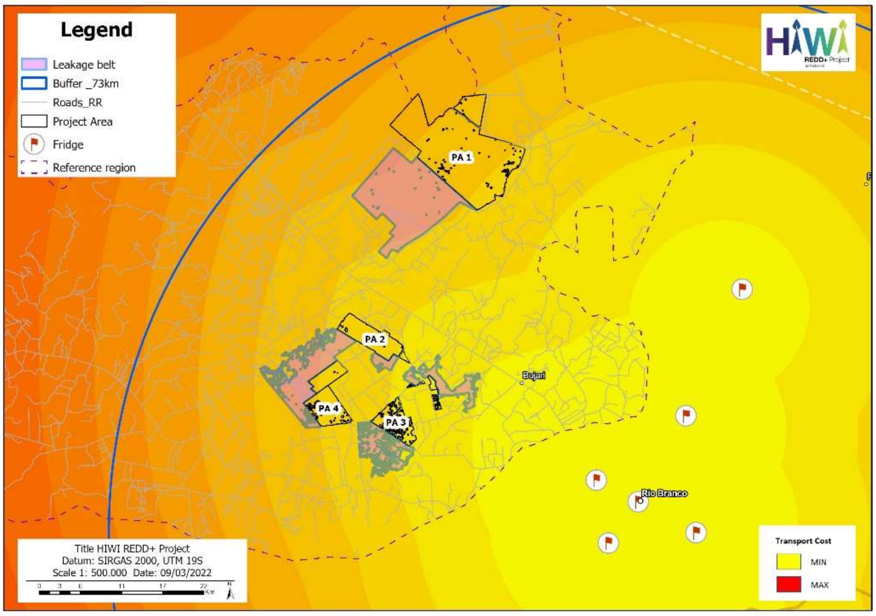

Figure 46 - Leakage belt in the Reference Region and transportation costs

The LB limit was allocated to more profitable areas adjacent to PA. Considering that the LB must only be an area with forest cover at the start date of the project, the final area of the LB is 20.525 ha.

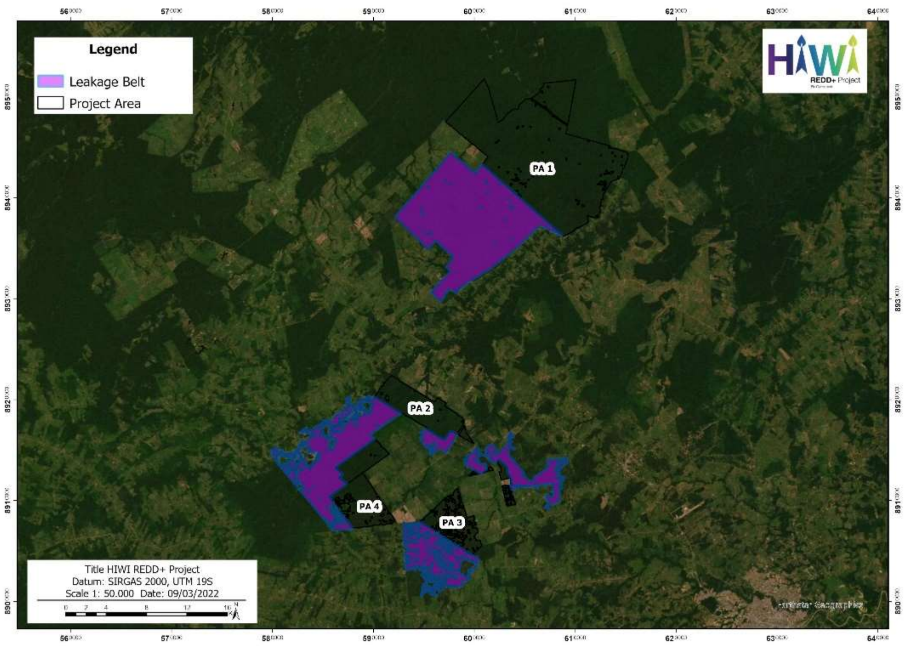

Figure 47 - Geographic limits of the leakage belt

Step 1.1.4 from VM0015 - Leakage Management Area

The Leakage Management Areas are non-forest areas located outside the project boundary, in which the project proponent intends to implement activities that will reduce the risk of activity displacement leakage. The boundary of leakage management areas is clearly defined using the common projection and GIS software formats used in the project.

i. Non-forest classes;

ii. Logistical proximity for the Project Proponents to conduct management near the REDD+ project, taking into account the main access point to the Project Area, with the objective of creating a barrier to stop deforestation entering the Project Area from the Reference Region;

iii. high potential for land-use changes in these areas, considering their proximity to roads and other deforested areas.

AFOLU non-permanence risk analyses will be assessed for each new geographic area. Activity-shifting, market leakage and ecological leakage assessments will be reassessed where new instances of the project activity are included in the project.

1) The geographic area within which all project activity instances shall occur is delineated with the Reference Region set in this PD.

2) The determination of the baseline for the project activity is in accordance with the requirements of the methodology applied to the project.

3) The demonstrations of additionality for the project activity are in accordance with the requirements of the methodology applied to the project.

4) A set of eligibility criteria for the inclusion of new project activity instances at subsequent verification events is defined in this PD.

5) A description of the central GHG information system and controls associated with the project and its monitoring is provided in the Monitoring Plan.

It is important to notice that the Leakage Management areas originally inserted in the project design will be priority to recruit new project instances. If the new instances involve the original Leakage Management areas, new areas shall be identified and adopted to manage leakage.

Step 1.1.5 from VM0015 – Forest

The definition of fores is in accordance with *Decision 11/CP.7 of the Marrakesh Accord (UNFCCC, 2002)*[94]. Data from MapBiomas Program, an initiative of the Greenhouse Gas Emissions Estimation System (SEEG) from the Climate Observatory and produced by a collaborative network of co-creators made up of NGOs, universities and technology companies[95] was used to produce the forest cover banchmark map. The Minimum Mapping Unit (MMU) in Mapbiomas collection data corresponds to 5 pixels (30m x 30 m), about 0.5 hectar[96].

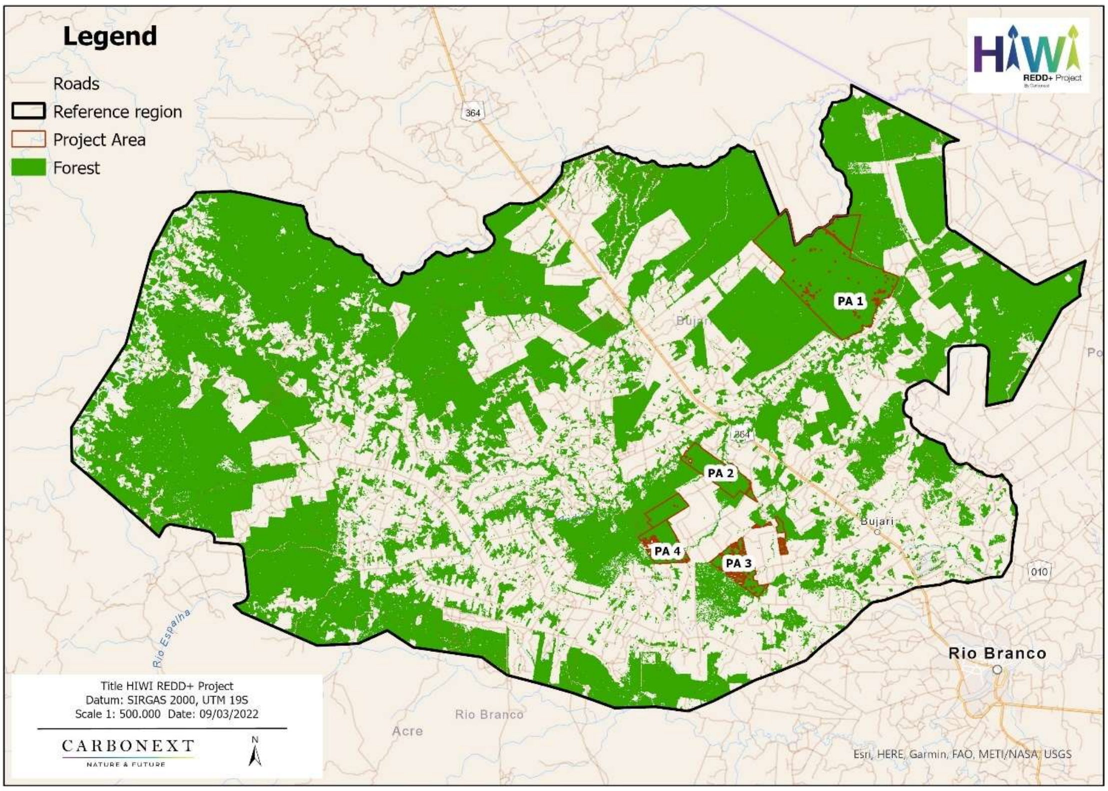

Figure 48: Forest cover benchmark map

Step 1.2 from VM0015 - Temporal Boundaries

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[94] https://unfccc.int/files/meetings/workshops/other_meetings/application/pdf/11cp7.pdf (page 5 do PDF)
[95] https://mapbiomas.org/en
[96] Mapbiomas General Handbook – Collection 6, version 1.0. Availble in https://mapbiomas-br-site.s3.amazonaws.com/Metodologia/ATBD_Collection_6_v1_January_2022.pdf. Consultado em 15/02/2022

Step 1.2.1 from VM0015 - Starting Date and End Date of the Historical Reference Period: the historical period considered for this project is from 2009 to 2019, this range were defined to meet the requirements from VM0015.

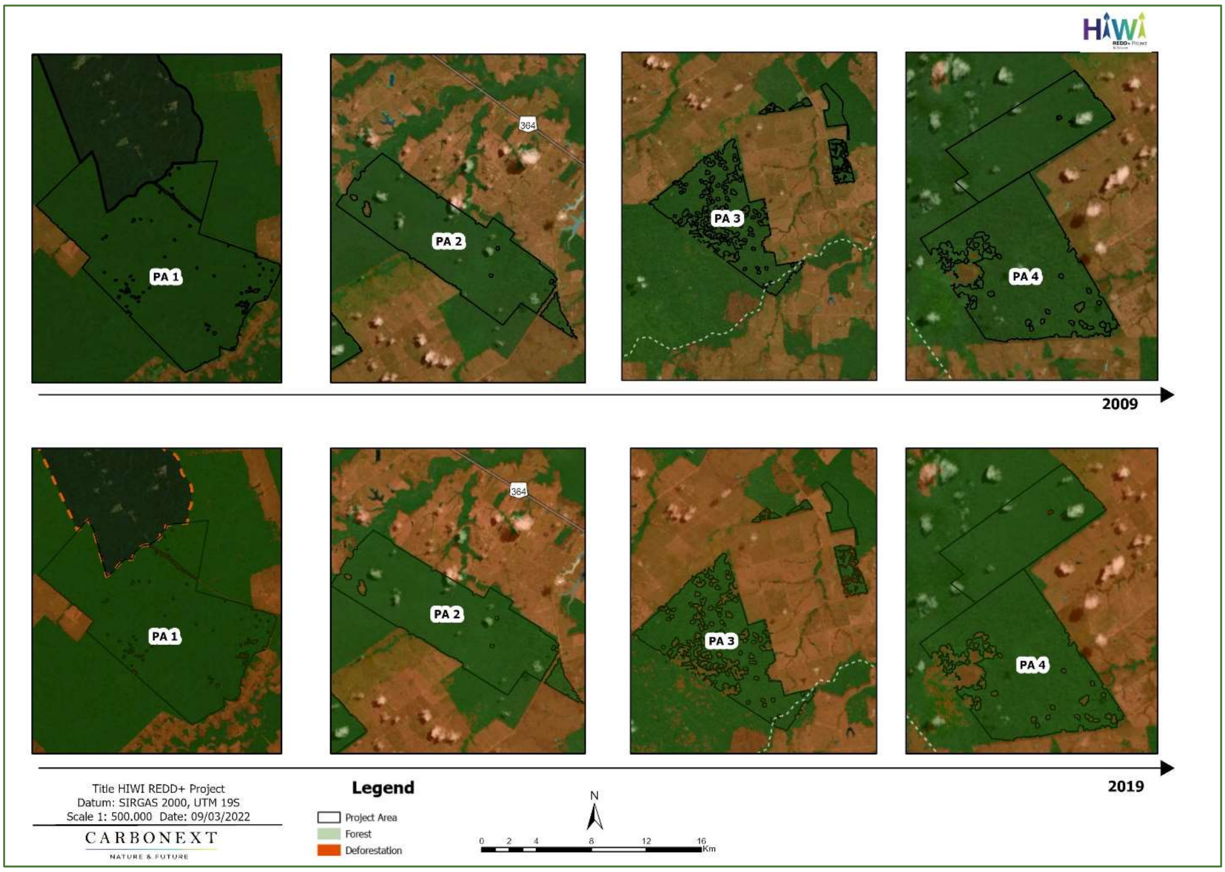


Figure 49: Land use and area from 2009 and 2019.

Step 1.2.2 from VM0015 - Starting Date of the Project Crediting Period of the AUD Project Activity:

The project crediting period is between 31/08/2019 and 30/08/2049.

Step 1.2.3 from VM0015 - Starting Date and End Date of the First Fixed Baseline Period:

The first baseline period is from 31/08/2019 until 30/08/2025 as determined by VM0015.

Step 1.2.4 from VM0015 - Monitoring Period:

The first monitoring periods will have the minimum duration of one year.

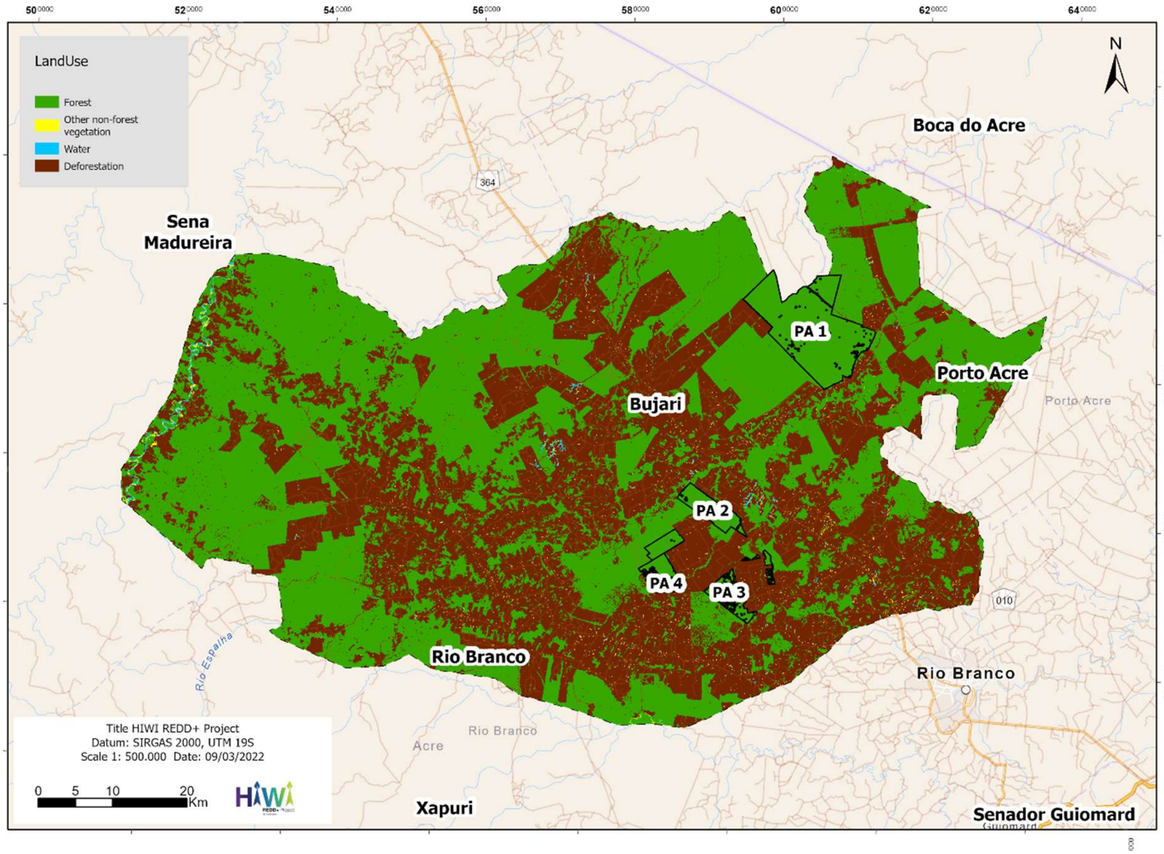


Figure 50 - LU/LC map in 2019

Step 1.3 of VM0015 - Carbon Pools

Table 37: Carbon pools included or excluded within the boundary of the proposed AUD project activity

Carbon pools	Included/Excluded	Justification / Explanation
Above-ground	Tree: Included	Is mandatory according to the VM0015 Methodology.
	Non-tree: Excluded	For conservativeness purposes.
Below-ground	Included	Included as recommended in the VM0015 Methodology.

Dead wood	Excluded	Justification detailed in the text below.
Harvested wood products	Included	Included as recommended in the VM0015 Methodology.
Litter	Excluded	Excluded according to "VCS AFOLU Requirements, v3.2"
Soil organic carbon	Excluded	Not to be measured in conversions to pasture grasses, which is the case in this project, according to VCS Program Update of May 24th, 2010.

Deforestation emissions were estimated for all forest strata (conservatively excluding non-tree biomass), of which the above- and belowground carbon pools were previously determined by means of a literature survey of data from the Project Area region. It is considered that a certain portion of logged wood is converted into long-term wood products, which serve as carbon pools after deforestation However, there is no logging activities in the project area.

Justification for not including the dead wood carbon pool

The omission of the dead wood carbon pool was determined as a matter of conservativeness, given that in the baseline scenario this carbon pool is likely to have much lower values than in the project scenario. So, even though dead wood carbon pool is significantly lower in the baseline than in the project scenario, the project proponent opted not to include this carbon pool in accounting of VCU benefits.

Step 1.4 of VM0015 - Sources of GHG emissions

Table 38. Sources and GHG included or excluded within the boundary of the proposed AUD project activity

Source		Gas	Included?	Justification/Explanation
Baseline	Biomass burning	CO_2	No	Counted as carbon stock change
		CH_4	Yes	Methane emissions during burning of biomass for land clearance.

Source		Gas	Included?	Justification/Explanation
		N_2O	Yes	Nitrous oxide emissions during burning of biomass for land clearance
		Other	-	Not applicable.
	Livestock emissions	CO_2	No	Not a significant source
		CH_4	No	Not a significant source
		N_2O	No	Not a significant source
		Other	-	Not applicable.
Project	Biomass burning	CO_2	No	Counted as carbon stock change
		CH_4	Yes	Methane emissions during burning of biomass for land clearance.
		N_2O	Yes	Nitrous oxide emissions during burning of biomass for land clearance
		Other	-	Not applicable.
	Livestock emissions	CO_2	No	Not a significant source
		CH_4	No	Not a significant source
		N_2O	No	Not a significant source
		Other	-	Not applicable.

Avoiding conversion of forests to pasture can reduce emissions of N_2O and CH_4 that are associated with biomass burning, which is used to clear the land. These emissions have been included in emission reduction calculations. However, emissions attributed to fertilizer use, and other agricultural practices that would have occurred if the forests had been converted, were conservatively omitted.

3.1.4 Baseline Scenario

Forest land is expected to be converted to non-forest land in the baseline scenario. As the region faces a high deforestation pressure, the project falls within the category AFOLU – REDD – Avoiding unplanned deforestation (AUD). The baseline scenario identified in the additionality (section 3.1.5), is clear cut of forest followed by cattle ranches, as described below.

The “VT0001 Tool for the demonstration and assessment of additionality in VCS agriculture, forestry and other land use (AFOLU) project activities”, Version 3.0, 1 February 2012, Sectoral Scope 14 was applied in order to select the most probable baseline scenario for the project. The approach is presented in section 3.1.5 “Additionality”.

Selection of the most probable baseline scenario for the project

For the selection of the most probable baseline scenario, steps 2 and 3 of the VM0015 were applied, as follow.

3.1.4.1 STEP 2: ANALYSIS OF HISTORICAL LAND-USE AND LAND-COVER CHANGE

3.1.4.1.1 Collection of appropriate data sources

Data from Mapbiomas collection 6 were used to analyze the dynamics of LU/LC change in the historical period within the reference region and the Project area. The MapBiomas project was launched in July 2015, aiming to contribute with the understanding of LU/LC dynamics in Brazil. The LU/LC annual maps produced in this project were based on the Landsat archive available in the Google Earth Engine platform, encompassing the years from 1985 through the present.

The imagery dataset used in the based mainly on Mapbiomas[97], across Collections 1 to 6, was obtained by the Landsat sensors Thematic Mapper (TM), Enhanced Thematic Mapper Plus (ETM+) and the Operational Land Imager and Thermal Infrared Sensor (OLI-TIRS), onboard of Landsat 5, Landsat 7 and Landsat 8, respectively. In Collection 6, new Landsat mosaics were processed using surface reflectance (SR) data. The total of 48 images, composed of four scenes (orbits: 244, 245 and 246 / points: 64 and 65), were adopted to map the land use classes of interest in the reference region within the historical period.

Table 39. Data used for historical LU/LC change analysis (Table 5 of VM0015).

Vector (Satellite or Aeroplane)	Sensor	Resolution		Coverage	Aquisition date	Scene or Point identifier	
		Spatial	Spectral	km	(YYYY)	Path / Latitude	Row / Longitude
Satellite	Landsat 7 ETM+	30 X 30 m	0.43 - 2.35 μm	170 x 183	2010	244	65
Satellite	Landsat 7 ETM+	30 X 30 m	0.43 - 2.35 μm	170 x 183	2010	245	64

[97] MapBiomas: https://mapbiomas.org/atbd---entenda-cada-etapa

Vector (Satellite or Aeroplane)	Sensor	Resolution		Coverage	Aquisition date	Scene or Point identifier	
		Spatial	Spectral	km	(YYYY)	Path / Latitude	Row / Longitude
Satellite	Landsat 7 ETM+	30 X 30 m	0.43 - 2.35 µm	170 x 183	2010	245	65
Satellite	Landsat 7 ETM+	30 X 30 m	0.43 - 2.35 µm	170 x 183	2010	246	64
Satellite	Landsat 7 ETM+	30 X 30 m	0.43 - 2.35 µm	170 x 183	2011	244	65
Satellite	Landsat 7 ETM+	30 X 30 m	0.43 - 2.35 µm	170 x 183	2011	245	64
Satellite	Landsat 7 ETM+	30 X 30 m	0.43 - 2.35 µm	170 x 183	2011	245	65
Satellite	Landsat 7 ETM+	30 X 30 m	0.43 - 2.35 µm	170 x 183	2011	246	64
Satellite	Landsat 7 ETM+	30 X 30 m	0.43 - 2.35 µm	170 x 183	2012	244	65
Satellite	Landsat 7 ETM+	30 X 30 m	0.43 - 2.35 µm	170 x 183	2012	245	64
Satellite	Landsat 7 ETM+	30 X 30 m	0.43 - 2.35 µm	170 x 183	2012	245	65
Satellite	Landsat 7 ETM+	30 X 30 m	0.43 - 2.35 µm	170 x 183	2012	246	64
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2013	244	65
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2013	245	64
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2013	245	65
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2013	246	64
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2014	244	65
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2014	245	64
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2014	245	65
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2014	246	64
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2015	244	65
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2015	245	64
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2015	245	65
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2015	246	64
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2016	244	65

Vector (Satellite or Aeroplane)	Sensor	Resolution		Coverage	Aquisition date	Scene or Point identifier	
		Spatial	Spectral	km	(YYYY)	Path / Latitude	Row / Longitude
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2016	245	64
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2016	245	65
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2016	246	64
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2017	244	65
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2017	245	64
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2017	245	65
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2017	246	64
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2018	244	65
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2018	245	64
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2018	245	65
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2018	246	64
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2019	244	65
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2019	245	64
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2019	245	65
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2019	246	64
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2020	244	65
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2020	245	64
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2020	245	65
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2020	246	64
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2021	244	65
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2021	245	64
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2021	245	65
Satellite	Landsat 8 OLI	30 X 30 m	0.43 - 2.29 µm	170 x 183	2021	246	64

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

For evaluation of land use changes, Mapbiomas integrates the maps of each class into a single map, which represents the coverage and land use of the entire Brazilian territory for each year. In this step, rules of prevalence are applied: if a given pixel is classified in two maps as different classes, it is possible to define which one belongs in the final map. Prevalence rules may vary according to the peculiarities of the biomes, themes or regions. The integration of the series is done for each year, generating an integrated map for each year, usually saved as a single ASSET with the number of annual layers of the period analyzed.

In order to understand the changes in land-cover and land-use, maps with class transitions between different pairs of selected years are produced, making it possible to visualize the dynamics across the Brazilian territory. Transition maps are produced pixel by pixel and after completion, they pass through a further spatial filter to eliminate isolated or border transition pixels. From these maps, the transition matrices for each biome, state, municipality, And the other territorial categories available on the MapBiomas[98] platform are constructed.

Mapbiomas collection of land use and land cover classes is extensive and detailed. To adapt to the methodology, the classes were grouped into Forest, Other natural formations (non-forest), hydrography and anthropization. The LU/LC classes adopted in this project are listed in table below. The description of each class and the area existing before the project are presented below

Table 40: Reclass Mapbiomas

MapBiomas ID	Project ID	Land use description
3	1	Forest (Forest Land)
4	2	Others natural formations
5	2	Others natural formations
49	2	Others natural formations
10	2	Others natural formations
11	2	Others natural formations
12	2	Others natural formations
32	2	Others natural formations
29	2	Others natural formations
13	2	Others natural formations
14	4	Non-Forest land (Anthropization)

[98] Source: Mapbiomas (accessed 04/02/21): https://mapbiomas.org/estatistica-de-acuracia

MapBiomas ID	Project ID	Land use description
15	4	Non-Forest land (Anthropization)
18	4	Non-Forest land (Anthropization)
19	4	Non-Forest land (Anthropization)
39	4	Non-Forest land (Anthropization)
20	4	Non-Forest land (Anthropization)
40	4	Non-Forest land (Anthropization)
41	4	Non-Forest land (Anthropization)
36	4	Non-Forest land (Anthropization)
46	4	Non-Forest land (Anthropization)
47	4	Non-Forest land (Anthropization)
48	4	Non-Forest land (Anthropization)
9	4	Non-Forest land (Anthropization)
21	4	Non-Forest land (Anthropization)
22	4	Non-Forest land (Anthropization)
23	2	Others natural formations
24	4	Non-Forest land (Anthropization)
30	4	Non-Forest land (Anthropization)
25	4	Non-Forest land (Anthropization)
26	3	Hydrography
33	3	Hydrography
31	4	Non-Forest land (Anthropization)
27	5	Non observed

• **Forest Land**: areas of remaining forest of the Ombrophilous Forest type. This class includes all areas classified as forest since 2009 and that have not changed class during the historical period. In other words, it has been a forest since the beginning of the historical period.

• **Non-Forest Land**: areas occupied by any anthropic use at some point in the historical period.

• **Others natural formations:** areas of natural formation, which, when vegetated, have a different physiognomy from the Ombrophilous Forest (Savannah, Cerrado, Campo, etc.).

• **Hydrography**: water bodies of any kind.

Table 29: List of all land use and land cover classes existing at the project start date within the reference region (Table 6 of VM0015)

Class Identifier		Trend in Carbon stock[1]	Presence in[2]	Baseline activity[3]			Description (including criteria for unambiguous boundary definition)
ID_{cl}	Name			LG	FW	CP	
1	Forest Land	decreasing	RR; LK; LM; PA	no	no	no	Determined by automated classification methods
2	Non-Forest Land	increasing	RR; LK; LM; PA	no	no	no	Determined by automated classification methods

Source: Remote Sensing data from Mapbiomas: database indicates that virtually all deforestation is converted in pasture.

1. Note if "decreasing", "constant", "increasing"
2. RR = Reference region, LK = Leakage belt, LM = Leakage management Areas, PA = Project area
3. LG = Logging, FW = Fuel-wood collection; CP = Charcoal Production (yes/no)
4. Each class shall have a unique identifier (IDcl). The methodology sometimes uses the notation icl (= 1, 2, 3, … Icl) to indicate "initial" (pre-deforestation) classes, which are all forest classes; and fcl (= 1, 2, 3, … Fcl) to indicate final" (post-deforestation) classes. In this table all classes ("initial" and "final") shall be listed.

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

The potential LU/LC-change categories that could occur within the Project Area and Leakage Belt during the project crediting period, in both the baseline and project case, are presented below.

Table 41: Potential land-use and land-cover change matrix (Table 7.a of VM0015)

BASELINE SCENARIO					
			Initial LU/LC class (2019)		Total (ha)
			Forest	*Pasture*	
		ID_{cl}	*I1*	*I2*	
Final LU/LC class (2049)	F1	*Forest*	369.688,00		369,688,0
	F2	*Pasture*	203,788,0	203.799,0	203,788,0
Total (ha)			573.487,00	203.799,00	573.487,00

PROJECT CASE					
			Initial LU/LC class (2019)		Total (ha)
			Forest	*Pasture*	
		ID_{cl}	*I1*	*I2*	
Final LU/LC class (2049)	F1	*Forest*	369.688,00	0,00	369,688,0
	F2	*Pasture*		203,788,0	203,788,0
Total (ha)			369.688,00	203.799,00	573.487,00

Table 42: List of land-use and land-cover change categories (Table 7.b of VM0015).

IDct	Name	Trend in Carbon stock	Presence in	Activity in the baseline case		
				LG	FW	CP
I1/F1	Forest / Pasture	Decrease	RR; LK; LM; PA	Yes	No	No

3.1.4.1.4 Analysis of historical land-use and land-cover change

Historical LU/LC data provided by Mapbiomas were used to analyze historical land use dynamics between 2009 and 2019 as well as obtain deforestation rates for the period, year by year. MapBiomas[99] is a collaborative network, formed by ONG's, universities and technology startups, that produces annual mapping of land cover and use since 1985, validates and prepares reports for each deforestation event detected in Brazil. Regarding the acquisition, pre-processing, classification, post-classification, and evaluation of the accuracy of satellite images, for projection of changes in land-use and land-cover change (LULCC) over the Project lifetime, the following steps were carried out, primarily utilizing already processed data from Mapbiomas, the main methodological steps carried out by Mapbiomas[100] are:

- **Pre-processing**: the first step is to generate an annual mosaic of Landsat images comprising a specific time window to optimize spectral contrast, remove clouds and shadows and better discriminate usage classes. Cloud and shadow removal utilizes the Quality Assessment (QA) band and Google Earth Engine's Mediam Reducer, identifying which pixels may be affected by artifacts such as cloud contamination or shadows. With this, the mechanism identifies high brightness (clouds) or very dark (shadow) pixels, discarding them and calculating the pixel median of each band over the period. Thus, a temporal mosaic of Landsat is constructed for each year, including about 90 other variables (in addition to the traditional sensor bands) such as texture information, fraction images, indices, maximizing the spectral contrast to better distinguish each theme.
- **Interpretation and classification:** to reduce inconsistencies, the process evaluates and selects the best images to enter the classification stage. The classification is done through the Random Forest algorithm. Samples for training the Randon Forest classifier are extracted from classes that do not change over the years in past collections, complemented with samples collected in the field, in the most traditional way. The Random Forest process requires the definition of some parameters

[99] Mais detalhes, disponíveis em: https://mapbiomas.org/o-projeto
[100] Mais detalhes, disponíveis em: https://mapbiomas-br-site.s3.amazonaws.com/Metodologia/ATBD_Collection_6_v1_January_2022.pdf

such as the number of trees, list of variables and training samples, and this varies from biome to biome.

- **Post-processing**: how the classification method is pixel-based, a series of procedures are applied to filter out classifier interpretation residues and spatial and temporal inconsistencies: (i) gap fill filter is used to fill no-data pixels; (ii) spatial filter removes isolated pixels, without connection with any other of the same value; (iii) temporal filter analyzes and corrects improper securities transactions for a series of three to five years; (iv) frequency filter reduces the temporal oscillation associated with a class of natural use; (v) incident filter removes pixels that change value every year from the time series; (vi) and finally, the rules for integrating themes are applied according to a hierarchy established for each biome.
- **Map accuracy check**: the validation strategy initially occurs through comparative analysis with reference maps of the biome, region, and date, according to availability. In addition, accuracy analysis based on statistical techniques of independent samples (points) with visual interpretation is used. Each sample is inspected by three independent interpreters. In case of confusion, a more senior interpreter decides the class of the pixel. Interpreters have access to Landsat, MODIS and Google Earth images. The accuracy analysis is performed according to Stehman et al. 2014[101] e Stehman & Fody, 2019[102], using the population error matrix and the global, user and producer accuracies. The accuracy for the Amazon biome, classification Level 1, 2 and 3 (Collection 6) is, respectively, 97%, 96.6% and 96.6%.

LU/LC-change analysis was carried out in the project area, to exclude any areas with forests that are less than 10 years old at the project start date, the resulting size was: 20,505.00 ha.

A brief analysis of deforestation location reveals a "fishbone" pattern of deforestation in the Reference Region, which refers to the opening of connected (secondary and tertiary) roads, mainly from the BR-364 major federal highway.

Historical deforestation data show cumulative deforestation of 251.991,54 hectares, equivalent to more than 42,8% of the Reference Region. A non-compliance within the Reference Region with regard to "Law No. 12,651" can be inferred, which requires conservation of 80% of forest Legal Reserve on each rural property in the Amazon Biome. This is a strong argument regarding the additionality of this REDD project, because it indicates a strongly worsening trend in the dynamics of land use in the Reference Region, as further described below.

[101] Stehman, S. V. Estimating area and map accuracy for stratified random sampling When the strata are different from the map classes. International journal of remote sensing, 2014. 34 pp. 4923-4939. doi:10.1080/01431161.2014.930207
[102] Stehman, Stephen V. Sampling designs for accuracy assessment of land cover. International Journal of Remote Sensing, 2019, 30 pp. 5243-5272. doi:10.1080/01431160903131000

The resulting analysis of the deforestation history between 2009 and 2019 in the reference region shows that 49.439 ha were converted from Forest to Non-Forest in the period of 10 years, corresponding to approximately 13% of the existing forest in 2009.

3.1.4.2 STEP 3: ANALYSIS OF AGENTS, DRIVERS AND UNDERLYING CAUSES OF DEFORESTATION AND THEIR LIKELY FUTURE DEVELOPMENT

3.1.4.2.1 Identification of agents of deforestation

Pasture accounts for virtually all the deforested land occupation in the project region.

The following information is provided for the identified agent of deforestation:

a) Name of the main agent: Cattle Ranchers

b) Description of the main features of the main agent of deforestation: Cattle ranching (pasture) is usually financed by means of initial capital obtained in wood logging. Deforestation is considered to occur through clear-cutting of forests for logging followed by pasture installation. This deforestation pattern may be caused by private landowners themselves and also by professional land-grabbers, through invasions of unguarded areas. As stated earlier in this PD, multiple illegal land occupation recordings within the properties have been reported by the owners. The final use of virtually all occupied lands would be cattle ranching (pasture). Thus, it can be affirmed that the deforestation agent group is composed by large and small-scale cattle ranchers supported by land-grabbers and loggers in the initial stage of deforestation. This group is composed by private owners and itinerant land-grabbers. It can also be affirmed that this group of deforestation agents is culturally and economically adapted to this “business cycle” of deforestation, whose results are clearly demonstrated in the Reference Region during the reference period.

c) Assessment of the most likely development of the population size of the deforestation agent group in the Reference Region, Project Area and Leakage Belt: As the main deforestation agent in the region, cattle ranching (pasture) is expected to increase in the project region. This increase is inferred from official IBGE data on cattle livestock in the municipality of Bujari: from 2017 to 2020, the herd size increased 13.4%.

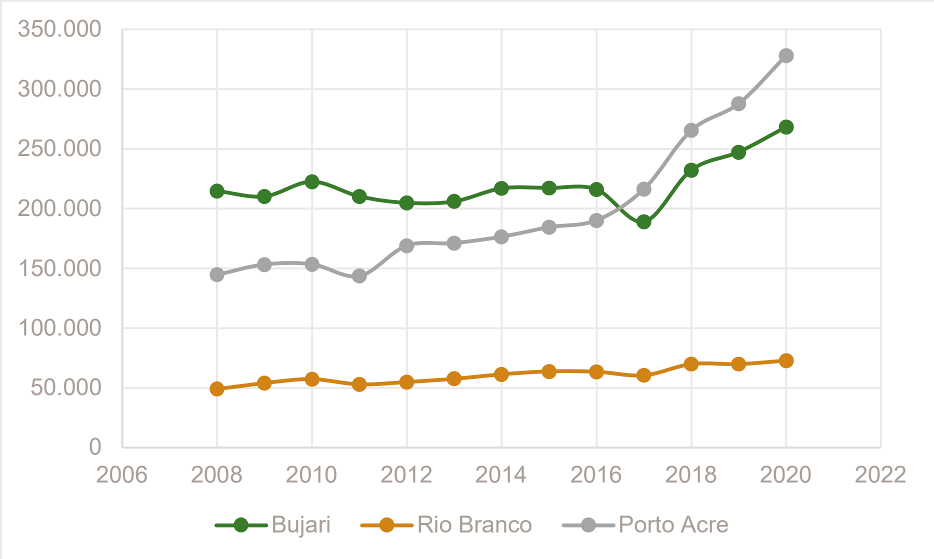


Figure 51: Historical growth of livestock numbers in the municipalities of Bujari, Rio Branco and Porto Acre.

Given the dynamic considering the three municipalities, the herd size is expected to increase by up to 79% during the project lifetime (up to 2049, figures below) according to statistical projections conducted with official IBGE data from the 11 years prior to the project start date. This significant pace of growth in cattle-related land uses will certainly impose considerable deforestation pressures in the future.

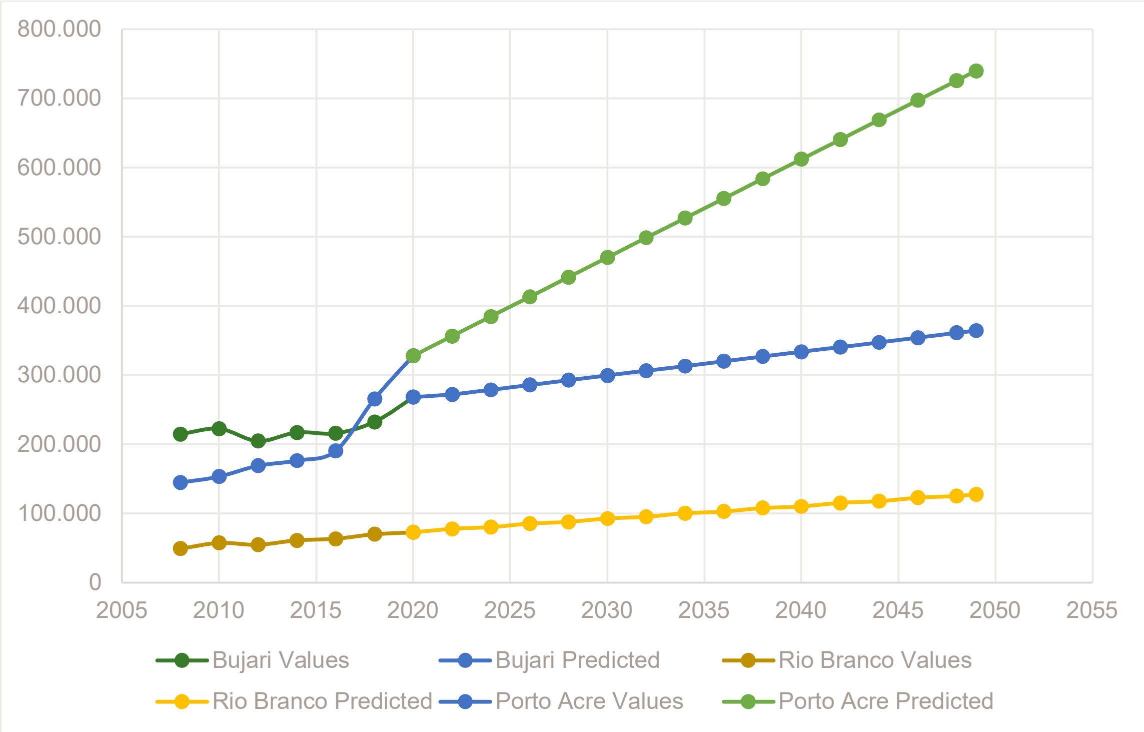


Figure 52: Projected growth of livestock numbers in the municipalities of Bujari, Rio Branco and Porto Acre within project lifetime (adapted from IBGE, 2021)

Analysis of land use, via project analysis of Mapbiomas data indicate that of the 39% of the Reference Region is pasture lands, as seen in the figure below. There are no other significant land uses within the deforested lands in the Reference Region. This corroborates the strong activity of cattle ranchers in the Reference Region. Thus, it is confirmed that virtually all deforestation in the Reference Region is attributed to the group of deforestation agents related to conversion of forest to pasture for cattle ranching.

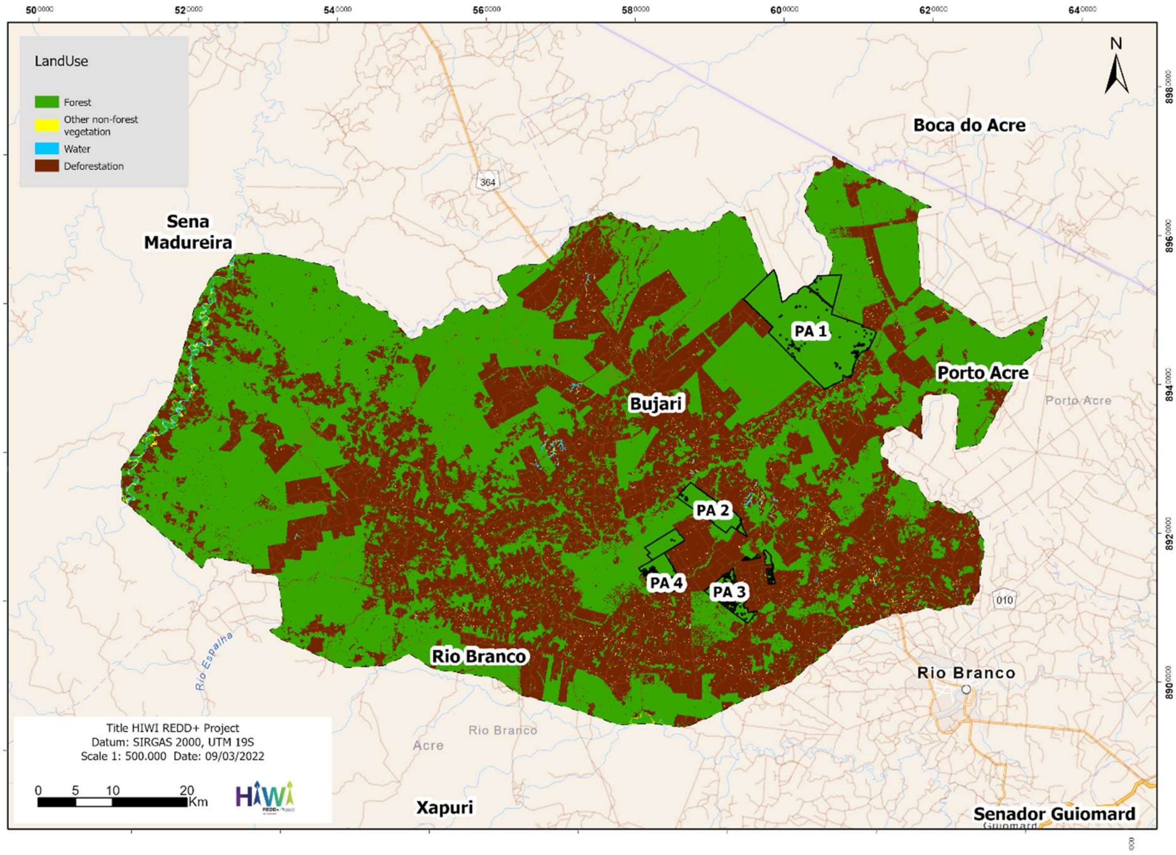


Figure 53 - History of deforestation in the Reference Region between 2009-2019

3.1.4.2.2 Identification of deforestation drivers

In this step, the factors that drive the land-use decisions of the agent group are analysed to identify the immediate causes of deforestation. For this analysis, two sets of driver variables are distinguished:

For this analysis, two sets of driver variables are distinguished:

a) Driver variables explaining the quantity (hectares) of deforestation:

Cattle prices:

1) According to CEPEA (2022)[103], the price of cattle increased 257% over the 2012 to 2022 period. This economic phenomenon can be observed throughout the country. Young (1998) as cited in Rivero et al. (2009), evaluating the mechanisms that cause deforestation in the

[103] Source (accessed: 16/03/21): CEPEA, https://www.cepea.esalq.usp.br/br/consultas-ao-banco-de-dados-do-site.aspx

Legal Amazon, found a positive relation between the expansion of agricultural areas and the variation of prices of agricultural products. For Margulis (2001) as cited in Rivero et al. (2009), the higher the agricultural prices, the higher is the migration to rural lands, which results in deforestation;

2) This key driver variable is likely to have a major impact on cattle ranchers' decision to deforest. Considering that the higher is the cattle price, the higher are the profits obtained with pasture for cattle ranching, instead of maintaining standing forests;

3) The figure below (CEPEA, 2022) clearly shows the increasing trend of cattle prices over the years;

4) The dynamics of cattle prices are regulated by micro and macroeconomic scenario throughout the country, and there are no applicable project measures that can be implemented to address this driver.

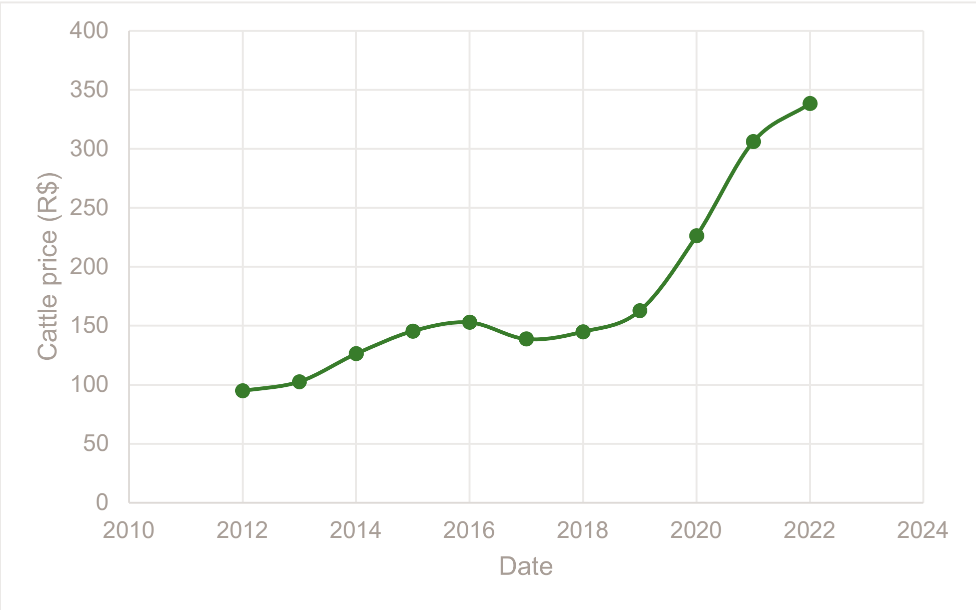


Figure 54: Cattle price in Brazil (CEPEA, 2022)

Population density:
This deforestation driver is associated with the dynamics of the local cattle market, as well as with the increase of potential deforestation agents working in the region. Several authors include population density as a prediction variable in deforestation models, which demonstrates that this driver has important impact

on deforestation trends (Reis and Margulis, 1991; Reis, 1996; Andersen and Reis, 1997 as cited in Rivero et al. 2009);

This key driver variable provides an increasing pressure of deforestation by cattle ranchers, avid for mitigating poverty by means of a profitable business;

The population of Bujari, Rio Branco and Porto Acre is expected to grow approximately 53% during the project period. This estimate was made by means of a linear regression based on the past years of official data on population, according to official IBGE data. This population growth rate could represent a major driver to increase the deforestation in the region over upcoming decades;

Considering that the project activity cannot regulate the population density, there will be no project measures to address this driver.

b) Driver variables explaining the location of deforestation, also called "predisposing factors" (de Jong, 2007). These driver variables were used in deforestation projection modelling, the results of which show that such variables can predict the location of deforestation variables explaining the quantity (hectares) of deforestation:

Access to forests (existing roads and navigable rivers):

Studies on historical location of deforestation in the Reference Region can evidence that this factor has been a driver for deforestation during the historical reference period. It is broadly recognized that deforestation is accelerated in regions that have denser road networks (IMAZON, 2021[104]);

The presence of roads and navigable rivers is a logical deforestation driver, since it facilitates the flow of wood and other products harvested from the forest. The capacity to transport wood logs, rapidly clear the land for pasture and place wood logs in sawmills, quickly obtaining revenues, certainly has a major impact on cattle ranchers' decision to deforest the most accessible forest areas;

The Reference Region holds a dense network of primary, secondary, and tertiary roads. The lands located near these roads are more likely to undergo deforestation, generating a progressive fishbone effect. This deforestation pattern may even increase exponentially in some cases, given that a single road may originate several other offshoot roads in the future, and so on. In a brief analysis of deforestation location, the existence of the fishbone deforestation patterns can be noted, which indicates the creation of secondary and tertiary roads, mainly from the major federal highway (BR-364) in the Reference Region. Barber et al. (2014), in their study on deforestation drivers in the Amazon, conclude that proximity to transportation networks, particularly the rapidly growing unofficial road network, is a major proximate driver of

[104] Source (accessed 16/03/21): Imazon, https://imazongeo.org.br/

deforestation in the Amazon. Thus, it can be expected that the growth of the unofficial road network will increasingly affect the dynamics of deforestation over the project lifetime.

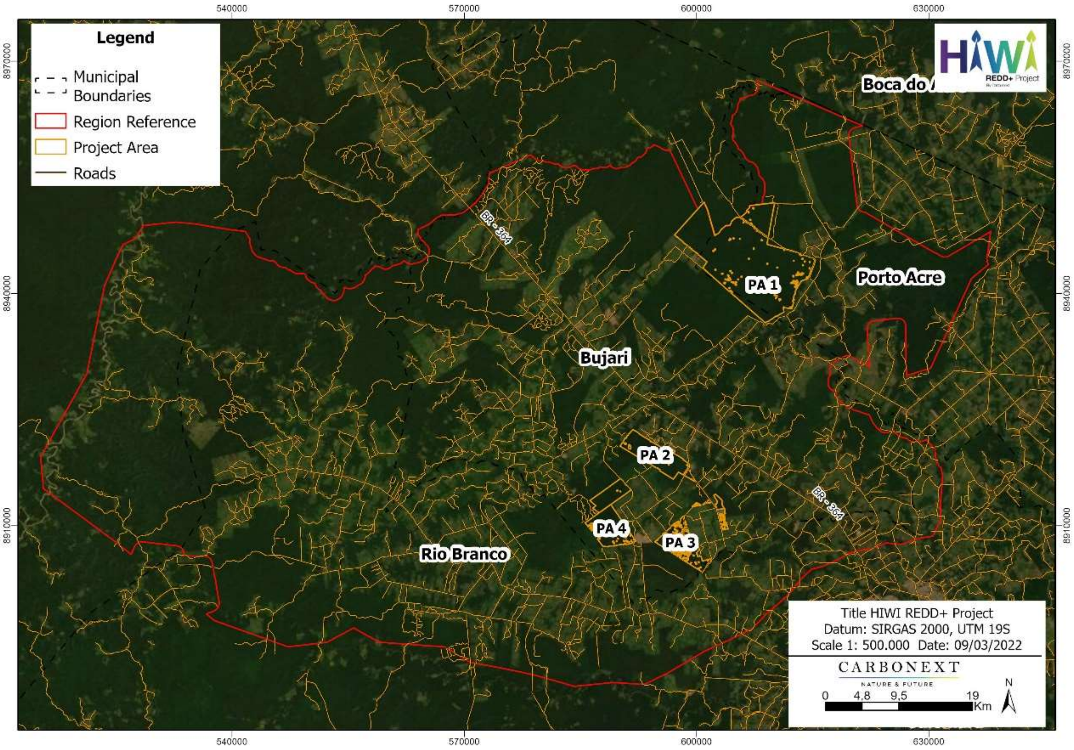


Figure 55: Roads in the Reference Region

Proximity to forest edges:

Studies on historical location of deforestation in the Reference Region provide evidence that this has also been a driver for deforestation over the historical reference period. Similarly, to the proximity to roads and navigable rivers, the effect of this driver on deforestation decisions is related to easier logistics when clearing areas and easier and quicker revenue from logging. The proximity to forest edges has been used in similar ways by other REDD projects, including the "The Suruí Forest Carbon Project", the "RMDLT Portel-Pará REDD Project", the "Florestal Santa Maria REDD Project". Furthermore, this deforestation driver has been used to explain the dynamics of deforestation in similar analyses (LAURANCE et al. 2009; ROSA et al. 2013). According to ROSA et al. (2013), deforestation is contagious, such that local deforestation rates increase over time if adjacent locations are deforested;

The impact of this driver on cattle ranchers' decision to deforest is similar to that explained for roads and navigable rivers: this proximity facilitates the logistics of wood and other products extracted from the forest;

This key driver variable will have increased impact during next years, owing to the advance of deforestation in the region, which will bring deforestation pressures gradually closer to the boundaries of the Project Area. As stated in several parts of this PD, deforestation for logging and cattle ranching is a common practice in the project region, and this behaviour tends to continue in the future. Thus, it is expected that deforested areas will attract deforestation agents continuously, in a growing deforestation trend, provoked by a "contagious" process, as stated by ROSA et al. (2013);

The project measures that will be implemented to address this driver are the same measures that are being adopted to manage leakage in this project. Among these measures as described section 4.4.1 – Community Monitoring Plan, the proposed activities foreseen by the project involve Technical Training on Sustainable Cattle Raising, Forest Management Courses, and others.

3.1.4.2.3 Identification of underlying causes of deforestation

According to literature surveys and local interviews, it is concluded that the underlying causes of deforestation are as follows:

- Land-use policies and their enforcement;
- Poverty and wealth.

Land-use policies and their enforcement:

As previously mentioned in this PD, in spite of the legal provisions intended to preserve at least 80% of the Amazon's forest cover, the lack of law enforcement by local authorities along with the increase in production and prices of cattle has created a scenario of almost complete disregard of the mandatory provisions of the Forest Code. High rates of criminality associated with land disputes usually jeopardize efforts concerning law enforcement improvement. In addition to that, to cover vast distances of areas with low demographic density makes tracking of illegal activities and land surveillance very difficult for the authorities. Accordingly, policies implemented to address illegal deforestation only by means of command-and-control approaches have proven to be ineffective so far (IPAM, 2011). Analysis of land use, via project analysis of Mapbiomas data indicate that on deforestation history show a cumulative deforestation of 251,991.54 hectares, equivalent to more than 42,8% of the Reference Region. This is interpreted as non-compliance within the Reference Region with Law No. 12,651, which requires a Legal Reserve of 80% in each rural property of the Amazon Biome.

This key underlying cause has a strong effect on the decisions of the main deforestation agents, as they are at liberty to continue their illegal business activities with very low probability of being detained by authorities.

The problem of lack of command-and-control measures to contain deforestation in the Amazon Biome is a widespread issue, which has been getting worse and worse every year, due to lack of personnel and infrastructure of legal authorities, in addition to schemes of corruption and violence established by illegal agents to maintain the status quo. In this context, the lack of law enforcement can be assumed to be a constant underlying cause of deforestation during the project lifetime.

Although the project activity cannot solve the problem of lack of enforcement in Brazil, it can serve as a case of success, to encourage neighbours to adopt sustainable practices as a profitable land-use alternative.

Poverty and wealth:

According to statistics on the municipalities of Bujari and Porto Acre (IBGE, 2022), the average monthly wage of formal workers in 2019 was just 1.3 and 1.9 times the minimum salary, respectively. Formal workers represent only 15.6% of total Bujari population and in Porto Acre the value is of 5.2% of its total population. Half of these municipalities' population lives under 0.5 times the minimum salary. In Rio Branco the situation is only slighter better, with an average salary of 3.2 times de minimum salary and 26% of formal workers. These data show that the region faces poverty issues.

This key underlying cause has a major impact on deforestation decisions, as the main agents (cattle ranchers, operationally supported by loggers and land-grabbers) can easily recruit cheap manpower, consisting of workers seeking to sustain their families by means of this profitable activity, despite it being illegal, due to the inconsistency of law enforcement.

Over the coming years, it is not expected that the region will rapidly solve the poverty issue, as it is historically deeply rooted in the region. Given this context, poverty can be assumed to be a constant underlying cause during the project lifetime.

Although the project activity cannot solve the poverty issue, it aims to provide new jobs for local agents, who will be able to generate revenues for their families by means of a legal and sustainable initiative, according to the project activities described in section 4.2.1 – Expected Community Impacts (CM2.1).

3.1.4.2.4 Identification of chain of events leading to deforestation.

Based on the historical evidence collected, it is concluded that the implementation of the BAU activity (pasture) is usually financed by means of initial capital obtained through timber logging. Official data from IBGE (2019) suggests a possible upcoming crisis in legal wood log production, reflecting a lack of supply of legal wood to the local market, mainly represented by local sawmills.

The lack of enforcement of policies and laws also affects land tenure and property rights. This aspect stimulates the action of land grabbers and squatters. Ineffective legal land registration and documentation is also a barrier to official registration of timber production from natural forests. In this scenario, a great portion of harvested wood logs can be regarded as illegal and official registration is not technically feasible.

All the above rural conflicts are linked to deforestation, wildfires, followed by cattle ranching activities, a very common in Brazil´s Legal Amazon which is substantiated by illegal trespassing, an event that was reported by the project owners to already have happened in one of the properties.

The area in question is located at Km 85-86 in the BR-364 municipality of Bujari and since 2011, more than 200 families suffer from land disputes, trying to claim the right to possession of more than 5,000 hectares[105] that, according to the Institute National Colonization and Agrarian Reform (INCRA), these are public lands of the Union as provided in the Decree of July 10, 1996[106]. This land situation ends up causing a chain reaction of irregularities, such as illegal logging, and consequently increases the pressure for deforestation in the area.

According to the Map of Conflict focuses on Brazil's 'Legal Amazon' region, this includes the states of Amazonas, Roraima, Rondônia, Pará, Amapá, Acre, Tocantins, Mato Grosso, and part of Maranhão, the Legal Amazon was the location of 55% of land conflicts in Brazil between 2011 and 2020[107]. The study shows how activities such as cattle farming may be linked to violent conflicts in the countryside; and how the policy markers underpin all these issues.

Conclusion

Available evidence about the most likely future deforestation trend within the Reference Region and Project Area is deemed to be "Conclusive". Meaning that the hypothesized relationships between agent groups, driver variables, underlying causes and historical levels of deforestation have been verified via literature studies and other verifiable local sources of information.

[105] https://agazetadoacre.com/2013/10/noticias/geral/2013-10-31-21-02-09/
[106] http://www.planalto.gov.br/ccivil_03/DNN/Anterior_a_2000/1996/Dnn4198.htm
[107] https://mapadosconflitos.apublica.org/en/

The weight of the available evidence conservatively suggests that the overall trend in future baseline deforestation rates will be “Increasing”. During the reference period, the deforestation rate in the Reference Region has consistently increased, year on year, over nine of the ten years of the historical reference period. In this context, the deforestation rate used in the projections can be approach “a” or develop a model (approach “c”) (see step 4.1.1 of the VM0015 methodology: Selection of Baseline Approach).

3.1.4.2.5 Description of baseline scenario adopted

According to the descriptions above, it is expected that unplanned deforestation is most likely to occur in the Project Area in case of absence of the REDD Project. The rate of deforestation adopted for calculation of REDD Project benefits was obtained from the Mapbiomas database and is presented in item 3.2.1.

In the absence of the REDD project, it is assumed that the property would certainly undergo the same deforestation intensity as other neighboring lands.

Above - and belowground carbon pools were determined by means of a literature survey regarding the Project region. It is assumed that the Project Activity preserves soil organic carbon and litter pools to a greater extent than BAU activities. However, for conservativeness purposes, the project proponents decided not to include the soil and litter carbon pools in the REDD Project benefits.

Fossil fuel emissions were not accounted for in the Reference Area (baseline case) or for the Project Activity. It is assumed that the Project Activity also reduces emissions from fossil fuel burning, in comparison with BAU activities. However, this factor was also not accounted for conservativeness purposes and difficulties in monitoring during the project period.

3.1.5 Additionality

The Project’s additionality is demonstrated below, according to “VT0001 Tool for the demonstration and assessment of additionality in VCS agriculture, forestry and other land use (AFOLU) project activities”, Version 3.0, 1 February 2012, Sectoral Scope 14. The tool is applicable to this project, according to statements below:

a) The project activity does not lead to violation of any applicable law, even if the law is not enforced;

b) There is a baseline methodology to provide for a stepwise approach justifying the determination of the most plausible baseline scenario.

According to the tool, Project proponent(s) shall apply the following four steps:

i) STEP 1. Identification of alternative land use scenarios to the AFOLU project activity;

ii) STEP 2. Investment analysis to determine that the proposed project activity is not the most economically or financially attractive of the identified land use scenarios; or

iii) STEP 3. Barriers analysis; and

iv) STEP 4. Common practice analysis.

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

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

a) The identified credible non-excluding alternative land use scenarios to the proposed VCS AFOLU project activity include:

i) SCENARIO 1: Continuation of the pre-project land uses:

Under the pre-project scenario, one guard and one farm manager were required for the surveillance of the project area, that has no economic activity. The costs involved in the pre-project activities were as follow:

Table 43: Pre-Project Scenario

Item	Description	Frequency	Value	
Monitor Salary	Responsible for ground monitoring	monthly	R$	1,838.00
Fuel	2 rounds per month	monthly	R$	60.03
Farm Manager	Responsible for ground monitoring	monthly	R$	4,500.00
		Monthly Total	**R$**	**6,398.03**
		Year Total	**R$**	**76,776.34**

Therefore, there are only maintenance costs and therefore no IRR value was available, the NPV over the 30-year project lifetime is of -*R$* 1,231,665*.*

ii) SCENARIO 2: Project activity on the land within the project boundary performed without being registered as the VCS AFOLU project:

In this scenario, as it is considered project activities performed without being registered as the VCS AFOLU project, there are no income, only costs. The costs are described in the table below. Evidence of the costs will be available to the auditors.

Table 44: Scenario 2 Activities

Activity	2019	2020	2021	2022	2023-2049
Monitoring	R$ 8,592.11	R$ 30,026.34	R$ 43,376.34	R$ 43,776.34	R$ 47,376.34
Vehicles	R$ 130,000.00	R$ -	R$ 226,990.00	R$ 315,000.00	R$ 24,295.19
Property Management	R$ 18,000.00	R$ 54,000.00	R$ 54,000.00	R$ 54,000.00	R$ 54,000.00
Infrastructure	R$ -	R$ 3,750.00	R$ -	R$ -	R$ 3,750.00
Project Activities	R$ -	R$ -	R$ -	R$ -	R$ 116,622.88
Total	R$ 156,592.11	R$ 87,776.34	R$ 324,366.34	R$ 412,776.34	R$ 246,044.40

Therefore, there are only maintenance costs and therefore no IRR value was available, the NPV over the 30-year project lifetime is of -R$ *4,291,912*.

iii) SCENARIO 3: Cattle farming

As presented in previously sections of this PD, cattle farming is the prevalent component of the regional economy, being the main post-deforestation land use in the reference region. The activity represented 39% Bujari's GDP[108]. Also, pasture was 39% of the reference region in 2019 and is expected to reach 70% of the area by the end of the project lifetime.

Therefore, this is a credible scenario.

b) All identified land use scenarios above may be deemed realistic and credible, as they currently exist and are technically feasible in the project region. For all land use scenarios, credibility is justified by current BAU practices attested by the literature and local observations.

c) Outcome of Sub-step 1a: Credible land-use scenarios that could have occurred on the land within the project boundary were identified as Scenarios 1, 2 and 3 described above.

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

a) The following procedure was applied:

[108] https://cidades.ibge.gov.br/brasil/ac/rio-branco/pesquisa/38/47001?tipo=ranking&ano=2014&localidade2=120013&indicador=47006

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

SCENARIOS 1 and 2: Maintenance of forest on the area is what is specified as legal within the Law: The Brazilian Forest Code stipulates that a property should officially allocate 80% of its total area as LR (Legal Reserve) for conservation. However, before the Forest Code approval, it was allowed the deforestation of 50% of the property, maintaining 50% of Legal Reserve. As stated in item 2.5.7, the Forest Code states that areas that were deforested before 2008 were granted with amnesty, not needing to increase the Legal Reserve to 80%. The properties of this project fall into this category, being deforested before the Forest Code and with a LR of 50%. Thus, this scenario is in compliance with legal and regulatory requirements.

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

SCENARIO 3: Cattle farming

As showed in 'Table 24: Land Use in the RR in 2019', pasture represents 99% of the post-deforestation land use. Data from Mapbiomas[109] shows that in the state of Acre, of 29,038 deforestation alerts, only 34 had authorization, resulting in 161,750.74 ha deforested without authorization or control, confirming that illegal deforestation is a common practice. This reality is also seen in the project municipalities as shown in the table below.

Table 45: Alerts of illegal deforestation in the municipalities of the RR

Municipality	Number of alerts with indication of illegality	% of the area deforested with indication of illegality
Bujari	784	94.6%
Rio Branco	2,218	96.8%
Porto Acre	533	99.7%

The region facing the highest deforestation rate, in the State, is the northeast[110], where the project is located. Acre was the state in the Amazon region that lost the most forest area in proportion to the territory,

[109] Mapbiomas Alerta | Monitor da Fiscalização
[110] http://terrabrasilis.dpi.inpe.br/

from 2018 to 2021[111], reaching, in 2021, the highest rates of illegal deforestation of the last 18 years[112]. It can therefore be concluded that the majority of rural properties in the municipality and the reference region fall within this scenario.

However, most of the deforestation in the Amazon is illegal. Although the State government of Acre is putting resources into stopping illegal deforestation, the practice is still present in the area[113].

Therefore, this scenario is not in compliance with mandatory legal requirements, which are systematically not enforced. This scenario is widespread.

b) Outcome of Sub-step 1b: Is has been demonstrated that SCENARIOS 1, 2 and 3 are plausible alternative land use scenarios to this VCS AFOLU project activity.

Sub-step 1c. Selection of the baseline scenario

Outcome of Sub-step 1c:

SCENARIO 3, cattle farming, is considered to be the baseline scenario as it is:

- the most prevalent post-deforestation baseline use in the Reference Region.

Step 1 Conclusion*:* The alternative land use scenario is cattle ranching, which is credible and causes a deforestation above the permitted by law, being the non-compliance with requirements widespread.

STEP 2. Investment analysis

In accordance with the VT0001 tool, the aim of this step is to "determine whether the proposed project activity, without the revenue from the sale of GHG credits is economically or financially less attractive than at least one of the other land use scenarios".

Sub-Step 2a. Determine appropriate analysis method:

Given that the project generates no economic benefits other than VCU-related income, a simple cost analysis (Option I) was applied.

[111] https://g1.globo.com/ac/acre/natureza/amazonia/noticia/2022/02/09/amazonia-legal-desmatamento-no-acre-mais-de-dobrou-em-seis-anos-aponta-ipan.ghtml
[112] https://g1.globo.com/ac/acre/natureza/amazonia/noticia/2021/11/23/desmatamento-no-acre-passa-de-870-km-e-tem-maior-taxa-dos-ultimos-18-anos.ghtml
[113] http://semapi.acre.gov.br/wp-content/uploads/sites/20/2021/09/Nota_tecnica_12_Desmatamento-e-Queimadas_julho_20210813-1.pdf

The activity produces no financial benefits other than VCS related income, as shown in **Sub-step 1a**, Table 44: Scenario 2 Activities. The project only has costs, which are associated with the surveillance and maintenance of the area. Evidence of all costs are available to the auditors.

As Simple Cost Analysis was applied, it was proceeded to Step 4.

STEP 4. Common practice analysis

According to the VT0001, the previous steps shall be complemented with an analysis of the extent to which similar activities have already diffused in the geographical area of the proposed VCS AFOLU project activity). Other registered VCS AFOLU project activities shall not be included in this analysis.

This analysis took into account similar activities in the project region, being the municipalities of Bujari, Rio Branco and Porto Acre.

One of the analysis was the presence of RPPN in the region, defined as a conservation unit of private domain, with the objective of conserving biological diversity. For being private conservation reserves, they are comparable to the Hiwi area, that also has as goal the conservation of the forest and its biodiversity. It was found through the official organ ICMbio that in the state of Acre there is only 1 RPPN, with an area of 38 ha[114]. Therefore, it can be seen that the private conservation areas are incomparably smaller (0.18%) in size to the Hiwi REDD+ project, and not predominant in the State or the municipalities of the RR. Thus, this is not a common practice in the area.

Also, as stated previously in the PD, a common practice in the region is land invasion and land dispute, most of them aggressive, as demonstrated by illegal invasion occurrences in neighbour properties[115]. In the project properties, there is no dispute over land nor property repossession. Also, the relationship with the neighbours and communities is positive. This common practice of land invasion and land dispute reinforces the importance of the project in the area, for it will protect the properties from possible future invasion attempts. Also, invasions are usually caused by people from settlements and, through the project activities, the project will help increase the communities productivity and income to families, without the need of opening more forest area, reducing invasion events.

[114] https://sistemas.icmbio.gov.br/simrppn/publico/rppn/AC/

[115] Famílias expulsas de área na BR 364 estão morando embaixo de ponte e dentro de curral – Jornal A Gazeta do Acre ; Posseiros expulsos de invasão têm plantações e casas destruídas por jagunços | ac24horas.com - Notícias do Acre

Another factor that shows that the project is not the baseline scenario is the common practice of non-compliance with the legislation, especially regarding the area of legal reserve. As shown in item 2.5.7, the project properties are in accordance with the law and all the deforestation was performed by the previous owner. However, as demonstrated in sub-step 1.b, most of the deforestation in the area is illegal.

All of the points mentioned above, the preservation of the legal reserve and compliance with the law shows, the non-existence of land dispute or conflicts and the lack of private conservation lands, shows that the proposed VCS REDD project activity is not the baseline scenario and, hence, it is additional.

3.1.6 Methodology Deviations

The Hiwi REDD+ Project has no methodology deviations until this moment.

3.2 Quantification of GHG Emission Reductions and Removals

3.2.1 Baseline Emissions

For the quantification of the baseline emissions, the steps 4 to 6 of the VM0015 were applied. The definition of the baseline scenario was priory described in item 3.1.4.

3.2.1.1 PROJECTION OF THE QUANTITY OF FUTURE DEFORESTATION

This section refers to the following steps of the VM0015 Methodology: 4.1.1: Selection of the baseline approach; and Step 4.1.2: Quantitative projection of future deforestation.

The Modelling approach "a" has been chosen to project future deforestation, which involves estimation of deforestation as a function of the rate of baseline deforestation is assumed to be a continuation of the average annual rate measured during the historical reference period within the reference region.

The analysis of the deforestation history in the RR for the historical period (2009 to 2019) shows that the deforestation rate presented periods with a large increase in the deforestation rate, in the years 2011, 2015 and 2019. The behavior of the rate corroborates the chain of deforestation events and factors already described in the baseline, such as extensive cattle ranching. The historical deforestation rate can be described linearly by the equation $y = 0.0001x + 0.0107$ ($R^2 = 0.01$, $p = 0.7$). Since the linear relationship does not present a significant trend, the historical average of the period was adopted, equal to 1.44%.

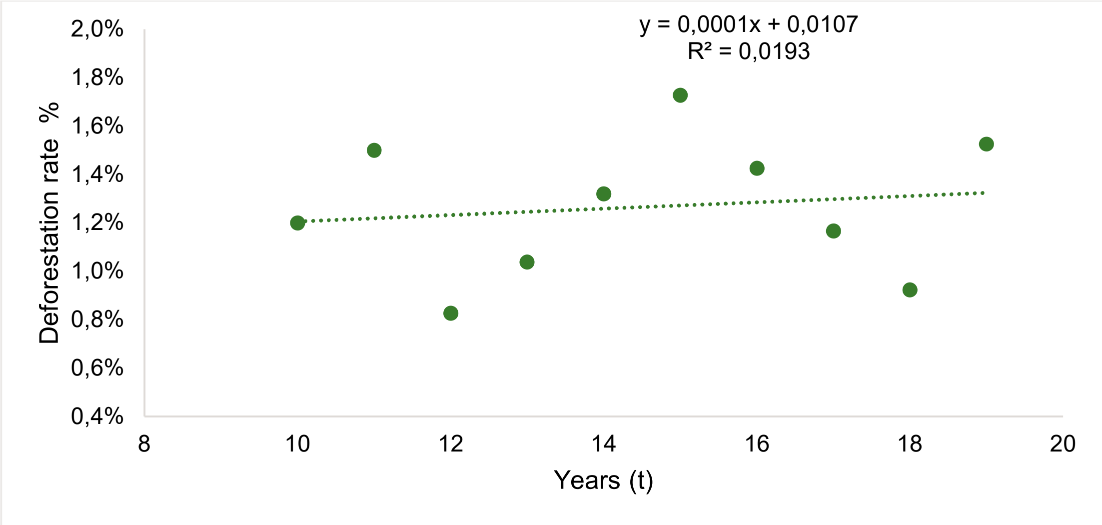


Figure 56: Analysis of the deforestation history in the RR for the historical period (2009 to 2019)

3.2.1.2 PROJECTION OF THE LOCATION OF FUTURE DEFORESTATION

This section refers to Step 4.2 of the VM0015 Methodology.

The basic tasks to perform this analysis are as follows, which is also represented in the flowchart below:

- Preparation of factor maps;
- Preparation of risk maps for deforestation;
- Selection of the most accurate deforestation risk map; and
- Mapping of the locations of future deforestation.

Table 46: List of variables, maps and factor maps (Table 10 of VM0015)

Factor Map	Source	Variable represented		Meaning of the categories or pixel value		Other Maps and Variables used to create factor map			Algorithm or Equation used	Comments
ID	*File Name*	Source	Unit	Description	Range	Meaning	ID	File Name	File name	
1	dist_desmat_1	Mapbiomas (2009 - 2018)	meters	Distance to existing deforestation	0 - 11.370	Values close to 0 are closer to the deforestation	1A	land use maps	Euclidean Distance - ArcGis (Esri)	N/A
2	dist_roads_1	Imazon (2014)	meters	Distance to main roads	0 - 11.591	Values close to 0 are closer to main roads	2A	estradas_driver.ti f	Euclidean Distance - ArcGis (Esri)	N/A
3	dist_settem_1	INCRA (2019)	meters	Distance to settlements	0 - 8.326	Values close to 0 are closer to settlements	3A	assentamentos_ driver.tif	Euclidean Distance - ArcGis (Esri)	N/A
4	dist_city_1	IBGE (2010)	meters	Distance to urban areas	0 - 82.144	Values close to 0 are closer to urban areas	4A	cidades_driver.tif	Euclidean Distance - ArcGis (Esri)	N/A
5	elevation	Topodata (INPE)	meters	Distance to elevation	0 1	Values close to 0 have low elevation	5A	elevacao_driver.t if	Euclidean Distance - ArcGis (Esri)	N/A
6	slope	Topodata (INPE)	degree	Distance to slope	0-1	Values close to 0 have low slope	6A	declividade_drive r.tif	Euclidean Distance - ArcGis (Esri)	N/A

3.2.1.2.1 Definition of the Model

Future deforestation location projection was found through Dinamica-EGO software version 6.1.0. The selection for Dinamica-EGO was made the following reasons: a) it is a model available in the scientific publications of Soares-Filho et al. (2006), Yanai et al. (2012) and Vitel et al (2013); b) it holds transparent process for input and output of data and parameters processed with user-friendly graphical interface; c) it incorporates the use of appropriate data to explain the location of deforestation.

The main steps conducted with Dinamica-EGO at this stage was: (i) organization of maps on land use and land cover, and maps with deforestation explanatory factors; (ii) model calibration by determining the weight of evidence and analyzing correlations between variables; (iii) assessment of model accuracy; (iv) development of deforestation baseline scenarios. Dinamica-EGO used spatial data with 30 x 30 m pixel size, GeoTIFF format.

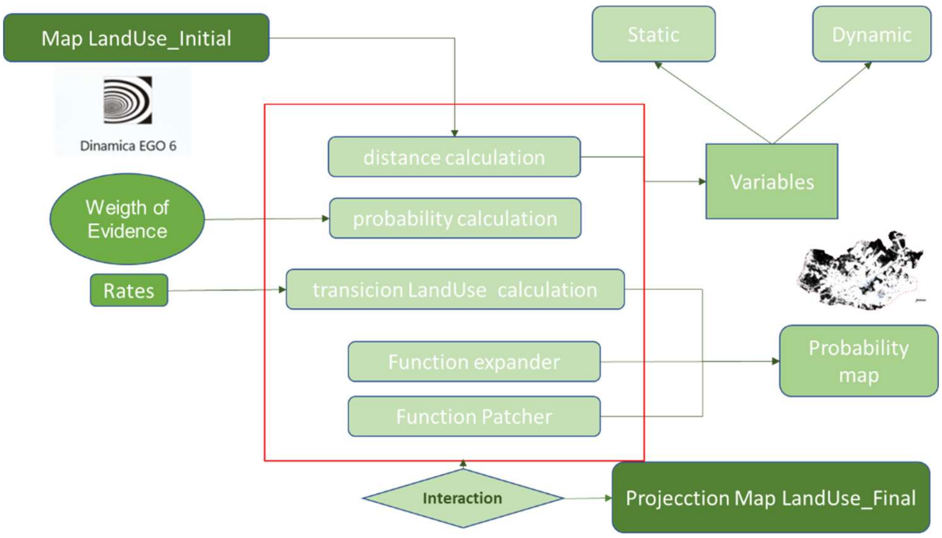


Figure 57: Flowchart of the process type model developed in the dynamic program-EGO.

This study took the following drivers into account: distance from deforestation, distance from roads, distance from cities, distance from settlements, elevation and slope to evaluate the variables and combinations can better explain the dynamics of historical deforestation in the region.

This step used an empirical approach, defining functions to represent the probability of allocation of deforestation from five key spatial variables selected from among nine initial variables. The method used in Dinamica-EGO is called Weight of Evidence, a Bayesian method. This method requires that the variables used to produce the map of deforestation risk are independent. According to an interval of classes, for each variable, a weight of evidence will be assigned, for this, the classes of deforestation distance of 100 meters and for classes of elevation and inclination of 1 meter were used.

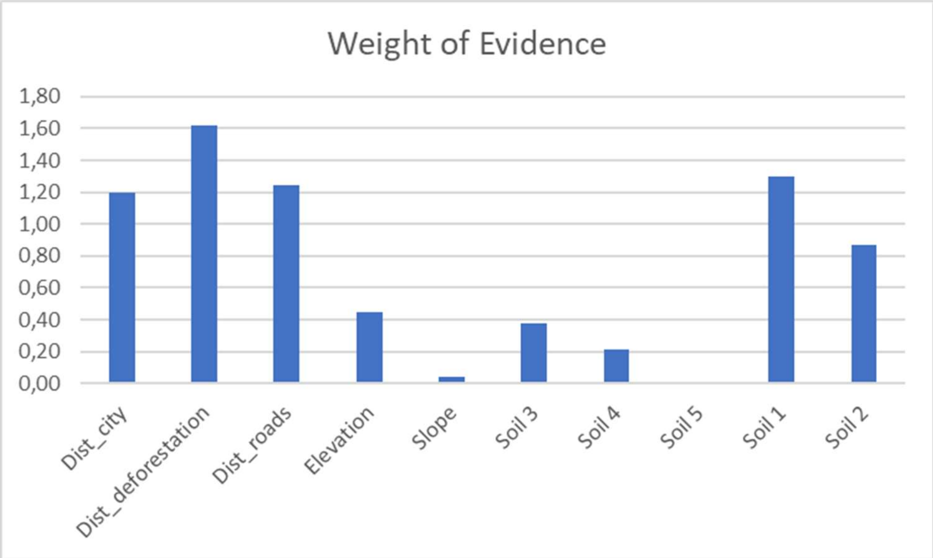


Figure 58 - Weigth of Evidence model 8.

The calculation of weights of evidence for each variable (or factor) examines their historical influence in relation to the deforestation observed. This influence of the variable is obtained from the amount of pixels representing forest area destroyed during the analysis period (the chosen calibration period was between 2018 and 2019).

During the analysis of deforestation dynamics in the Reference Region, the input data (explanatory variables) of network models were all analyzed, despite the possibility of correlation and redundancy of information between them. The only assumption for the Weights of Evidence method is that the input maps have to be spatially independent. A set of measures can be applied to assess this assumption, such as the Cramer test and the Joint-Uncertainty Information (Bonham-Carter, 1994). As a result, correlated variables must be disregarded or combined into a third that will replace the correlated pair in the model.

This model performs pairwise tests for categorical maps in order to test the independence assumption. Methods employed are the Chi^2, Cramer, the Contingency, the Entropy, and the Uncertainty Joint Information (Bonham-Carter, 1994). In addition to the links to be connected, the only parameter to be set in the Determine Weights of Evidence Correlation is the transition as follows.

Different models were tested, all if the allocation pattern of new deforestation considered 25% for new patches and 75% for expansion of already deforested areas (patcher and expander) and alternating combinations of explanatory variables.

Variable / Model	Distance_city	Distance_ deforestation	Distance_ roads	Elevation	Distance_ settlelments	Slope	Soil
m_1	x	x	x	x	-	x	-
m_2	-	x	x	-	-	-	-
m_3	x	-	x	x	-	x	x
m_4	x	x	-	x	-	x	-
m_5	-	x	x	-	x	-	-
m_6	x	x	x	x	-	x	x
m_7	x	x	x	x	x	-	-
m_8	x	x	x	x	x	x	x
m_9	x	x	x	-	x	x	-
M_10	x	x	x	x	x	x	-

3.2.1.2.2 Quality Control of the Model

According to the VM0015 methodology, one of the evaluation techniques that can be used is the "Figure of Merit" (FOM) that confirms the prediction of the model in a statistical way (Pontius et al. 2008; Pontius et al. 2007), which for this project was the technique used.

To evaluate the accuracy of the models, it was necessary to compare the land use map obtained by the prediction model with observed land use map at the same year: i) Estimated / modelled map up to 2018, and ii) actual observed deforestation map of 2018.

The FOM is a ratio of the intersection of the observed change (change between the reference maps in time 1 and time 2) and the predicted change (change between the reference map in time 1 and simulated map in time 2) to the union of the observed change and the predicted change. The FOM is a ratio of the intersection of the observed change and the predicted change to the union of the observed change and the predicted change.

Variable / Model	Dist_city	Dist_defore st	Dist_roads	Elevation	Dist_settle	Slope	Soil	FOM
m_1	x	x	x	x	-	x	-	72,97%
m_2	-	x	x	-	-	-	-	68,02%
m_3	x	-	x	x	-	x	x	45,06%
m_4	x	x	-	x	-	x	-	81,98%
m_5	-	x	x	-	x	-	-	75,93%

m_6	x	x	x	x	-	x	x	81,94%
m_7	x	x	x	x	x	-	-	62,91%
m_8	x	x	x	x	x	x	x	92,80%
m_9	x	x	x	-	x	x	-	51,91%
m_10	x	x	x	x	x	x	-	81,91%

The model selected with the best potential to explain the future of deforestation dynamics in the Reference Region it was model 8, presented a value of "Figure of Merit" (FOM) = 0.928.

3.2.1.2.3 Projected Results from the Model

Location analysis of future deforestation within the Reference Region was performed with the best model to determine the annual areas of deforestation within the Project Area and Leakage Belt (VM0015 step 4.2). Once location analysis has been completed, the proportion of annual areas of baseline deforestation within the project area and leakage belt was determined using GIS analysis.

The accumulated baseline deforestation projected to occur within the Reference Region was estimated as 157,024.4 hectares over the 30-year project lifetime, corresponding to an estimated average annual rate of deforestation is 5,234.1 hectares for the Reference Region

Table 47: Annual areas of baseline deforestation in the reference region (Table 9.a of VM0015)

Year	Project year	Total - RR	
		annual $ABSLRR_t$ ha	cummulative ABSLRR ha
2019	0	7.126,1	7.126,1
2020	1	6.901,7	14.027,8
2021	2	6.501,3	20.529,2
2022	3	6.368,9	26.898,1
2023	4	6.239,3	33.137,4
2024	5	6.112,3	39.249,6
2025	6	5.987,8	45.237,4
2026	7	5.865,8	51.103,3
2027	8	5.746,4	56.849,7

Year	Project year	Total - RR	
		annual ABSLRR$_t$ ha	cummulative ABSLRR ha
2028	9	5.629,4	62.479,1
2029	10	5.514,8	67.993,9
2030	11	5.402,5	73.396,4
2031	12	5.292,5	78.689,0
2032	13	5.184,7	83.873,7
2033	14	5.079,2	88.952,8
2034	15	4.975,7	93.928,6
2035	16	4.874,4	98.803,0
2036	17	4.775,2	103.578,2
2037	18	4.677,9	108.256,1
2038	19	4.582,7	112.838,8
2039	20	4.489,4	117.328,2
2040	21	4.398,0	121.726,3
2041	22	4.308,5	126.034,7
2042	23	4.220,7	130.255,5
2043	24	4.134,8	134.390,2
2044	25	4.050,6	138.440,9
2045	26	3.968,1	142.409,0
2046	27	3.887,3	146.296,3
2047	28	3.808,2	150.104,4
2048	29	3.730,6	153.835,0
2049	30	881,1	154.716,1
TOTAL		**154.716,1**	

The accumulated baseline deforestation projected to occur within the Project Area over the 30-year project lifetime was estimated at 5,160.7 hectares. The estimated average annual rate of deforestation is 172.02 hectares for the Project Area.

Table 48. Annual areas of baseline deforestation in the project area (Table 9.b of VM0015)

Year	Project year	Total - PA	
		annual $ABSLPA_t$ ha	cummulative ABSLPA ha
2019	0	17.0	17.0
2020	1	118.3	135.3
2021	2	138.9	274.1
2022	3	140.9	415.0
2023	4	141.8	556.8
2024	5	136.1	692.9
2025	6	145.4	838.4
2026	7	158.0	996.4
2027	8	173.7	1,170.1
2028	9	148.8	1,318.9
2029	10	161.9	1,480.8
2030	11	169.1	1,649.9
2031	12	179.3	1,829.2
2032	13	176.9	2,006.1
2033	14	178.8	2,184.9
2034	15	165.2	2,350.2
2035	16	179.6	2,529.8
2036	17	192.2	2,722.1
2037	18	172.4	2,894.4
2038	19	173.5	3,067.9
2039	20	162.8	3,230.7
2040	21	169.7	3,400.5
2041	22	193.0	3,593.4
2042	23	185.3	3,778.7
2043	24	200.3	3,979.1
2044	25	184.3	4,163.4
2045	26	195.2	4,358.6
2046	27	205.7	4,564.3
2047	28	193.0	4,757.3
2048	29	188.6	4,946.0
2049	30	214.7	5,160.7
TOTAL		**5,160.7**	

Table 49. Annual areas of baseline deforestation in the leakage belt (Table 9.c of VM0015)

Year	Project year	Total - LK	
		annual $ABSLLK_t$ ha	cummulative ABSLLK ha
2019	0	45.0	45.0
2020	1	97.9	142.9
2021	2	261.7	404.6
2022	3	251.7	656.4
2023	4	281.1	937.4
2024	5	267.4	1,204.8
2025	6	267.5	1,472.3
2026	7	269.6	1,742.0
2027	8	257.9	1,999.9
2028	9	288.4	2,288.3
2029	10	244.6	2,532.9
2030	11	259.2	2,792.1
2031	12	281.3	3,073.3
2032	13	286.2	3,359.5
2033	14	286.6	3,646.1
2034	15	266.6	3,912.7
2035	16	301.9	4,214.5
2036	17	291.6	4,506.1
2037	18	270.0	4,776.1
2038	19	326.8	5,102.9
2039	20	309.9	5,412.8
2040	21	320.3	5,733.1
2041	22	324.9	6,058.0
2042	23	342.5	6,400.4
2043	24	320.4	6,720.8
2044	25	351.4	7,072.2
2045	26	325.1	7,397.3
2046	27	348.3	7,745.6
2047	28	389.6	8,135.2

Year	Project year	Total - LK	
		annual $ABSLLK_t$ ha	cummulative ABSLLK ha
2048	29	342.5	8,477.6
2049	30	263.1	8,740.7
TOTAL		**8,740.7**	

3.2.1.2.4 Location of future deforestation: Conclusion

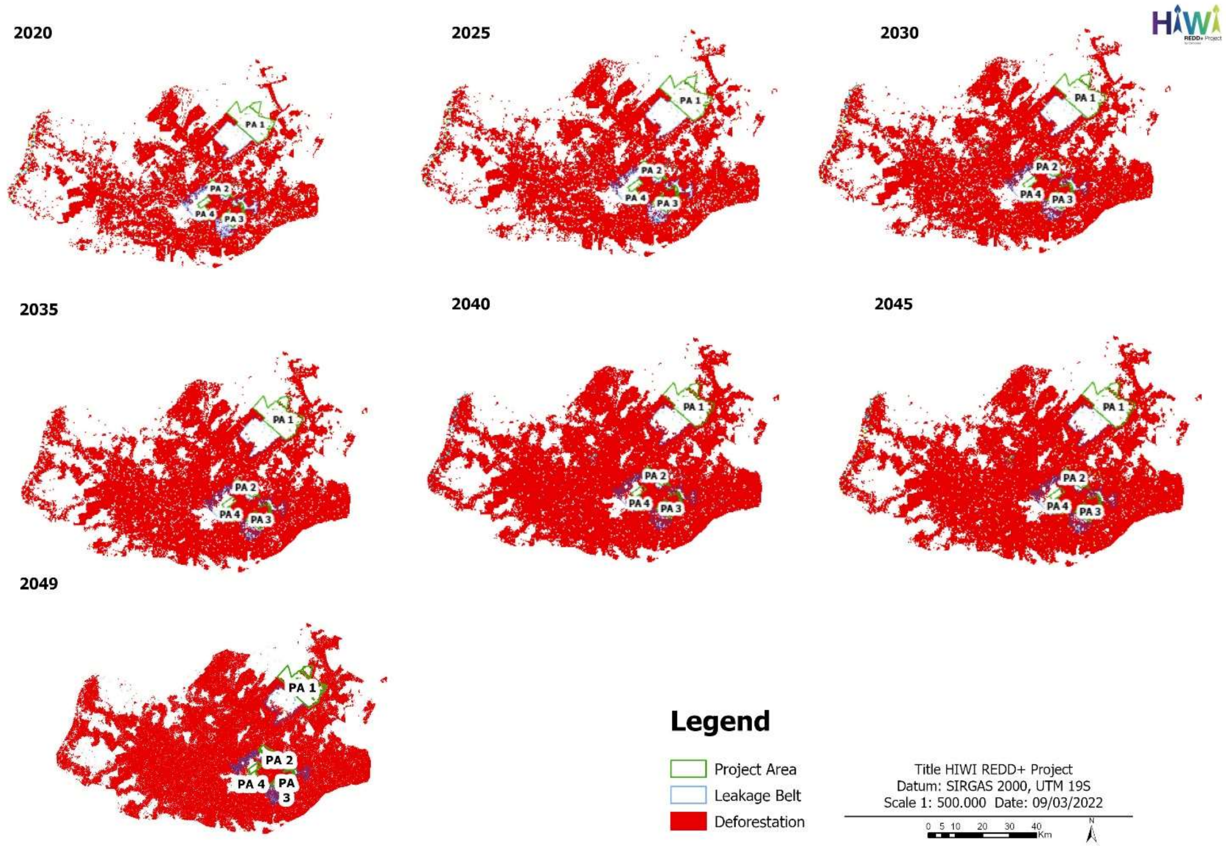
The location of deforestation in the Reference Region was strongly influenced by the factor of accessibility of forests, contributing to the expansion and clearing of new areas in the region as a whole, mainly as extensions from the BR-364 along its length in the states of Acre and Rondônia into the Amazon.

The Reference Region has a vast and dense network of primary, secondary and tertiary roads. Distance from previously deforested areas (i.e., proximity to forest edges) has also been an important deforestation driver: regions near old deforestation and communities, municipal centres, etc. tend to have a higher probability and risk of future deforestation.

All drivers related to the dynamics of land-use change caused by cattle ranching may increase the potential of the deforestation drivers. Thus, any fluctuations in the market of livestock-related products may affect the deforestation in the region as a whole, mainly in locations close to consumption clusters.

In parallel, demographic dynamics (i.e., changes in population density) are also important drivers, interacting with and amplifying all the other drivers mentioned above, as they cause an increase in food consumption and availability of labour, which directly affect deforestation. The following figure shows the yearly projection of deforestation location up to 2049.

Figure 59. Mapping of cumulative annual deforestation projected up to 2049, covering the Reference Region and Project Area



The Figure below shows the location of deforestation within the Project Area, highlighting the general tendency of the deforestation to push upwards from the greater concentration of roads, waterways, existing deforestation and sawmills in the South and to the East of the central group of project areas

Figure 60: Mapping of cumulative deforestation projected to 2049, in the Project Area.

3.2.1.3 DEFINITION OF THE LAND-USE AND LAND-COVER CHANGE COMPONENT OF THE BASELINE

This section refers to Step 5 of the VM0015 Methodology, the goal of which step is to calculate activity data (hectares per year) of the initial forest classes (icl) that will be deforested and activity data of the post-deforestation classes (fcl) that would replace them in the baseline case.

After step 4, the area and location of future deforestation are both known and pre-deforestation carbon stocks were determined by matching the predicted location of deforestation with the location of forest classes with known carbon stocks.

3.2.1.3.1 Calculation of baseline activity data per forest class

(Step 5.1) According to MMA (Ministry of Environment) data, the Project Area displays 100% of its forests classified as open ombrophylous forest ("Ab"). The data processing procedure in this step was the same as performed and explained in previous steps.

The following table shows the annual estimates of deforestation within the Project Area, obtained by means of modelling.

Table 50. Annual areas deforested per forest class icl within the project area in the baseline case (baseline activity data per forest class) (Table 11.b of VM0015)

Year	ID_{icl} >	1	Total baseline deforestation in the project area	
	Name >	Lowloand Open Ombrophilous Forest (Ab)		
	Project year t	ha	annual $ABSLPA_t$ ha	cummulative ABSLPA ha
2019	0	17.0	17.0	17.0
2020	1	118.3	118.3	135.3
2021	2	138.9	138.9	274.1
2022	3	140.9	140.9	415.0
2023	4	141.8	141.8	556.8
2024	5	136.1	136.1	692.9
2025	6	145.4	145.4	838.4
2026	7	158.0	158.0	996.4
2027	8	173.7	173.7	1,170.1
2028	9	148.8	148.8	1,318.9
2029	10	161.9	161.9	1,480.8
2030	11	169.1	169.1	1,649.9
2031	12	179.3	179.3	1,829.2
2032	13	176.9	176.9	2,006.1
2033	14	178.8	178.8	2,184.9
2034	15	165.2	165.2	2,350.2
2035	16	179.6	179.6	2,529.8
2036	17	192.2	192.2	2,722.1
2037	18	172.4	172.4	2,894.4
2038	19	173.5	173.5	3,067.9
2039	20	162.8	162.8	3,230.7
2040	21	169.7	169.7	3,400.5
2041	22	193.0	193.0	3,593.4

Year	ID_{icl} >	1	Total baseline deforestation in the project area	
	Name >	Lowland Open Ombrophilous Forest (Ab)		
	Project year t	ha	annual $ABSLPA_t$ ha	cummulative ABSLPA ha
2042	23	185.3	185.3	3,778.7
2043	24	200.3	200.3	3,979.1
2044	25	184.3	184.3	4,163.4
2045	26	195.2	195.2	4,358.6
2046	27	205.7	205.7	4,564.3
2047	28	193.0	193.0	4,757.3
2048	29	188.6	188.6	4,946.0
2049	30	214.7	214.7	5,160.7
TOTAL			**5,160.7**	

The following table shows the annual estimates of deforestation within the Leakage Belt, obtained by means of modelling.

Table 51. Annual areas deforested per forest class icl within the leakage belt area in the baseline case (baseline activity data per forest class) (Table 11.c of VM0015)

Year	ID_{icl} >	1	Total baseline deforestation in the leakage belt	
	Name >	Lowland Open Ombrophilous Forest (Ab)		
	Project year t	ha	annual $ABSLLK_t$ ha	cummulative ABSLLK ha
2019	0	45.0	45.0	45.0
2020	1	97.9	97.9	142.9
2021	2	261.7	261.7	404.6
2022	3	251.7	251.7	656.4
2023	4	281.1	281.1	937.4
2024	5	267.4	267.4	1,204.8

	ID_{icl} >	1	Total baseline deforestation in the leakage belt	
	Name >	Lowloand Open Ombrophilous Forest (Ab)		
Year	Project year t	ha	annual $ABSLLK_t$ ha	cummulative ABSLLK ha
2025	6	267.5	267.5	1,472.3
2026	7	269.6	269.6	1,742.0
2027	8	257.9	257.9	1,999.9
2028	9	288.4	288.4	2,288.3
2029	10	244.6	244.6	2,532.9
2030	11	259.2	259.2	259.2
2031	12	281.3	281.3	3,073.3
2032	13	286.2	286.2	3,359.5
2033	14	286.6	286.6	3,646.1
2034	15	266.6	266.6	3,912.7
2035	16	301.9	301.9	4,214.5
2036	17	291.6	291.6	4,506.1
2037	18	270.0	270.0	4,776.1
2038	19	326.8	326.8	5,102.9
2039	20	309.9	309.9	5,412.8
2040	21	320.3	320.3	5,733.1
2041	22	324.9	324.9	6,058.0
2042	23	342.5	342.5	6,400.4
2043	24	320.4	320.4	6,720.8
2044	25	351.4	351.4	7,072.2
2045	26	325.1	325.1	7,397.3
2046	27	348.3	348.3	7,745.6
2047	28	389.6	389.6	8,135.2
2048	29	342.5	342.5	8,477.6
2049	30	263.1	263.1	8,740.7
TOTAL			**8,740.7**	

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

To project the LU/LC classes that will replace forests in the baseline case, Method 1 "Historical LU/LC-change" was chosen, because historical LU/LC-changes are assumed to be representative of future trends. Hence, post-deforestation land-uses are allocated to the projected areas of annual deforestation in same proportions as those observed on lands deforested during the historical reference period in the Reference Region.

Pasture accounts for virtually all the deforested land occupation in the project region. An analysis of land-use cover in Bujari over the historical reference period years[116], show that, of the agricultural land uses, pastureland accounts for over 99% of the area in every year analyzed. Thus, the post deforestation class is considered exclusively as "pasture".

The following table shows the annual estimates of deforestation within the Project Area, obtained by means of modelling.

Table 52. Annual areas deforested in each zone within the project area in the baseline case (baseline activity data zone) (Table 13.b of VM0015)

	ID_z >	1	Total baseline deforestation in the project area	
	Name >	Pasture		
Year	Project year t	ha	annual $ABSLPA_t$ ha	cummulative ABSLPA ha
2019	0	17.0	17.0	17.0
2020	1	118.3	118.3	135.3
2021	2	138.9	138.9	274.1
2022	3	140.9	140.9	415.0
2023	4	141.8	141.8	556.8
2024	5	136.1	136.1	692.9
2025	6	145.4	145.4	838.4
2026	7	158.0	158.0	996.4
2027	8	173.7	173.7	1,170.1
2028	9	148.8	148.8	1,318.9

[116] Source, Mapbiomas: https://plataforma.brasil.mapbiomas.org

Year	ID_z > / Name >	1 / Pasture	Total baseline deforestation in the project area	
	Project year t	ha	annual $ABSLPA_t$ ha	cummulative ABSLPA ha
2029	10	161.9	161.9	1,480.8
2030	11	169.1	169.1	1,649.9
2031	12	179.3	179.3	1,829.2
2032	13	176.9	176.9	2,006.1
2033	14	178.8	178.8	2,184.9
2034	15	165.2	165.2	2,350.2
2035	16	179.6	179.6	2,529.8
2036	17	192.2	192.2	2,722.1
2037	18	172.4	172.4	2,894.4
2038	19	173.5	173.5	3,067.9
2039	20	162.8	162.8	3,230.7
2040	21	169.7	169.7	3,400.5
2041	22	193.0	193.0	3,593.4
2042	23	185.3	185.3	3,778.7
2043	24	200.3	200.3	3,979.1
2044	25	184.3	184.3	4,163.4
2045	26	195.2	195.2	4,358.6
2046	27	205.7	205.7	4,564.3
2047	28	193.0	193.0	4,757.3
2048	29	188.6	188.6	4,946.0
2049	30	214.7	214.7	5,160.7
TOTAL			**5,160.7**	

The following table shows the annual estimates of deforestation within the Leakage Belt, obtained by means of modelling.

Table 53. Annual areas deforested in each zone within the leakage belt area in the baseline case (baseline activity data per zone) (Table 13.c of VM0015)

Year	ID_z >	1	Total baseline deforestation in the leakage belt	
	Name >	Pasture		
	Project year t	ha	annual $ABSLLK_t$ ha	cummulative ABSLLK ha
2019	0	45.0	45.0	45.0
2020	1	97.9	97.9	142.9
2021	2	261.7	261.7	404.6
2022	3	251.7	251.7	656.4
2023	4	281.1	281.1	937.4
2024	5	267.4	267.4	1,204.8
2025	6	267.5	267.5	1,472.3
2026	7	269.6	269.6	1,742.0
2027	8	257.9	257.9	1,999.9
2028	9	288.4	288.4	2,288.3
2029	10	244.6	244.6	2,532.9
2030	11	259.2	259.2	259.2
2031	12	281.3	281.3	3,073.3
2032	13	286.2	286.2	3,359.5
2033	14	286.6	286.6	3,646.1
2034	15	266.6	266.6	3,912.7
2035	16	301.9	301.9	4,214.5
2036	17	291.6	291.6	4,506.1
2037	18	270.0	270.0	4,776.1
2038	19	326.8	326.8	5,102.9
2039	20	309.9	309.9	5,412.8
2040	21	320.3	320.3	5,733.1
2041	22	324.9	324.9	6,058.0
2042	23	342.5	342.5	6,400.4
2043	24	320.4	320.4	6,720.8
2044	25	351.4	351.4	7,072.2

Year	ID_z >	1	Total baseline deforestation in the leakage belt	
	Name >	Pasture		
	Project year t	ha	annual $ABSLLK_t$ ha	cummulative ABSLLK ha
2045	26	325.1	325.1	7,397.3
2046	27	348.3	348.3	7,745.6
2047	28	389.6	389.6	8,135.2
2048	29	342.5	342.5	8,477.6
2049	30	263.1	263.1	8,740.7
TOTAL			**8,740.7**	

3.2.1.5 ESTIMATION OF BASELINE CARBON STOCK CHANGES AND NON-CO2 EMISSIONS

This section refers to Step 6 of the VM0015 Methodology, the goal of which is to finalize the baseline assessment by calculating:

- Baseline carbon stock changes; and (optionally)
- Baseline non-CO2 emissions from forest fires used to clear forests.

3.2.1.5.1 Estimation of baseline carbon stock changes

The use of carbon stock estimates in similar ecosystems derived from local studies, literature and IPCC defaults is permitted, provided the accuracy and conservativeness of the estimates are demonstrated.
As noted under section 3.1.3, Project Boundary, the project area contains 100% Open Ombrofilous Forest (OOF). Biomass data for were taken from literature[117], which contains data relating to the total carbon stocks in Lowland Ombrophilous Open Forest (Ab). In order to calculate the above and below-ground data, it was applied the root-to-shoot ratio of 0.37[118] in the total biomass.

The table below shows the carbon stock per hectare of Lowland Ombrophilous Forest present in the project area and leakage belt.

[117] Source: http://redd.mma.gov.br/images/FREL/RR_LULUCF_Mudana-de-Uso-e-Floresta.pdf
[118] Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories", V. 4, Ch. 4, AFOLU, pg. 4.49, Table 4-4

Table 54: Carbon stocks per hectare of initial forest classes icl existing in the project area and leakage belt: Estimated values (Table 15.a of VM0015)

Year	Project year t	Initial forest class *icl* Name: Lowland open ombrophilous forest (Ab) ID icl 1 Average carbon stock per hectare ± 90% CI												
		Cab *icl*		Cbb *icl*		Cwp *icl* short lived		Cwp *icl* medium lived		Cwp *icl* long lived		Ctot *icl*	
		C stock	± 90% CI	*C stock*	± 90% CI	*C stock*	± 90% CI	*C stock*	± 90% CI	*C stock*	± 90% CI	*C stock*	± 90% CI
		t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}
2019	0												
2020	1		444		164		0		0		28		580
2021	2	467		173		0		0		29		611	
...	...		491		181		0		0		29		643
2049	30												

90% Confidence Intervals have been used to define whether the most suitable choice would be the average or the lower limit of the range, to mitigate uncertainties in estimates, as shown in the table below. In the present case, the averages of above and below-ground biomass were used for calculations; while the upper limit of the interval was used for the calculations related to the wood products carbon pool, for conservativeness purposes and mitigation of uncertainties.

Table 55: Carbon stocks per hectare of initial forest classes icl existing in the project area and leakage belt: Values to be used after discounts due to uncertainties (Table 15.b of VM0015)

Year	Project year t	Initial forest class *icl* Name: Lowland Open Ombrophilous Forest (Ab) ID icl 1 Average carbon stock per hectare ± 90% CI												
		Cab *icl*		Cbb *icl*		Cwp *icl* short lived		Cwp *icl* medium lived		Cwp *icl* long lived		Ctot *icl*	
		C stock	*C stock change*	*C stock*	*C stock change*	*C stock*	*C stock change*	*C stock*	*C stock change*	*C stock*	*C stock change*	*C stock*	*C stock change*
		t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}
2019	0												
2020	1												
2021	2	467	0	173	0	0	0	0	0	29	0	611	0
...	...												
2049	30												

The same reasoning is applicable to post-deforestation classes, for which the upper limit of the interval was taken in the case of above-ground biomass, while the average has been chosen for below-ground biomass, for conservativeness purposes and mitigation of uncertainties.

Table 56: Long-term (20-year) average carbon stocks per hectare of post-deforestation LU/LC classes present in the Reference Region (Table 16 of VM0015)

Year	Project year t	Post deforestation class *fcl* Name: Pasture ID $_{fcl}$ 1 Average carbon stock per hectare ± 90% CI											
		Cab $_{fcl}$		Cbb $_{fcl}$		Cwp $_{fcl}$						Ctot $_{fcl}$	
						short lived		*medium lived*		*long lived*			
		average stock	± 90% CI	*average stock*	± 90% CI	*average stock*	± 90% CI	*average stock*	± 90% CI	*average stock*	± 90% CI	*average stock*	± 90% CI
		$t\ CO_2e\ ha^{-1}$	$t\ CO_2e\ ha^{-1}$	$t\ CO_2e\ ha^{-1}$	$t\ CO_2e\ ha^{-1}$	$t\ CO_2e\ ha^{-1}$	$t\ CO_2e\ ha^{-1}$	$t\ CO_2e\ ha^{-1}$	$t\ CO_2e\ ha^{-1}$	$t\ CO_2e\ ha^{-1}$	$t\ CO_2e\ ha^{-1}$	$t\ CO_2e\ ha^{-1}$	$t\ CO_2e\ ha^{-1}$
2019	0												
2020	1		7.10		11.34		0		0		0		18.4
2021	2	11.37		18.15		0		0		0		29.52	
…	…		15.63		24.96		0		0		0		40.6
2049	30												
Average		11.37		18.15		0		0		0		29.52	
Average to be used in calculations		15.6		25.0		0		0		0		40.6	

Table 57: Long-term (20-year) area weighted average carbon stock per zone (Table 17 of VM0015)

Zone		Post -deforestation LU/LC-class *fcl* Name: Pasture ID $_{fcl}$ 1			Area weighted long-term (20 years) average carbon stocks per zone *z*			
		Cab $_{fcl}$ *C stock*	Cbb $_{fcl}$ *C stock*	Cwp $_{fcl}$ *C stock*	Cab $_z$ *C stock*	Cbb $_z$ *C stock*	Cwp $_z$ *C stock*	Ctot $_z$ *C stock*
IDz	Name	$t\ CO_2e\ ha^{-1}$	$t\ CO_2e\ ha^{-1}$	$t\ CO_2e\ ha^{-1}$	$t\ CO_2e\ ha^{-1}$	$t\ CO_2e\ ha^{-1}$	$t\ CO_2e\ ha^{-1}$	$t\ CO_2e\ ha^{-1}$
1	RR	15.6	25.0	0	15.6	25.0	0	40.6

The carbon stock change factors shown below were calculated based on VM0015 premises, using Method 2, as activity data are available for categories.

Table 58: Carbon stock change factors for land-use change categories (ct or ctz) (Method 2) (Table 20.c of VM0015)

Year after deforestation		$\Delta Cab_{ctz,t}$	$\Delta Cbb_{ctz,t}$	$\Delta Cwp_{ctz,t}$ long-lived
1	2019	-465,62	-14,79	0
2	2020	1,56	-14,79	0
3	2021	1,56	-14,79	0
4	2022	1,56	-14,79	0

Year after deforestation		$\Delta Cab_{ctz,t}$	$\Delta Cbb_{ctz,t}$	$\Delta Cwp_{ctz,t}$ long-lived
5	2023	1,56	-14,79	0
6	2024	1,56	-14,79	0
7	2025	1,56	-14,79	0
8	2026	1,56	-14,79	0
9	2027	1,56	-14,79	0
10	2028	1,56	-14,79	0
11	2029	0	0,00	0
12	2030	0	0,00	0
13	2031	0	0,00	0
14	2032	0	0,00	0
15	2033	0	0,00	0
16	2034	0	0,00	0
17	2035	0	0,00	0
18	2036	0	0,00	0
19	2037	0	0,00	0
20	2038	0	0,00	0
21	2039	0	0,00	0
22	2040	0	0,00	0
23	2041	0	0,00	0
24	2042	0	0,00	0
25	2043	0	0,00	0
26	2044	0	0,00	0
27	2045	0	0,00	0
28	2046	0	0,00	0
29	2047	0	0,00	0
30	2048	0	0,00	0
31	2049	0	0,00	0

The following tables show the calculation of baseline carbon stock changes in above-ground biomass, below-ground biomass and wood products in the Project Area, using the carbon stock change factors presented in the table immediately above.

Table 59. Baseline carbon stock change in the above-ground biomass in the project area (Table 22.b.1 of VM0015)

Year	Project year t	Activity data per category x Carbon stock change factor for above-ground biomass in the project area		Total baseline carbon stock change in the project area	
		Forest / Pasture		annual	cumulative
		$ABSLPA_{ct,t}$	$\Delta Cab_{ct,t}$	$\Delta CabBSLPA_t$	$\Delta CabBSLPA$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2019	0	17.0	-466	-7,915	-7,915
2020	1	118.3	-407	-55,042	-62,957
2021	2	138.9	-235	-64,449	-127,406
2022	3	140.9	-157	-65,154	-192,560
2023	4	141.8	-117	-65,394	-257,954
2024	5	136.1	-90	-62,491	-320,445
2025	6	145.4	-79	-66,636	-387,081
2026	7	158.0	-73	-72,276	-459,356
2027	8	173.7	-68	-79,320	-538,677
2028	9	148.8	-51	-67,441	-606,118
2029	10	161.9	-50	-73,353	-679,471
2030	11	169.1	-51	-76,637	-756,108
2031	12	179.3	-52	-81,325	-837,434
2032	13	176.9	-50	-80,176	-917,610
2033	14	178.8	-50	-81,001	-998,611
2034	15	165.2	-45	-74,606	-1,073,217
2035	16	179.6	-48	-81,280	-1,154,497
2036	17	192.2	-50	-87,113	-1,241,611
2037	18	172.4	-45	-77,823	-1,319,434
2038	19	173.5	-45	-78,331	-1,397,765
2039	20	162.8	-42	-73,326	-1,471,092
2040	21	169.7	-44	-76,563	-1,547,655
2041	22	193.0	-50	-87,389	-1,635,044
2042	23	185.3	-47	-83,802	-1,718,846
2043	24	200.3	-51	-90,791	-1,809,637

Year	Project year t	Activity data per category x Carbon stock change factor for above-ground biomass in the project area		Total baseline carbon stock change in the project area	
		Forest / Pasture		annual	cumulative
		ABSLPA$_{ct,t}$	ΔCab$_{ct,t}$	ΔCabBSLPA$_t$	ΔCabBSLPA
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2044	25	184.3	-46	-83,276	-1,892,913
2045	26	195.2	-48	-88,340	-1,981,253
2046	27	205.7	-51	-93,196	-2,074,449
2047	28	193.0	-47	-87,277	-2,161,727
2048	29	188.6	-45	-85,193	-2,246,920
2049	30	214.7	-50	-97,306	-2,344,226

Table 60. Baseline carbon stock change in the below-ground biomass in the project area (Table 22.b.2 of VM0015)

Year	Project year t	Activity data per category x Carbon stock change factor for below-ground biomass in the project area		Total baseline carbon stock change in the project area	
		Forest / Pasture		annual	cumulative
		BBSLPA$_{ct,t}$	ΔCbb$_{ct,t}$	ΔCbbBSLPA$_t$	ΔCbbBSLPA
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2019	0	17.0	-14.79	-251	-251
2020	1	118.3	-14.79	-2,001	-2,252
2021	2	138.9	-14.79	-4,055	-6,307
2022	3	140.9	-14.79	-6,138	-12,444
2023	4	141.8	-14.79	-8,236	-20,680
2024	5	136.1	-14.79	-10,248	-30,928
2025	6	145.4	-14.79	-12,399	-43,327
2026	7	158.0	-14.79	-14,737	-58,064
2027	8	173.7	-14.79	-17,306	-75,369
2028	9	148.8	-14.79	-19,506	-94,875
2029	10	161.9	-14.79	-21,649	-116,524
2030	11	169.1	-14.79	-22,401	-138,925
2031	12	179.3	-14.79	-22,999	-161,924
2032	13	176.9	-14.79	-23,533	-185,457
2033	14	178.8	-14.79	-24,080	-209,536
2034	15	165.2	-14.79	-24,511	-234,047
2035	16	179.6	-14.79	-25,017	-259,064

Year	Project year t	Activity data per category x Carbon stock change factor for below-ground biomass in the project area		Total baseline carbon stock change in the project area	
		Forest / Pasture		annual	cumulative
		$BBSLPA_{ct,t}$	$\Delta Cbb_{ct,t}$	$\Delta CbbBSLPA_t$	$\Delta CbbBSLPA$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2036	17	192.2	-14.79	-25,522	-284,586
2037	18	172.4	-14.79	-25,503	-310,089
2038	19	173.5	-14.79	-25,869	-335,957
2039	20	162.8	-14.79	-25,882	-361,839
2040	21	169.7	-14.79	-25,891	-387,731
2041	22	193.0	-14.79	-26,094	-413,824
2042	23	185.3	-14.79	-26,217	-440,041
2043	24	200.3	-14.79	-26,535	-466,577
2044	25	184.3	-14.79	-26,818	-493,395
2045	26	195.2	-14.79	-27,048	-520,443
2046	27	205.7	-14.79	-27,246	-547,689
2047	28	193.0	-14.79	-27,552	-575,241
2048	29	188.6	-14.79	-27,776	-603,017
2049	30	214.7	-14.79	-28,544	-631,561

Table 61. Baseline carbon stock change in the wood products in the project area (Table 22.b.6 of VM0015)

Year	Project year t	Activity data per category x Carbon stock change factor for wood products biomass in the project area		Total baseline carbon stock change in the project area	
		Forest / Pasture		annual	cumulative
		$WPSLPA_{ct,t}$	$\Delta Cwp_{ct,t}$	$\Delta CwpBSLPA_t$	$\Delta CwpBSLPA$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2019	0	17.0	0.00	0	0
2020	1	118.3	0.00	0	0
2021	2	138.9	0.00	0	0
2022	3	140.9	0.00	0	0
2023	4	141.8	0.00	0	0
2024	5	136.1	0.00	0	0
2025	6	145.4	0.00	0	0
2026	7	158.0	0.00	0	0
2027	8	173.7	0.00	0	0
2028	9	148.8	0.00	0	0
2029	10	161.9	0.00	0	0
2030	11	169.1	0.00	0	0
2031	12	179.3	0.00	0	0

Year	Project year t	Activity data per category x Carbon stock change factor for wood products biomass in the project area		Total baseline carbon stock change in the project area	
		Forest / Pasture		**annual**	**cumulative**
		$WPSLPA_{ct,t}$	$\Delta Cwp_{ct,t}$	$\Delta CwpBSLPA_t$	$\Delta CwpBSLPA$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2032	13	176.9	0.00	0	0
2033	14	178.8	0.00	0	0
2034	15	165.2	0.00	0	0
2035	16	179.6	0.00	0	0
2036	17	192.2	0.00	0	0
2037	18	172.4	0.00	0	0
2038	19	173.5	0.00	0	0
2039	20	162.8	0.00	0	0
2040	21	169.7	0.00	0	0
2041	22	193.0	0.00	0	0
2042	23	185.3	0.00	0	0
2043	24	200.3	0.00	0	0
2044	25	184.3	0.00	0	0
2045	26	195.2	0.00	0	0
2046	27	205.7	0.00	0	0
2047	28	193.0	0.00	0	0
2048	29	188.6	0.00	0	0
2049	30	214.7	0.00	0	0

The following tables show the calculation of baseline carbon stock changes in above-ground biomass, below-ground biomass and wood products in the Leakage Belt, using the carbon stock change factors presented in Table 58.

Table 62. Baseline carbon stock change in the above-ground biomass in the leakage belt area (Table 22.c.1 of VM0015)

Year	Project year t	Activity data per category x Carbon stock change factor for above-ground biomass in the leakage belt		Total baseline carbon stock change in the leakage belt	
		Forest / Pasture		**annual**	**cumulative**
		$ABSLLK_{ct,t}$	$\Delta Cab_{ct,t}$	$\Delta CabBSLLK_t$	$\Delta CabBSLLK$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2019	0	45	-466	-20,953	-20,953
2020	1	98	-319	-45,523	-66,475
2021	2	262	-301	-121,638	-188,113

Year	Project year t	Activity data per category x Carbon stock change factor for above-ground biomass in the leakage belt		Total baseline carbon stock change in the leakage belt	
		Forest / Pasture		annual	cumulative
		$ABSLLK_{ct,t}$	$\Delta Cab_{ct,t}$	$\Delta CabBSLLK_t$	$\Delta CabBSLLK$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2022	3	252	-178	-116,577	-304,690
2023	4	281	-139	-129,845	-434,535
2024	5	267	-102	-123,036	-557,571
2025	6	267	-83	-122,660	-680,231
2026	7	270	-71	-123,248	-803,478
2027	8	258	-59	-117,378	-920,857
2028	9	288	-57	-131,139	-1,051,996
2029	10	245	-44	-110,393	-1,162,389
2030	11	259	-44	-116,952	-1,279,341
2031	12	281	-48	-127,223	-1,406,565
2032	13	286	-48	-129,482	-1,536,046
2033	14	287	-48	-129,641	-1,665,688
2034	15	267	-44	-120,308	-1,785,996
2035	16	302	-50	-136,737	-1,922,733
2036	17	292	-48	-131,909	-2,054,642
2037	18	270	-44	-121,799	-2,176,441
2038	19	327	-53	-148,270	-2,324,712
2039	20	310	-49	-140,264	-2,464,975
2040	21	320	-49	-145,045	-2,610,021
2041	22	325	-49	-147,122	-2,757,142
2042	23	342	-51	-155,233	-2,912,375
2043	24	320	-47	-144,879	-3,057,254
2044	25	351	-50	-159,210	-3,216,463
2045	26	325	-46	-146,896	-3,363,360
2046	27	348	-49	-157,655	-3,521,015
2047	28	390	-53	-176,768	-3,697,783
2048	29	342	-46	-154,711	-3,852,494
2049	30	263	-35	-117,699	-3,970,193

Table 63. Baseline carbon stock change in the below-ground biomass in the leakage belt area (Table 22.c.2 of VM0015)

Year	Project year t	Activity data per category x Carbon stock change factor for below-ground biomass in the leakage belt		Total baseline carbon stock change in the leakage belt	
		Forest / Pasture		annual	cumulative
		$BBSLLK_{ct,t}$	$\Delta Cbb_{ct,t}$	$\Delta CbbBSLLK_t$	$\Delta CbbBSLLK$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2019	0	45	-14.79	-666	-666
2020	1	98	-14.79	-2,114	-2,779
2021	2	262	-14.79	-5,985	-8,764
2022	3	252	-14.79	-9,708	-18,472
2023	4	281	-14.79	-13,865	-32,336
2024	5	267	-14.79	-17,819	-50,156
2025	6	267	-14.79	-21,775	-71,931
2026	7	270	-14.79	-25,763	-97,695
2027	8	258	-14.79	-29,578	-127,273
2028	9	288	-14.79	-33,843	-161,116
2029	10	245	-14.79	-36,796	-197,912
2030	11	259	-14.79	-39,181	-237,093
2031	12	281	-14.79	-39,470	-276,562
2032	13	286	-14.79	-39,980	-316,542
2033	14	287	-14.79	-40,061	-356,603
2034	15	267	-14.79	-40,049	-396,652
2035	16	302	-14.79	-40,557	-437,209
2036	17	292	-14.79	-40,882	-478,091
2037	18	270	-14.79	-41,060	-519,151
2038	19	327	-14.79	-41,629	-560,780
2039	20	310	-14.79	-42,594	-603,374
2040	21	320	-14.79	-43,498	-646,872
2041	22	325	-14.79	-44,143	-691,015
2042	23	342	-14.79	-44,975	-735,990
2043	24	320	-14.79	-45,476	-781,466
2044	25	351	-14.79	-46,730	-828,195
2045	26	325	-14.79	-47,073	-875,268
2046	27	348	-14.79	-47,912	-923,180
2047	28	390	-14.79	-49,681	-972,861
2048	29	342	-14.79	-49,912	-1,022,773
2049	30	263	-14.79	-49,220	-1,071,993

Table 64. Baseline carbon stock change in the wood products in the leakage belt area (Table 22.c.6 of VM0015)

Year	Project year t	Activity data per category x Carbon stock change factor for wood products biomass in the leakage belt area		Total baseline carbon stock change in the leakage belt area	
		Forest / Pasture		annual	cumulative
		$WPSLLK_{ct,t}$	$\Delta Cwp_{ct,t}$	$\Delta CwpBSLLK_t$	$\Delta CwpBSLLK$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2019	0	45.0	0.00	0	0
2020	1	97.9	0.00	0	0
2021	2	261.7	0.00	0	0
2022	3	251.7	0.00	0	0
2023	4	281.1	0.00	0	0
2024	5	267.4	0.00	0	0
2025	6	267.5	0.00	0	0
2026	7	269.6	0.00	0	0
2027	8	257.9	0.00	0	0
2028	9	288.4	0.00	0	0
2029	10	244.6	0.00	0	0
2030	11	259.2	0.00	0	0
2031	12	281.3	0.00	0	0
2032	13	286.2	0.00	0	0
2033	14	286.6	0.00	0	0
2034	15	266.6	0.00	0	0
2035	16	301.9	0.00	0	0
2036	17	291.6	0.00	0	0
2037	18	270.0	0.00	0	0
2038	19	326.8	0.00	0	0
2039	20	309.9	0.00	0	0
2040	21	320.3	0.00	0	0
2041	22	324.9	0.00	0	0
2042	23	342.5	0.00	0	0
2043	24	320.4	0.00	0	0
2044	25	351.4	0.00	0	0
2045	26	325.1	0.00	0	0
2046	27	348.3	0.00	0	0
2047	28	389.6	0.00	0	0
2048	29	342.5	0.00	0	0
2049	30	263.1	0.00	0	0

3.2.1.5.2 Baseline non-CO2 emissions from forest fires

Conversion of forest to non-forest involving fires is a source of emissions of non-CO_2 gases (CH_4 and N_2O). Sources report a steady increase in the number of fire alerts in the RR over the historical reference period. Furthermore, GIS analysis was conducted utilizing data on fire occurrence from the CPTEC/INPE database[119] and Mapbiomas[120], which will be presented at audit under the category "Forest Fire Assessment in the RR". In addition, data published by INPE[121], reveal that the greatest focus of fires occurs in areas that are recently deforested.

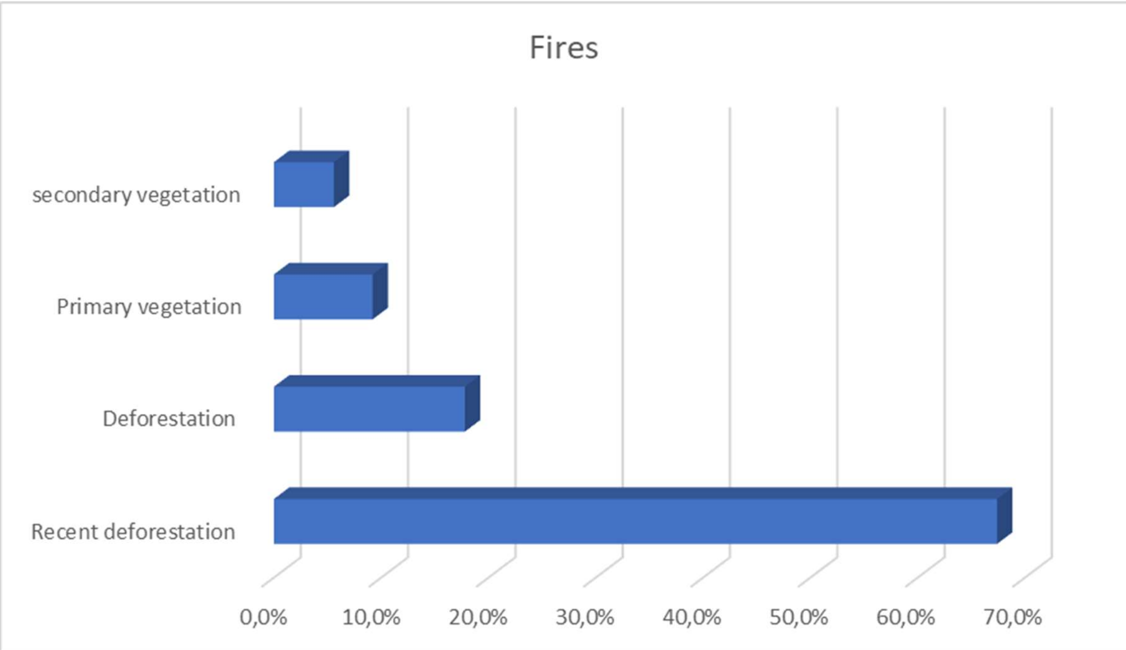


Figure 61: Fire occurrence according to the Land use

Frequency of forest fires within the Reference Region over the historical reference period, for years 2009 – 2019 was assessed, these being the years of the historical reference period for which fire data were available. To this extent, as specified in the methodology, data on such forest fires are available from the historical reference period.

[119] Source (last visited on 04/02/2022): http://queimadas.dgi.inpe.br/queimadas/bdqueimadas#exportar-dados
[120] Source . Projeto MapBiomas – Coleção 5.0 da Série Anual de Mapas de Uso e Cobertura da Terra do Brasil (last visited on 04/07/2021): https://mapbiomas.org/colecoes-mapbiomas-1?cama_set_language=pt-BR.
[121] Source . INPE/Terrabrasilis - http://terrabrasilis.dpi.inpe.br/app/dashboard/fires/biomes/aggregated/ (last visited on 05/02/2022).

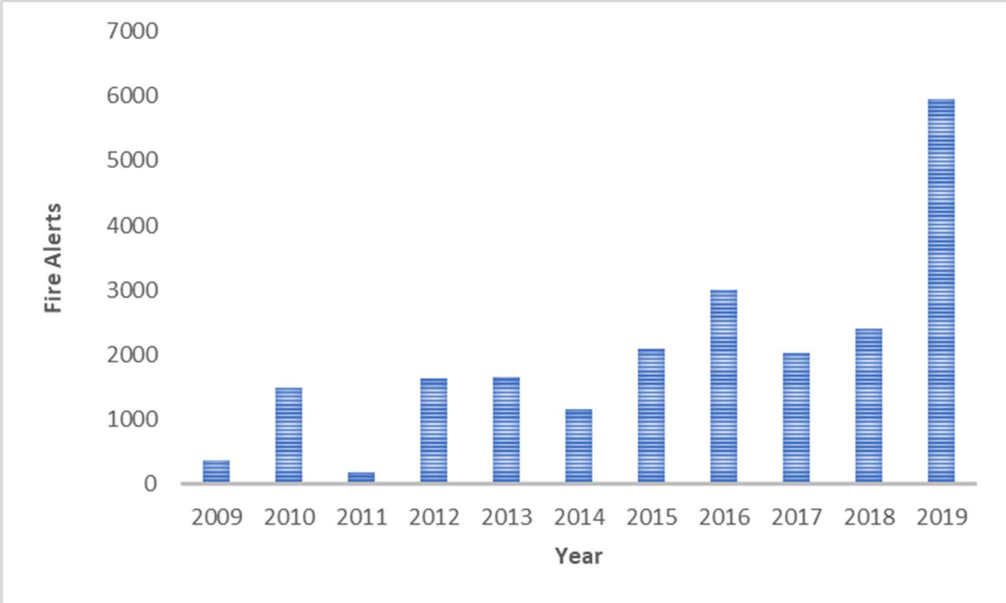


Figure 62: Fire alerts within the reference region (RR) over the historical reference period.

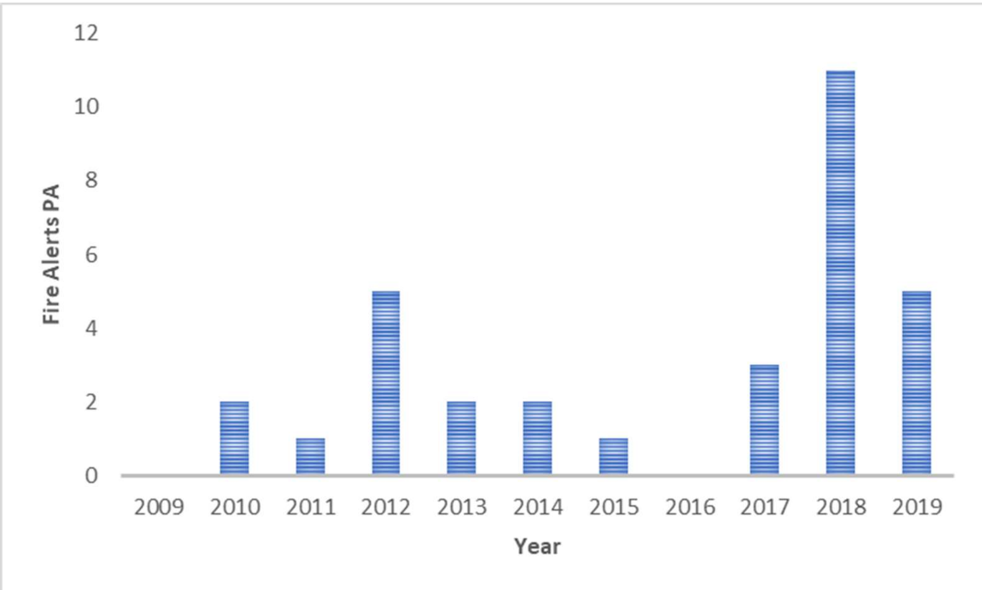


Figure 63: Fire alerts within the project area (PA) over the historical reference period

To estimate non-CO2 emissions from forest fires, the average percentage of the deforested area in which fire was used, the average proportion of mass burnt in each carbon pool (Pburnt,p), and the average combustion efficiency of each pool (CEp) were estimated. These average percentage values were estimated for each forest class (icl) and are assumed to remain the same in the future.

In accordance with the VM0015 methodology, GHG emissions from biomass burning were estimated based on revised IPCC 1996 GL LULUCF guidance, as follows.

$$EBBtot_{icl,t} = EBBN20_{icl,t} + EBBCH4_{icl,t}$$

Where:

$EBBtot_{icl,t}$	Total GHG emission from biomass burning in forest class icl at year t; tCO_2-e ha^{-1}
$EBBN20_{icl,t}$	Total GHG emission from biomass burning in forest class icl at year t; tCO2-e ha^{-1}
$EBBCH4_{icl,t}$	CH_4 emission from biomass burning in forest class icl at year t; tCO2-e ha^{-1}

$$EBBN20_{icl,t} = EBBCO2_{icl,t} * 12/44 * NCR * ER_{N20} * 44/28 * GWP_{N20}$$

$$EBBCH4_{icl,t} = EBBCO2_{icl,t} * 12/44 * ER_{CH4} * 16/12 * GWP_{CH4}$$

Where:

$EBBCO2_{icl,t}$	Per hectare CO_2 emission from biomass burning in slash and burn in forest class icl at year t; tCO_2-e ha^{-1}
$EBBN20_{icl,t}$	Per hectare N_20 emission from biomass burning in slash and burn in forest class icl at year t; tCO_2-e ha^{-1}
$EBBCH4_{icl,t}$	Per hectare CH_4 emission from biomass burning in slash and burn in forest class icl at year t; tCO_2-e ha^{-1}

NCR	Nitrogen to carbon ratio (IPCC default value = 0.01); dimensionless
ER_{N2O}	Emission ratio for N_2O (IPCC default value = 0.007)
ER_{CH4}	Emission ratio for CH_4 (IPCC default value = 0.012)
GWP_{N2O}	Global Warming Potential for N_2O (IPCC default value = 265 for the first commitment period)
GWP_{CH4}	Global Warming Potential for CH_4 (IPCC default value = 28 for the first commitment)

$$EBBCO2_{icl,t} = Fburnt_{icl} * \sum_{p=1}^{p} (C_{p,icl,t} * Pburnt_{p,icl} * CE_{p,icl})$$

Where:

$EBBCO2_{icl,t}$	Per hectare CO_2 emission from biomass burning in slash and burn in forest class icl at year t; tCO_2-e ha^{-1}
$Fburnt_{icl}$	Proportion of forest area burned during the historical reference period in the forest class icl; %
$C_{p,icl,t}$	Average carbon stock per hectare in the carbon pool p burnt in the forest class icl at year t; tCO2-e ha-1
$Pburnt_{p,icl}$	Average proportion of mass burnt in the carbon pool p in the forest class icl; %
$CE_{p,icl}$	Average combustion efficiency of the carbon pool p in the forest class icl; dimensionless
p	Carbon pool that could burn (above-ground biomass, dead wood, litter)
icl	1, 2, 3, …Icl (pre-deforestation) forest classes
t	1, 2, 3 … T, a year of the proposed project crediting period; dimensionless

Table 65: Parameters used to calculate non-CO2 emissions from forest fires (Table 23 of VM0015)

Initial Forest Class		Parameters								
		$Fburnt_{icl}$	Cab	$Pburnt_{ab,icl}$	$CEab,icl$	$ECO2\text{-}ab$	$EBBCO2\text{-}tot$	$EBBN2O_{icl}$	$EBBCH4_{icl}$	$EBBtot_{icl}$
IDcl	Name	N/A	$tCO_2e\ ha^{-1}$	N/A	N/A	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$
1	Lowland Open Ombrophilous Forest (Ab)	1.0	467	0.85	0.5	198	198	1.58	24.2	25.8

Table 66. Baseline non-CO2 emissions from forest fires in the project area (Table 24 of VM0015)

Year	Project year t	Emissions of non-CO2 gasses from baseline forest fires		Total baseline non-CO2 emissions from forest fires in the project area	
		IDicl = 1		annual	cumulative
		$ABSLPA_{icl,t}$	$EBBBSLtot_{icl}$	$EBBBSLPA_t$	EBBBSLPA
		ha	$tCO_2\text{-}e\ ha^{-1}$	$tCO_2\text{-}e$	$tCO_2\text{-}e$
2019	0	17.0	25.78	438	438
2020	1	118.3	25.78	3,049	3,488
2021	2	138.9	25.78	3,581	7,068
2022	3	140.9	25.78	3,632	10,700
2023	4	141.8	25.78	3,657	14,357
2024	5	136.1	25.78	3,509	17,866
2025	6	145.4	25.78	3,750	21,616
2026	7	158.0	25.78	4,075	25,691
2027	8	173.7	25.78	4,479	30,170
2028	9	148.8	25.78	3,836	34,005
2029	10	161.9	25.78	4,175	38,180
2030	11	169.1	25.78	4,360	42,540
2031	12	179.3	25.78	4,623	47,163
2032	13	176.9	25.78	4,562	51,725
2033	14	178.8	25.78	4,611	56,336
2034	15	165.2	25.78	4,261	60,597
2035	16	179.6	25.78	4,632	65,228
2036	17	192.2	25.78	4,957	70,185

Year	Project year t	Emissions of non-CO2 gasses from baseline forest fires		Total baseline non-CO2 emissions from forest fires in the project area	
		IDicl = 1		annual	cumulative
		$ABSLPA_{icl,t}$	$EBBBSLtot_{icl}$	$EBBBSLPA_t$	EBBBSLPA
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2037	18	172.4	25.78	4,444	74,629
2038	19	173.5	25.78	4,474	79,103
2039	20	162.8	25.78	4,198	83,301
2040	21	169.7	25.78	4,377	87,677
2041	22	193.0	25.78	4,975	92,653
2042	23	185.3	25.78	4,778	97,431
2043	24	200.3	25.78	5,166	102,596
2044	25	184.3	25.78	4,752	107,349
2045	26	195.2	25.78	5,033	112,382
2046	27	205.7	25.78	5,302	117,685
2047	28	193.0	25.78	4,978	122,662
2048	29	188.6	25.78	4,864	127,526
2049	30	214.7	25.78	5,537	133,063

3.2.2 Project Emissions

The goal of this step (STEP 7 of the VM0015 methodology) is to provide an ex-ante estimate of future carbon stock changes and non-CO2 emissions from forest fires under the project scenario (“actual”).

3.2.2.1 Ex ante estimation of actual carbon stock changes

These carbon stock changes are due to the following:

- Planned activities within the project area.
- Unplanned deforestation that cannot be avoided.

Carbon stock changes due to possible future catastrophic events cannot be predicted and are therefore excluded from the ex-ante assessment. There are not planned activities within the project area that will change the carbon stock of the area.

Some unplanned deforestation may happen in the project area despite the AUD project activity. The level at which deforestation will actually be reduced in the project case depends on the effectiveness of the proposed activities, which cannot be measured ex ante.

To allow ex ante projections to be made, the project proponent shall make a conservative assumption about the effectiveness of the proposed project activities and estimate an Effectiveness Index (EI) between 0 (no effectiveness) and 1 (maximum effectiveness). The estimated value of EI is used to multiply the baseline projections by the factor (1 - EI) and the result shall be considered the ex-ante estimated emissions from unplanned deforestation in the project case. The project design team conservatively considers that surveillance activities are able to attain 90% of effectiveness in avoiding unplanned deforestation inside the Project Area.

$$\Delta CUDdPA_t = \Delta CBSL_t * (1 - EI)|$$

Where:

$\Delta CUDdPA_t$	Total ex ante actual carbon stock change due to unavoided unplanned deforestation at year t in the project area; tCO_2-e GHG emission from biomass burning in forest class icl at year t; tCO_2-e ha^{-1}
$\Delta CBSL_t$	Total baseline carbon stock change at year t in the project area; tCO_2-e
EI	Ex ante estimated Effectiveness Index; %
t	1, 2, 3 … T, a year of the proposed project crediting period; dimensionless

Table 67. Ex ante estimated net carbon stock change in the project area under the project scenario (Table 27 of VM0015)

Year	Project year t	Total carbon stock decrease due to unavoided unplanned deforestation		Total carbon stock change in the project case	
		annual	cumulative	annual	cumulative
		$\Delta CUDdPA_t$	$\Delta CUDdPA$	$\Delta CPSPA_t$	$\Delta CPSPA$
		tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2019	0	-817	-817	-817	-817
2020	1	-5,704	-6,521	-5,704	-6,521
2021	2	-6,850	-13,371	-6,850	-13,371
2022	3	-7,129	-20,500	-7,129	-20,500

Year	Project year t	Total carbon stock decrease due to unavoided unplanned deforestation		Total carbon stock change in the project case	
		annual	cumulative	annual	cumulative
		$\Delta CUDdPA_t$	$\Delta CUDdPA$	$\Delta CPSPA_t$	$\Delta CPSPA$
		tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2023	4	-7,363	-27,863	-7,363	-27,863
2024	5	-7,274	-35,137	-7,274	-35,137
2025	6	-7,904	-43,041	-7,904	-43,041
2026	7	-8,701	-51,742	-8,701	-51,742
2027	8	-9,663	-61,405	-9,663	-61,405
2028	9	-8,695	-70,099	-8,695	-70,099
2029	10	-9,500	-79,600	-9,500	-79,600
2030	11	-9,904	-89,503	-9,904	-89,503
2031	12	-10,432	-99,936	-10,432	-99,936
2032	13	-10,371	-110,307	-10,371	-110,307
2033	14	-10,508	-120,815	-10,508	-120,815
2034	15	-9,912	-130,726	-9,912	-130,726
2035	16	-10,630	-141,356	-10,630	-141,356
2036	17	-11,264	-152,620	-11,264	-152,620
2037	18	-10,333	-162,952	-10,333	-162,952
2038	19	-10,420	-173,372	-10,420	-173,372
2039	20	-9,921	-183,293	-9,921	-183,293
2040	21	-10,245	-193,539	-10,245	-193,539
2041	22	-11,348	-204,887	-11,348	-204,887
2042	23	-11,002	-215,889	-11,002	-215,889
2043	24	-11,733	-227,621	-11,733	-227,621
2044	25	-11,009	-238,631	-11,009	-238,631
2045	26	-11,539	-250,170	-11,539	-250,170
2046	27	-12,044	-262,214	-12,044	-262,214
2047	28	-11,483	-273,697	-11,483	-273,697
2048	29	-11,297	-284,994	-11,297	-284,994
2049	30	-12,585	-297,579	-12,585	-297,579

3.2.2.2 Ex ante estimation of actual non-CO2 emissions from forest fires

Where forest fires have been included in the baseline scenario, non-CO_2 emissions from biomass burning must be included in the project scenario. This is done by multiplying the baseline emissions by the factor (1 – EI).

$$EBBPSPA_t = EBBBSPA_t * (1 - EI)$$

Where:

$EBBPSPA_t$ Total ex ante actual non-CO_2 emissions from forest fires due to unavoided unplanned deforestation at year t in the project area; tCO_2-e

$EBBBSPA_t$ Total non-CO_2 emissions from forest fires at year t in the project area; tCO_2-e

EI Ex ante estimated Effectiveness Index; %

t 1, 2, 3 … T, a year of the proposed project crediting period; dimensionless

Table 68. Total ex ante estimated actual emissions of non-CO2 gases due to forest fires in the project area (Table 28 of VM0015)

		Total ex ante estimated actual non-CO2 emissions from forest fires in the Project area	
		annual	cumulative
	Project	$EBBPSPA_t$	EBBPSPA
Year	year t	tCO_2-e	tCO_2-e
2019	0	44	44
2020	1	305	349
2021	2	358	707
2022	3	363	1,070
2023	4	366	1,436
2024	5	351	1,787
2025	6	375	2,162
2026	7	407	2,569
2027	8	448	3,017

Year	Project year t	Total ex ante estimated actual non-CO2 emissions from forest fires in the Project area	
		annual	cumulative
		$EBBPSPA_t$	EBBPSPA
		tCO_2-e	tCO_2-e
2028	9	384	3,401
2029	10	417	3,818
2030	11	436	4,254
2031	12	462	4,716
2032	13	456	5,173
2033	14	461	5,634
2034	15	426	6,060
2035	16	463	6,523
2036	17	496	7,019
2037	18	444	7,463
2038	19	447	7,910
2039	20	420	8,330
2040	21	438	8,768
2041	22	498	9,265
2042	23	478	9,743
2043	24	517	10,260
2044	25	475	10,735
2045	26	503	11,238
2046	27	530	11,768
2047	28	498	12,266
2048	29	486	12,753
2049	30	554	13,306

3.2.2.3 Ex ante estimation of actual carbon stock changes

Table 69. Total ex ante estimated actual net carbon stock changes and emissions of non-CO2 gases in the project area (Table 29 of VM0015)

Year	Project year t	Total ex ante carbon stock decrease due to unavoided unplanned deforestation		Total ex ante net carbon stock change		Total ex ante estimated actual non-CO2 emissions from forest fires in the project area	
		annual $\Delta CUDdPA_t$ tCO_2-e	cumulative $\Delta CUDdPA$ tCO_2-e	annual $\Delta CPSPA_t$ tCO_2-e	cumulative $\Delta CPSPA$ tCO_2-e	annual $EBBPSPA_t$ tCO_2-e	cumulative $EBBPSPA$ tCO_2-e
2019	0	-817	-817	-817	-817	44	44
2020	1	-5,704	-6,521	-5,704	-6,521	305	349
2021	2	-6,850	-13,371	-6,850	-13,371	358	707
2022	3	-7,129	-20,500	-7,129	-20,500	363	1,070
2023	4	-7,363	-27,863	-7,363	-27,863	366	1,436
2024	5	-7,274	-35,137	-7,274	-35,137	351	1,787
2025	6	-7,904	-43,041	-7,904	-43,041	375	2,162
2026	7	-8,701	-51,742	-8,701	-51,742	407	2,569
2027	8	-9,663	-61,405	-9,663	-61,405	448	3,017
2028	9	-8,695	-70,099	-8,695	-70,099	384	3,401
2029	10	-9,500	-79,600	-9,500	-79,600	417	3,818
2030	11	-9,904	-89,503	-9,904	-89,503	436	4,254
2031	12	-10,432	-99,936	-10,432	-99,936	462	4,716
2032	13	-10,371	-110,307	-10,371	-110,307	456	5,173
2033	14	-10,508	-120,815	-10,508	-120,815	461	5,634
2034	15	-9,912	-130,726	-9,912	-130,726	426	6,060
2035	16	-10,630	-141,356	-10,630	-141,356	463	6,523
2036	17	-11,264	-152,620	-11,264	-152,620	496	7,019
2037	18	-10,333	-162,952	-10,333	-162,952	444	7,463
2038	19	-10,420	-173,372	-10,420	-173,372	447	7,910
2039	20	-9,921	-183,293	-9,921	-183,293	420	8,330
2040	21	-10,245	-193,539	-10,245	-193,539	438	8,768
2041	22	-11,348	-204,887	-11,348	-204,887	498	9,265

Year	Project year t	Total ex ante carbon stock decrease due to unavoided unplanned deforestation		Total ex ante net carbon stock change		Total ex ante estimated actual non-CO2 emissions from forest fires in the project area	
		annual $\Delta CUDdPA_t$ tCO_2-e	cumulative $\Delta CUDdPA$ tCO_2-e	annual $\Delta CPSPA_t$ tCO_2-e	cumulative $\Delta CPSPA$ tCO_2-e	annual $EBBPSPA_t$ tCO_2-e	cumulative $EBBPSPA$ tCO_2-e
2042	23	-11,002	-215,889	-11,002	-215,889	478	9,743
2043	24	-11,733	-227,621	-11,733	-227,621	517	10,260
2044	25	-11,009	-238,631	-11,009	-238,631	475	10,735
2045	26	-11,539	-250,170	-11,539	-250,170	503	11,238
2046	27	-12,044	-262,214	-12,044	-262,214	530	11,768
2047	28	-11,483	-273,697	-11,483	-273,697	498	12,266
2048	29	-11,297	-284,994	-11,297	-284,994	486	12,753
2049	30	-12,585	-297,579	-12,585	-297,579	554	13,306

3.2.3 Leakage

The goal of this step (STEP 8) is to provide an ex-ante estimate of the possible decrease in carbon stock and increase in GHG emissions (other than carbon stock change) due to leakage.

Two sources of leakage are considered in this methodology and must be addressed:

- Decrease in carbon stocks and increase in GHG emissions associated with leakage prevention measures;
- Decrease in carbon stocks and increase in GHG emissions associated with activity displacement leakage.

3.2.3.1 Ex ante estimation of the decrease in carbon stocks and increase in GHG emissions due to leakage prevention measures

If leakage prevention measures include tree planting, agricultural intensification, fertilization, fodder production and/or other measures to enhance cropland and grazing land areas, a reduction in carbon stocks and/or an increase in GHG emissions may occur compared to the baseline case. If this decrease in carbon stocks or increase in GHG emissions is significant, it must be accounted for and monitoring will be required. If it is not significant, it must not be accounted for and ex post monitoring will not be necessary.

The following activities in leakage management areas could occasion a decrease in carbon stocks or an increase in GHG emissions:

- Carbon stock changes due to activities implemented in leakage management areas;
- Methane (CH_4) and nitrous oxide (N_2O) emissions from livestock intensification (involving a change in the animal diet and/or animal numbers).

In the case of this project activity, this component of the calculation is not applicable. The present project activity does not involve a decrease in carbon stocks or increase in GHG emissions associated with leakage prevention activities. In this project, leakage prevention activities do not involve any carbon stock reduction due to deforestation or additional emissions caused by increased grazing activities. The project proponent will offer training on sustainable cattle raising, to promote deforestation-free increases in livestock (that would occur in the baseline). It is intended that ranchers will be able to rationalize the land-use by means of techniques that allow a bigger production without increasing the area, so decreasing deforestation pressures. The activities do not intend to effect additional changes to “animal diet and/or animal numbers”, compared to that occurring in the baseline: the training goals will lead to a spatial rearrangement of production in a sustainable manner. Thus, the final balance of these training activities will be lower deforestation for a given number of cattle heads. This being the case, only the decrease in carbon stocks and increase in GHG emissions due to activity displacement leakage are calculated and monitored in the present project.

3.2.3.2 Ex ante estimation of the decrease in carbon stocks and increase in GHG emissions due to activity displacement leakage

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 AUD project activity. 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. Leakage due to activity displacement can thus be estimated by ex post monitoring of deforestation in the leakage belt and comparing ex post observed deforestation with ex ante projected baseline deforestation.

Ex ante activity displacement leakage can only be guessed based on the anticipated combined effectiveness of the proposed leakage prevention measures and project activities. This shall be done by multiplying the estimated baseline carbon stock changes for the project area by a “Displacement Leakage

Factor" (DLF) representing the percent of deforestation expected to be displaced outside the project boundary.

If deforestation agents do not participate in leakage prevention activities and project activities, the Displacement Factor shall be 100%. Where leakage prevention activities are implemented, the factor shall be equal to the proportion of the baseline agents estimated to be given the opportunity to participate in leakage prevention activities and project activities.

It is expected that 100% of potential deforestation agents in the Reference Region will be given the opportunity to participate in leakage prevention activities. Thus, the "Displacement Leakage Factor" (DLF) is conservatively considered as 0.05.

If emissions from forest fires have been included in the baseline, the ex-ante emissions from forest fires due to activity displacement leakage will be calculated by multiplying baseline forest fire emissions in the project area by the same DLF used to estimate the decrease in carbon stocks.

Table 70. Ex ante estimated leakage due to activity displacement (Table 34 of VM0015)

		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	
Year	Project year t	annual $\Delta CADLK_t$ tCO_2-e	cumulative $\Delta CADLK$ tCO_2-e	annual $EADLK_t$ tCO_2-e	cumulative $EADLK$ tCO_2-e
2019	0	-408	-408	22	22
2020	1	-2,852	-3,260	152	174
2021	2	-3,425	-6,686	179	353
2022	3	-3,565	-10,250	182	535
2023	4	-3,681	-13,932	183	718
2024	5	-3,637	-17,569	175	893
2025	6	-3,952	-21,520	188	1,081
2026	7	-4,351	-25,871	204	1,285
2027	8	-4,831	-30,702	224	1,508
2028	9	-4,347	-35,050	192	1,700
2029	10	-4,750	-39,800	209	1,909

Year	Project year t	Total ex ante estimated decrease in carbon stocks due to displaced deforestation		Total ex ante estimated increase in GHG emissions due to displaced forest fires	
		annual $\Delta CADLK_t$ tCO_2-e	cumulative $\Delta CADLK$ tCO_2-e	annual $EADLK_t$ tCO_2-e	cumulative $EADLK$ tCO_2-e
2030	11	-4,952	-44,752	218	2,127
2031	12	-5,216	-49,968	231	2,358
2032	13	-5,185	-55,153	228	2,586
2033	14	-5,254	-60,407	231	2,817
2034	15	-4,956	-65,363	213	3,030
2035	16	-5,315	-70,678	232	3,261
2036	17	-5,632	-76,310	248	3,509
2037	18	-5,166	-81,476	222	3,731
2038	19	-5,210	-86,686	224	3,955
2039	20	-4,960	-91,647	210	4,165
2040	21	-5,123	-96,769	219	4,384
2041	22	-5,674	-102,443	249	4,633
2042	23	-5,501	-107,944	239	4,872
2043	24	-5,866	-113,811	258	5,130
2044	25	-5,505	-119,315	238	5,367
2045	26	-5,769	-125,085	252	5,619
2046	27	-6,022	-131,107	265	5,884
2047	28	-5,741	-136,848	249	6,133
2048	29	-5,648	-142,497	243	6,376
2049	30	-6,292	-148,789	277	6,653

3.2.3.3 Ex ante estimation of total leakage

The summary of the total ex-ante estimation of leakage is as presented in the table below.

Table 71. Ex-ante estimated total leakage (Table 35 of VM0015)

Year	Project year t	Total ex ante increase in GHG emissions due to displaced forest fires		Total ex ante decrease in carbon stocks due to displaced deforestation		Total net carbon stock change due to leakage		Total net increase in emissions due to leakage	
		annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
		$EADLK_t$	EADLK	$\Delta CADLK_t$	ΔCADLK	ΔCLK_t	ΔCLK	ELK_t	ELK
		tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2019	0	22	22	-408	-408	-408	-408	22	22
2020	1	152	174	-2,852	-3,260	-2,852	-3,260	152	174
2021	2	179	353	-3,425	-6,686	-3,425	-6,686	179	353
2022	3	182	535	-3,565	-10,250	-3,565	-10,250	182	535
2023	4	183	718	-3,681	-13,932	-3,681	-13,932	183	718
2024	5	175	893	-3,637	-17,569	-3,637	-17,569	175	893
2025	6	188	1,081	-3,952	-21,520	-3,952	-21,520	188	1,081
2026	7	204	1,285	-4,351	-25,871	-4,351	-25,871	204	1,285
2027	8	224	1,508	-4,831	-30,702	-4,831	-30,702	224	1,508
2028	9	192	1,700	-4,347	-35,050	-4,347	-35,050	192	1,700
2029	10	209	1,909	-4,750	-39,800	-4,750	-39,800	209	1,909
2030	11	218	2,127	-4,952	-44,752	-4,952	-44,752	218	2,127
2031	12	231	2,358	-5,216	-49,968	-5,216	-49,968	231	2,358
2032	13	228	2,586	-5,185	-55,153	-5,185	-55,153	228	2,586
2033	14	231	2,817	-5,254	-60,407	-5,254	-60,407	231	2,817
2034	15	213	3,030	-4,956	-65,363	-4,956	-65,363	213	3,030
2035	16	232	3,261	-5,315	-70,678	-5,315	-70,678	232	3,261
2036	17	248	3,509	-5,632	-76,310	-5,632	-76,310	248	3,509
2037	18	222	3,731	-5,166	-81,476	-5,166	-81,476	222	3,731
2038	19	224	3,955	-5,210	-86,686	-5,210	-86,686	224	3,955
2039	20	210	4,165	-4,960	-91,647	-4,960	-91,647	210	4,165
2040	21	219	4,384	-5,123	-96,769	-5,123	-96,769	219	4,384
2041	22	249	4,633	-5,674	-102,443	-5,674	-102,443	249	4,633
2042	23	239	4,872	-5,501	-107,944	-5,501	-107,944	239	4,872

2043	24	258	5,130	-5,866	-113,811	-5,866	-113,811	258	5,130
2044	25	238	5,367	-5,505	-119,315	-5,505	-119,315	238	5,367
2045	26	252	5,619	-5,769	-125,085	-5,769	-125,085	252	5,619
2046	27	265	5,884	-6,022	-131,107	-6,022	-131,107	265	5,884
2047	28	249	6,133	-5,741	-136,848	-5,741	-136,848	249	6,133
2048	29	243	6,376	-5,648	-142,497	-5,648	-142,497	243	6,376
2049	30	277	6,653	-6,292	-148,789	-6,292	-148,789	277	6,653

3.2.4 Net GHG Emission Reductions and Removals

3.2.4.1 Calculation of ex-ante estimation of total net GHG emissions reductions

The net anthropogenic GHG emission reduction (STEP 9 of the VM0015 Methodology) of the proposed AUD project activity is calculated as follows:

$$\Delta REDD_t = (\Delta CBSLPA_t + EBBBSLPA_t) - (\Delta CPSPA_t + EBBPSPA_t) - (\Delta CLK + \Delta ELK_t)$$

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 the equation above

$EBBBSLPA_t$ Sum of baseline emissions from biomass burning in the project area at year t; tCO2e

$\Delta CPSPA_t$ Sum of ex ante estimated actual carbon stock changes in the project area at year t; tCO2e of baseline emissions from biomass burning in the project area at year t; tCO2e

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; tCO2e

ΔCLK_t Sum of ex ante estimated leakage net carbon stock changes at year t; tCO2e

Note: If the cumulative sum of ΔCLK_t within a fixed baseline period is > 0, ΔCLK_t shall be set to zero.

ΔELK_t Sum of ex ante estimated leakage emissions at year t; tCO2e

t 1, 2, 3 … T, a year of the proposed project crediting period; dimensionless

3.2.4.2 Calculation of ex-ante estimation of total net GHG emissions reductions

The number of Verified Carbon Units (VCUs) to be generated through the proposed AUD project activity at year t is calculated as follows:

$$VCU_t = REDD_t - VBC_t$$

$$VBC_t = (CBSLPA_t - CPSPA_t) * RF_t$$

Where:

VCU_t Number of Verified Carbon Units that can be traded at time t; tCO_2-e

$REDD_t$ Ex-ante estimated net anthropogenic greenhouse gas emission reductions attributable to the AUD project activity at year t; tCO_2-e ha^{-1}

VBC_t Number of Buffer Credits deposited in the VCS Buffer at time t; tCO_2-e

$CBSLPA_t$ Sum of baseline carbon stock changes in the project area at year t; tCO_2e

$CPSPA_t$ Sum of ex ante estimated actual carbon stock changes in the project area at year t; tCO_2-e ha^{-1}

RF_t Risk factor used to calculate VCS buffer credits; %

Note: RF_t is a risk factor to be determined using the latest version of the VCS-approved AFOLU Non-Permanence Risk Tool.

t 1, 2, 3 … T, a year of the proposed project crediting period; dimensionless

It is specified that the risk rating according to the AFOLU Non-Permanence Risk Tool is 10, being sub-divided into Internal Risk (5.0), External Risk (0) and Natural Risk (2.5), which is rounded up to 10 points.

Table 72: Ex ante estimated net anthropogenic GHG emission reductions ($\Delta REDDt$) and Voluntary Carbon Units (VCUt) (Table 36 of VM0015)

Year	Estimated baseline emissions (tCO2e)	Estimated project emissions (tCO2e)	Estimated leakage emissions (tCO2e)	Estimated net GHG emission reductions (tCO2e)
2019	8,605	861	430	7,314
2020	60,092	6,009	3,005	51,078
2021	72,084	7,208	3,604	61,271
2022	74,923	7,492	3,746	63,684
2023	77,287	7,729	3,864	65,694
2024	76,248	7,625	3,812	64,810
2025	82,785	8,279	4,139	70,368
2026	91,087	9,109	4,554	77,424
2027	101,105	10,110	5,055	85,939
2028	90,783	9,078	4,539	77,165
2029	99,177	9,918	4,959	84,300
2030	103,399	10,340	5,170	87,889
2031	108,947	10,895	5,447	92,605
2032	108,271	10,827	5,414	92,030
2033	109,692	10,969	5,485	93,238
2034	103,378	10,338	5,169	87,871
2035	110,929	11,093	5,546	94,290
2036	117,593	11,759	5,880	99,954
2037	107,770	10,777	5,388	91,604
2038	108,674	10,867	5,434	92,373
2039	103,406	10,341	5,170	87,895
2040	106,831	10,683	5,342	90,806
2041	118,458	11,846	5,923	100,689
2042	114,798	11,480	5,740	97,578
2043	122,492	12,249	6,125	104,118
2044	114,847	11,485	5,742	97,620
2045	120,421	12,042	6,021	102,358
2046	125,745	12,574	6,287	106,883

Year	Estimated baseline emissions (tCO2e)	Estimated project emissions (tCO2e)	Estimated leakage emissions (tCO2e)	Estimated net GHG emission reductions (tCO2e)
2047	119,807	11,981	5,990	101,836
2048	117,833	11,783	5,892	100,158
2049	131,387	13,139	6,569	111,679
Total	**3,108,850**	**310,885**	**155,442**	**2,642,522**

Table 73: Ex-ante Tradable VCUs and Buffer Credits

Ex ante VCUs tradable		**Ex ante buffer credits**	
annual VCU_t tCO_2-e	**cumulative VCU tCO_2-e**	**annual VBC_t tCO_2-e**	**cumulative VBC tCO_2-e**
6,579	6,579	735	735
45,944	52,524	5,134	5,869
55,106	107,630	6,165	12,034
57,268	164,898	6,416	18,450
59,067	223,965	6,627	25,077
58,264	282,229	6,546	31,624
63,254	345,484	7,113	38,737
69,593	415,077	7,831	46,568
77,243	492,319	8,696	55,264
69,340	561,659	7,825	63,089
75,750	637,409	8,550	71,640
78,976	716,385	8,913	80,553
83,216	799,601	9,389	89,942
82,696	882,297	9,334	99,276
83,781	966,077	9,457	108,733
78,951	1,045,028	8,921	117,654
84,723	1,129,751	9,567	127,221
89,816	1,219,567	10,137	137,358
82,305	1,301,872	9,299	146,657
82,995	1,384,867	9,378	156,035
78,966	1,463,833	8,929	164,964
81,585	1,545,419	9,221	174,185

Ex ante VCUs tradable		Ex ante buffer credits	
annual VCU_t tCO_2-e	cumulative VCU tCO_2-e	annual VBC_t tCO_2-e	cumulative VBC tCO_2-e
90,476	1,635,895	10,213	184,398
87,676	1,723,571	9,902	194,300
93,558	1,817,129	10,559	204,859
87,711	1,904,841	9,908	214,768
91,973	1,996,813	10,385	225,153
96,043	2,092,857	10,840	235,992
91,502	2,184,358	10,335	246,327
89,991	2,274,349	10,167	256,494
100,352	2,374,702	11,326	267,821

3.3 Monitoring

3.3.1 Data and Parameters Available at Validation

Data / Parameter	**CF**
Data unit	tC/tdm
Description	Default value of carbon fraction in biomass
Source of data	Values from the literature (e.g., IPCC 2003. Good practice guidance for land use, land-use change and forestry. Kanagawa: IGES, 2003. Available at: <http://www.ipccnggip. iges.or.jp/public/gpglulucf/gpglulucf.html>)
Value applied	0.5
Justification of choice of data or description of	The default value was used for conservativeness purposes.

measurement methods and procedures applied	
Purpose of Data	• Calculation of baseline emissions • Calculation of project emissions • Calculation of leakage
Comments	If new and more accurate carbon fraction data become available, these can be used to estimate the net anthropogenic GHG emission reduction of the subsequent fixed baseline period.

Data / Parameter	**44/12**
Data unit	Dimensionless
Description	Carbon mass to CO2e mass conversion factor
Source of data	From scientific literature: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 AFOLU
Value applied	44/12
Justification of choice of data or description of measurement methods and procedures applied	Conversion from C to CO2 based on molecular weights
Purpose of Data	• Calculation of baseline emissions • Calculation of project emissions • Calculation of leakage
Comments	IPCC standard value

Data / Parameter	**R**
Data unit	t root d.m.t^{-1} shoot d.m.
Description	Root to shoot ratio appropriate to species or forest type biome; note that as defined here, root to shoot ratio is applied as belowground biomass per unit area: aboveground biomass per unit area (not on a per stem basis)
Source of data	The “2006 IPCC Guidelines for National Greenhouse Gas Inventories”, V. 4, Ch. 4, AFOLU, pg. 4.49, Table 4-4.
Value applied	0.37
Justification of choice of data or description of measurement methods and procedures applied	Local values are not known, and the IPCC is a conservative value.
Purpose of Data	• Calculation of baseline emissions • Calculation of project emissions • Calculation of leakage
Comments	Peer-reviewed work performed in the region of the Project Area, with a similar vegetation typology. The statistical quality of model is in accordance with methodology requirements

Data / Parameter	**BEF**
Data unit	Dimensionless
Description	Biomass Expansion Factor
Source of data	According to “Brown, S., A. J. R. Gillespie, and A. E. Lugo, 1989. Biomass estimation methods for tropical forests with applications

	to forest inventory data. Forest Science, 35:881-902". (Table 4; pg. 890; minimum value deducted from lowest limit.: 1.743 - 0.083 = 1.66)
Value applied	1.66
Justification of choice of data or description of measurement methods and procedures applied	BEF was applied for conversion of merchantable volume to total aboveground tree biomass
Purpose of Data	• Determination of baseline scenario (AFOLU projects only) • Calculation of baseline emissions • Calculation of project emissions • Calculation of leakage
Comments	N/A

Data / Parameter	**Cab_{icl}**
Data unit	tCO2/ha
Description	Average carbon stock per hectare in the above-ground biomass carbon pool of initial forest class icl
Source of data	Third Brazilian Inventory of Anthropogenic Greenhouse Gas Emissions and Removals, pg 95, table 12. The conversion from total biomass to above-ground biomass is explained in Section 3.2.1.
Value applied	467

Justification of choice of data or description of measurement methods and procedures applied	Other secondary data was consulted, however the data from the Third Brazilian Inventory was chosen for being the most conservative. In order to convert the value from total biomass to above-ground biomass, the root-to-shoot ratio (0.37) was applied to calculate the above-ground biomass.
Purpose of Data	• Calculation of baseline emissions
Comments	NA

Data / Parameter	**Cbb_{icl}**
Data unit	tCO2/ha
Description	Average carbon stock per hectare in the below-ground biomass carbon pool of initial forest class icl
Source of data	Third Brazilian Inventory of Anthropogenic Greenhouse Gas Emissions and Removals, pg 95, table 12.
Value applied	173
Justification of choice of data or description of measurement methods and procedures applied	Other secondary data was consulted, however the data from the Third Brazilian Inventory was chosen for being the most conservative. In order to convert the value from total biomass to below-ground biomass, first the root-to-shoot ratio (0.37) was applied to calculate the above-ground biomass. The below-ground is the difference between the total and the above-ground biomass.
Purpose of Data	• Calculation of baseline emissions
Comments	NA.

Data / Parameter	**Cabfcl**
Data unit	tCO2/ha
Description	Average carbon stock per hectare in the above-ground biomass carbon pool of final post-deforestation class fcl
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, V. 4, Chapter 6: Grassland, pg. 6.27, Table 6.4 (for Pasture)
Value applied	15.63
Justification of choice of data or description of measurement methods and procedures applied	Conservative default value from IPCC, to estimate post-deforestation land use carbon stock.
Purpose of Data	• Calculation of baseline emissions
Comments	Conservative average to be used in calculations, based on uncertainties in source values.

Data / Parameter	**Cbbfcl**
Data unit	tCO2/ha
Description	Average carbon stock per hectare in the below-ground biomass pool of final post-deforestation class fcl
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, V. 4, Chapter 6: Grassland, pg. 6.27, Table 6.4 (for Pasture)
Value applied	*24.96*
Justification of choice of data or description of	Conservative default value from IPCC, to estimate post-deforestation land use carbon stock.

measurement methods and procedures applied	
Purpose of Data	• Calculation of baseline emissions
Comments	Conservative average to be used in calculations, based on uncertainties in source values.

Data / Parameter	**EI**
Data unit	N/A
Description	Ex ante estimated effectiveness index
Source of data	Local assessment
Value applied	0.9
Justification of choice of data or description of measurement methods and procedures applied	The project design team conservatively considers that surveillance activities are able to attain 90% of effectiveness in avoiding unplanned deforestation inside the Project Area.
Purpose of Data	• Calculation of project emissions
Comments	This value is an ex-ante estimate. Accurate and actual values will be monitored and reported in verification periods.

Data / Parameter	**DLF**
Data unit	N/A
Description	Displacement Leakage Factor
Source of data	Local assessment

Value applied	0.05
Justification of choice of data or description of measurement methods and procedures applied	If deforestation agents do not participate in leakage prevention activities and project activities, the Displacement Factor shall be 100%. Where leakage prevention activities are implemented, the factor shall be equal to the proportion of the baseline agents estimated to be given the opportunity to participate in leakage prevention activities and project activities. The project design team estimates that 100% of potential deforestation agents in the Reference Region will be given the opportunity to participate in leakage prevention activities. Projections of deforestation within the Leakage Belt have duly been made as part of the present project, according to projections of deforestation presented in Section 3.2.3. The project proponent has conservatively allowed 5% leeway on this estimate, which is unlikely to be surpassed. If this allowance is surpassed, an assessment of how much is due to the project will be conducted during monitoring. Thus, the "Displacement Leakage Factor" (DLF) was conservatively defined as 0.05. Leakage fighting activities are also listed in this PD, as fire brigade trainings, sustainable cattle raising etc.
Purpose of Data	• Calculation of leakage
Comments	This value is an ex-ante estimate. Accurate and actual values will be monitored and reported in verification periods

Data / Parameter	**Deforestation**
Data unit	ha
Description	Maps of forest cover areas converted into non-forest areas

Source of data	Measured through data from Mapbiomas project (if available) or supervised classification.
Value applied	Yearly variable: deforestation values are presented for the Reference Region, Leakage Belt and Project Area (projections) in this PD
Justification of choice of data or description of measurement methods and procedures applied	The project area is located within a region that is subject to a monitoring program that is approved or sanctioned by the national government (Mapbiomas). The data generated by this program is used in this project. Mapbiomas data are applicable for use in this project, according to the criteria listed below (Methodology VM0015): i) Mapbiomas monitoring occurs in the entire project area and leakage belt. ii) Mapbiomas monitoring occurs in the entire reference region and covers the beginning, middle and end of the fixed baseline period. iii) Mapbiomas monitors conversion of forest land to non-forest land. iv) Monitoring occurred during the entire fixed baseline period. v) data accuracies are acceptable according to the methodology criteria. An order of preference of data applies to the available sources of data: 1) Mapbiomas in first order of preference; 2) PRODES in second place; and 3) place self-classification of images.
Purpose of Data	• Calculation of baseline emissions
Comments	N/A

3.3.2 Data and Parameters Monitored

Data / Parameter	ACPAt
Data unit	Ha

Description	Annual area within the Project Area affected by catastrophic events at year t
Source of data	- Remote sensing data and GIS, - Supervisor reports
Description of measurement methods and procedures to be applied	The following sources will be monitored: - INMET (INMET. Instituto Nacional de Meteorologia). https://www.gov.br/agricultura/pt-br/assuntos/inmet?r=home/page&page=%20rede_estacoes_conv_graf - Periodic reports from area supervisor - INPE (INPE. Instituto Nacional de Pesquisas Espaciais. https://queimadas.dgi.inpe.br/queimadas/portal - itens 1 and 5)
Frequency of monitoring/recording	Each time a catastrophic event occurs
Value applied	The value will be calculated ex-post each time a catastrophic event occurs, when significant
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisition is performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analyzing the overall accuracy and kappa index obtained from a

	confusion matrix. The minimum accuracy of the classification mapping should be 80%.
Purpose of data	Calculation of project emissions.
Calculation method	Remote sensing and GIS
Comments	N/A

Data / Parameter	**ABSLLKt**
Data unit	ha
Description	Annual area of baseline deforestation within the leakage belt at year t
Source of data	Remote sensing data and GIS
Description of measurement methods and procedures to be applied	Deforestation in the leakage belt area will be considered activity displacement leakage. Activity data for the leakage belt area will be determined using the same methods applied to monitoring deforestation activity data in the project area.
Frequency of monitoring/recording	Annually
Value applied	Table 49
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisition is performed during the period of low incidence of clouds and rainfall in the region, within July and September.

	2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analyzing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 80%.
Purpose of data	• Calculation of leakage
Calculation method	Analysis of satellite images and maps
Comments	Where strong evidence can be collected that deforestation in the leakage belt is attributable to deforestation agents that are not linked to the project area, the detected deforestation will not be attributed to the project activity, thus not considered leakage.

Data / Parameter	**ABSLPAt**
Data unit	ha
Description	Annual area of baseline deforestation in the project area at year t
Source of data	Remote sensing data and GIS
Description of measurement methods and procedures to be applied	Forest cover change due to deforestation is monitored through periodic assessment of classified satellite imagery covering the project area.

Frequency of monitoring/recording	Annually
Value applied	Table 49
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisition is performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analysing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 80%.
Purpose of data	• Calculation of project emissions • Calculation of baseline emissions
Calculation method	Analysis of satellite images and maps
Comments	N/A

Data / Parameter	**ΔCADLKt**
Data unit	tCO_2e

Description	Total decrease in carbon stocks due to displaced deforestation at year t
Source of data	Remote sensing data and GIS
Description of measurement methods and procedures to be applied	Deforestation in the leakage belt area will be considered activity displacement leakage. Activity data for the leakage belt area will be determined using the same methods applied to monitoring deforestation activity data in the project area.
Frequency of monitoring/recording	Annually
Value applied	Table 70
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisition is performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analysing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 80%.
Purpose of data	• Calculation of leakage

Calculation method	Emissions from deforestation are estimated by multiplying the detected area of forest loss by the average forest carbon stock per unit area.
Comments	N/A

Data / Parameter	**ΔCPAdPAt**
Data unit	tCO_2e
Description	Total decrease in carbon stock due to all planned activities at year t in the project area.
Source of data	Documents, remote sensing and GIS.
Description of measurement methods and procedures to be applied	The planned activities in the project area that result in carbon stock decrease will be subject to monitoring, when significant.
Frequency of monitoring/recording	Annually.
Value applied	Table 69
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisition is performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed.

	4) Evaluation of classification accuracy is performed by analysing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 80%.
Purpose of data	• Calculation of project emissions
Calculation method	Emissions from all planned activities are estimated by the sum of the emissions from planned deforestation + emissions from planned logging activities + emissions from planned fuel-wood and charcoal activities.
Comments	N/A

Data / Parameter	**ΔCPSLKt**
Data unit	tCO2e
Description	Total annual carbon stock change in leakage management areas in the project case
Source of data	- Activity reports related to leakage prevention measures. - Field assessments. - Remote sensing and GIS.
Description of measurement methods and procedures to be applied	The planned activities in leakage management areas that result in carbon stock decrease will be subject to monitoring, when significant.
Frequency of monitoring/recording	Annually
Value applied	0

Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisition is performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analysing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 80%.
Purpose of data	• Calculation of leakage
Calculation method	Emissions from planned activities in leakage management areas are estimated by multiplying the detected area of forest loss by the average forest carbon stock per unit area.
Comments	N/A

Data / Parameter	**ΔCUDdPAt**
Data unit	tCO2e
Description	Total actual carbon stock change due to unavoided unplanned deforestation at year t in the project area
Source of data	Remote sensing and GIS

Description of measurement methods and procedures to be applied	Forest cover change due to unplanned deforestation is monitored through periodic assessment of classified satellite imagery covering the project area.
Frequency of monitoring/recording	Annually
Value applied	Table 69
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisition is performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analysing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 80%.
Purpose of data	• Calculation of project emissions
Calculation method	Emissions from unavoided unplanned deforestation are estimated by multiplying the detected area of forest loss by the average forest carbon stock per unit area.
Comments	N/A

Data / Parameter	**EBBPSPAt**
Data unit	tCO_2e
Description	Sum of (or total) actual non-CO_2 emissions from forest fire at year t in the project area
Source of data	Remote sensing data and GIS, - Supervisor reports.
Description of measurement methods and procedures to be applied	If forest fires occur, these non-CO_2 emissions will be subject to monitoring and accounting, when significant.
Frequency of monitoring/recording	Annually
Value applied	0
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisition is performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analysing the overall accuracy and kappa index obtained from a

	confusion matrix. The minimum accuracy of the classification mapping should be 80%.
Purpose of data	• Calculation of project emissions
Calculation method	Analysis of satellite images and maps to determine the incidence of deforestation and multiplying it by the respective emission factors.
Comments	If forest fires occur, these non-CO2 emissions will be subject to monitoring and accounting, when significant.

Data / Parameter	**EADLKt**
Data unit	tCO2e
Description	Total ex ante increase in GHG emissions due to displaced forest fires at year t
Source of data	Remote sensing data and GIS
Description of measurement methods and procedures to be applied	When significant, GHG emissions due displaced forest fires will be monitored.
Frequency of monitoring/recording	Annually
Value applied	Table 70
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisition is performed during the period

	of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analysing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 80%.
Purpose of data	• Calculation of leakage
Calculation method	Analysis of satellite images and maps to determine the incidence of deforestation and multiplying it by the respective emission factors.
Comments	Where strong evidence can be collected that forest fires in the leakage belt is attributable to deforestation agents that are not linked to the project area, the detected deforestation will not be attributed to the project activity, thus not considered leakage.

Data / Parameter	**RFt**
Data unit	%
Description	Risk factor used to calculate VCS buffer credits
Source of data	- VCS Non-Permanence Risk Report (v3.1), - Remote sensing data and GIS, - Supervisor report. - Literature data.

Description of measurement methods and procedures to be applied	All sources of data from the VCS Non-Permanence Risk Report will be used to measure the various risk factors.
Frequency of monitoring/recording	Annually
Value applied	10
Monitoring equipment	VCS-approved AFOLU Non-Permanence Risk Tool
QA/QC procedures to be applied	Literature data from reputed sources will be used and critically checked. When possible, the average of two or more sources will be used.
Purpose of data	• Calculation of VCS buffer credits
Calculation method	All the risk factors described in the VCS Risk Report were assessed.
Comments	N/A

Data / Parameter	**Deforestation in the project area and leakage belt**
Data unit	ha
Description	Forest cover areas converted into non-forest areas inside the Project Area and Leakage Belt
Source of data	Calculated through remote sensing images
Description of measurement methods and procedures to be applied	The monitoring of the forest cover in the Project Area and Leakage Belt will be done through satellite image analysis. When data from the Mapbiomas system are not available, the forest cover monitoring will be carried out by automatic classification

	and visual interpretation of images from other optical sensors or SAR data.
Frequency of monitoring/recording	Annually
Value applied	N/A
Monitoring equipment	Remote sensing images digital processing program, geographic information systems
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisition is performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analysing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 80%.
Purpose of data	Calculation of project emissions Calculation of leakage
Calculation method	Analysis of satellite images and maps
Comments	N/A

Data / Parameter	**ΔCabBSLLKt**
Data unit	tCO2e
Description	Total baseline carbon stock changes for the above-ground biomass pool in the leakage belt
Source of data	Calculated
Description of measurement methods and procedures to be applied	- leakage prevention activities will be listed; - a map showing areas of intervention and type of intervention will be created; - areas where leakage prevention activities impact carbon stock will be identified; - non-forest classes existing within these areas in the baseline case will be identified; - carbon stocks will be measured on the identified classes or conservative literature estimates will be used; - carbon stock changes in the leakage management areas under the project scenario will be reported using table 30b of the VM0015; - net carbon stock changes that the leakage prevention measures cause during the fixed baseline period and, optionally, the project crediting period will be calculated; - results of the calculations will be reported in table 30.c of the VM0015.
Frequency of monitoring/recording	To be determined depending on the activity
Value applied	0
Monitoring equipment	Remote sensing images digital processing program, geographic information systems

QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisition is performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analysing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 80%.
Purpose of data	• Calculation of leakage
Calculation method	Analysis of satellite images and maps to determine deforestation in Leakage Belt and multiplying it by the carbon stocks previously set.
Comments	N/A

3.3.3 Monitoring Plan

This Monitoring Plan was developed according to Methodology VM0015 "Methodology for Avoided Unplanned Deforestation", Version 1.1.3 The methodology encompasses three main monitoring tasks:

i) Monitoring of actual carbon stock changes and GHG emissions within the project area;

ii) Monitoring of leakage; and

iii) Ex post calculation of net anthropogenic GHG emission reduction.

This Monitoring Plan describes how these tasks will be implemented. For each task, the monitoring plan includes the following aspects:

a) Technical description of the monitoring tasks.

b) Data to be collected.

c) Overview of data collection procedures.

d) Quality control and quality assurance procedures.

e) Data archiving.

f) Organization and responsibilities of the parties involved in all the above.

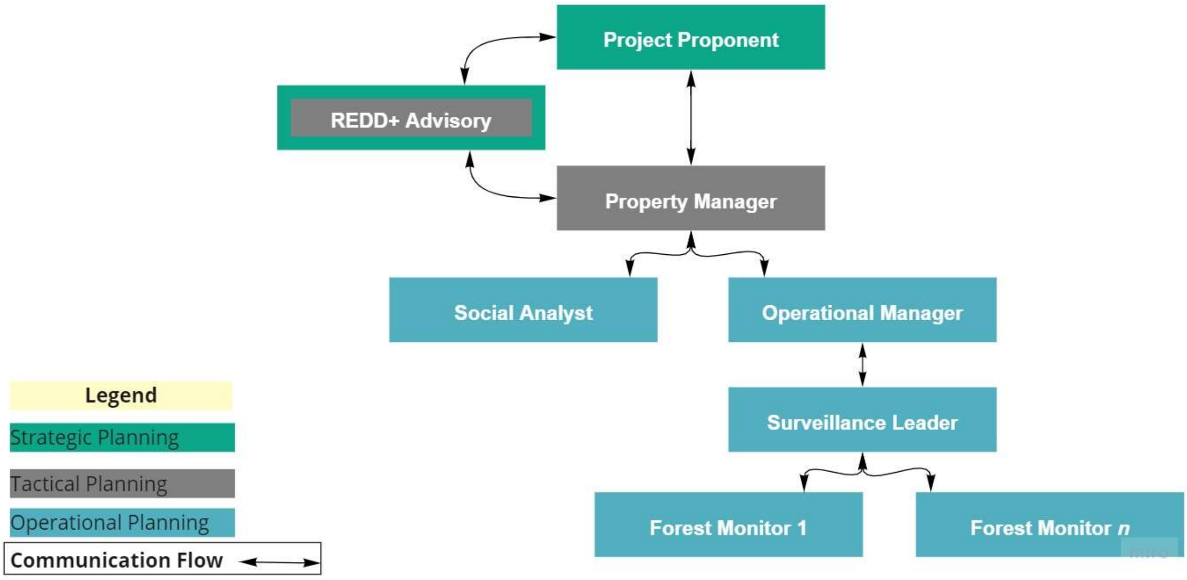


Figure 64. General overview of staff in the Project Area

3.3.3.1 Monitoring of actual carbon stock changes and GHG emissions within the project area

3.3.3.1.1 Monitoring of project implementation

a) Technical description of the monitoring tasks.

Project activities implemented within the project area will be monitored to be consistent with the management plans of the project area and the PD.

b) Data to be collected.

Monitoring of deforestation-avoidance activities will be performed by means of evaluations of the surveillance rounds, and using satellite imagery to continuously inspect the forest condition within the Project Area. All images, maps and records generated during project implementation should be conserved and made available to VCS verifiers at verification for inspection to demonstrate that the AUD project activity has actually been implemented.

Monitoring of social and biodiversity parameters of project implementation will be based on data presented in sections 4.4.2 and 5.4.2, respectively, which attest that foreseen activities are being effectively implemented. A system will be implemented to record data on costs and investments, based on invoices, receipts and contracts related to activity implementation, as well as signed attendance lists.

c) Overview of data collection procedures.

All invoices, receipts and contracts related to activities implemented in this REDD project shall be conserved in printed version. Whenever possible, documentation should be kept in electronic format.

d) Quality control and quality assurance procedures.

The project proponent will train personnel to collect and keep all documentation in a sure place, according to the Operating Procedure of Document and Record Control. All electronic documentation should also be sent to Carbonext to further security and checking.

e) Data archiving.

All maps and records generated during project implementation will be conserved and made available to VCS verifiers at verification. Backup copies of files should be available in the project proponent facilities, as well as in Carbonext facilities.

All documents and records will be kept in a secure retrievable manner for at least two years after the end of the project crediting period.

f) Organization and responsibilities of the parties involved in all the above.

The project proponents are responsible to implement this monitoring item. Carbonext is co-responsible in archiving, and quality control and quality assurance procedures.

Monitoring of land-use and land-cover change within the project area

a) Technical description of the monitoring tasks.

Monitoring of land-use and land-cover change within the Project Area will be performed annually by analyzing satellite imagery of the Project Area.

Imagery analysis of land use will be based on secondary information from Mapbiomas, referring mainly to the classes "Forest Land" and "Non-Forest Land".

b) Data to be collected.

The categories of change that will be subject to MRV-A (monitoring, reporting, verification and accounting) are "Area of forest land converted to non-forest land", "Area of forest land undergoing carbon stock decrease" and "Area of forest land undergoing carbon stock increase". These categories are mandatory in AUD project activities having the same characteristics as this project (i.e., planned logging above the baseline and claiming carbon credits for carbon stock increase).

In this context, data to be collected consists of annual satellite imagery processed by Mapbiomas, for the entire land coverage of Project Area.

The satellite images used will be four scenes of satellite Landsat 8 TM (orbits 001/65, 001/66, 233/65, and 233/66) to the total geographic scope of the Project Area and Reference Region.

c) Overview of data collection procedures.

The project area is located within a region that is subject to a monitoring program that is approved or sanctioned by the national government (Mapbiomas). The data generated by such program is used in this project. Mapbiomas data are applicable for use in this project, according to the criteria listed below (Methodology VM0015):

i) Mapbiomas monitoring occurs in the entire project area and leakage belt.

ii) Mapbiomas monitoring occurs in the entire reference region and covers the beginning, middle and end of the fixed baseline period.

iii) Mapbiomas monitors conversion of forest land to non-forest land.

iv) Monitoring occurred during the entire fixed baseline period.

d) Quality control and quality assurance procedures.

The validation of land-use data used for modeling of land use will be performed by using the confusion matrix, in order to calculate the overall index of success by period and by class. Three specific classes will be used: forest, accumulated deforestation and other (hydrography, not forest, clouds, roads, residues, unclassified objects, and others).

The validation will be performed by using the land use mapping Mapbiomas. The satellite images used will be four scenes of satellite Landsat 8 TM (orbits 001/65, 001/66, 233/65, and 233/66) to the total geographic scope of the Project Area and Reference Region.

With the help of the "Create Random Points" tool in ArcGIS 10.0, 100 random points will be generated for each class / year as samples for evaluation, using satellite images as reference, making it possible to generate a confusion matrix for calculation of the accuracy indexes, and the Kappa index (indicators for validation of mapping accuracy).

Land use classes must have higher values than 90% accuracy for the accuracy and Kappa index, as required in VM00015 1.1.3 methodology.

e) Data archiving.

All maps and records generated during project implementation will be conserved and made available to VCS verifiers at verification for inspection to demonstrate that the AUD project activity has actually been implemented.

All documents and records will be kept in a secure retrievable manner for at least two years after the end of the project crediting period.

f) Organization and responsibilities of the parties involved in all the above.

All satellite imagery assessments will be performed by Carbonext, also responsible for reporting and data archiving, according to VM0015, and for providing assistance during verification audits.

3.3.3.1.2 **Monitoring of carbon stock changes and non-CO2 emissions from forest fires**

a) Technical description of the monitoring tasks.

Monitoring of carbon stocks is mandatory in the following cases:

Within the project area:

a) Areas subject to unplanned and significant carbon stock decrease, e.g., due to uncontrolled forest fires and other catastrophic events. In these areas, carbon stock losses must be estimated as soon as possible after the catastrophic event.

Within leakage management areas:

a) Areas subject to planned and significant carbon stock decrease in the project scenario according to the ex-ante assessment. In these areas, carbon stocks must be estimated at least once after the planned event that caused the carbon stock decrease.

b) Data to be collected.

The results of monitoring activity data and carbon stocks must be reported using the same formats and tables used for the ex-ante assessment, according to Methodology VM0015 (the applicability of each table must be evaluated ex post, in the Monitoring Report):

Table 15 Ex post carbon stock per hectare of initial forest classes icl existing in the project area and leakage belt.

Table 16 Ex post carbon stock per hectare of final classes fcl existing in the project area and leakage belt.

Table 25.a Ex post carbon stock decrease due to planned and unplanned deforestation in the project area.

Table 25.c Ex post carbon stock decrease due to planned fuel-wood and charcoal activities.

Table 25.d Total ex post carbon stock decrease due to planned activities in the project area.

Table 25.e Ex post carbon stock decrease due to forest fires.

Table 25.f Ex post carbon stock decrease due to catastrophic events.

Table 25.g Total ex post carbon stock decrease due to forest fires and catastrophic events.

Table 26.a Ex post carbon stock increase due to growth without harvest.

Table 26.c Ex post carbon stock increase following planned fuel-wood and charcoal activities.

Table 26.d Total ex post carbon stock increase due to planned activities in the project area.

Table 26.e Ex post carbon stock increase on areas affected by forest fires.

Table 26.f Ex post carbon stock increase on areas affected by catastrophic events.

Table 26.g Ex post carbon stock increase on areas recovering after forest fires and catastrophic events.

Table 27 Ex post total net carbon stock change in the project area.

Non-CO_2 emissions from forest fires are subject to monitoring and accounting, when significant. In this case, under the project scenario it will be necessary to monitor the variables of table 23 within the project area and to report the results in table 24, according to VM0015.

Decreases in carbon stocks and increases in GHG emissions (e.g., in case of forest fires) due to natural disturbances (such as hurricanes, earthquakes, volcanic eruptions, tsunamis, flooding, drought, fires, tornados or winter storms) or man-made events, including those over which the project proponent has no control (such as acts of terrorism or war), are subject to monitoring and must be accounted under the project scenario, when significant. Use tables 25.e, 25.f and 25.g to report carbon stock decreases and, optionally, tables 26.e, 26.f and 26.g to report carbon stock increases that may happen on the disturbed lands after the occurrence of an event. Use tables 23 and 24 to report emissions from forest fires.

If the area (or a sub-set of it) is affected by natural disturbances or man-made events generated VCUs in past verifications, the total net change in carbon stocks and GHG emissions in the area(s) that generated VCUs must be estimated, and an equivalent amount of VCUs must be cancelled from the VCS buffer.

Summarize the results of all ex-post estimations in the project area using the same table format used for the ex-ante assessment:

Table 29: Total ex post estimated actual net changes in carbon stocks and emissions of GHG gases in the project area.

c) Overview of data collection procedures.

The project area is located within a region that is subject to a monitoring program that is approved or sanctioned by the national government (Mapbiomas). The data generated by such program is used in this project. Mapbiomas data are applicable for use in this project, according to the criteria listed below (Methodology VM0015):

i) Mapbiomas monitoring occurs in the entire project area and leakage belt.

ii) Mapbiomas monitoring occurs in the entire reference region and covers the beginning, middle and end of the fixed baseline period.

iii) Mapbiomas monitors conversion of forest land to non-forest land.

iv) Monitoring occurred during the entire fixed baseline period.

d) Quality control and quality assurance procedures.

The validation of land-use data used for modeling of land use will be performed by using the confusion matrix, in order to calculate the overall index of success by period and by class. Three specific classes will be used: forest, accumulated deforestation and other (hydrography, not forest, clouds, roads, residues, unclassified objects, and others).

The validation will be performed by using the land use mapping Mapbiomas. The satellite images used will be four scenes of satellite Landsat 8 TM (orbits 001/65, 001/66, 233/65, and 233/66) to the total geographic scope of the Project Area and Reference Region.

With the help of the "Create Random Points" tool in ArcGIS 10.0, 100 random points will be generated for each class / year as samples for evaluation, using satellite images as reference, making it possible to generate a confusion matrix for calculation of the accuracy indexes, and the Kappa index (indicators for validation of mapping accuracy).

Land use classes must have higher values than 90% accuracy for the accuracy and Kappa index, as required in VM00015 1.1 methodology.

e) Data archiving.

All maps and records generated during project implementation will be conserved and made available to VCS verifiers at verification for inspection to demonstrate that the AUD project activity has actually been implemented.

All documents and records will be kept in a secure retrievable manner for at least two years after the end of the project crediting period

f) Organization and responsibilities of the parties involved in all the above.

All satellite imagery assessments will be performed by Carbonext, also responsible for reporting and data archiving, according to VM0015, and for providing assistance during verification audits.

3.3.3.2 Monitoring of leakage

a) Technical description of the monitoring tasks.

The sources of leakage identified as significant in the ex-ante assessment are subject to monitoring. Two sources of leakage are potentially subject to monitoring:

- Decrease in carbon stocks and increase in GHG emissions associated with leakage prevention activities;

- Decrease in carbon stocks and increase in GHG emissions in due to activity displacement leakage.

This Project Activity does not involve decrease in carbon stocks and increase in GHG emissions associated with leakage prevention activities. In this project, leakage prevention activities do not involve any carbon stock reduction due to deforestation or additional emissions caused by increased grazing activities. In this case, only the decrease in carbon stocks and increase in GHG emissions in due to activity displacement leakage will be monitored.

b) Data to be collected.

Deforestation above the baseline in the leakage belt area will be considered activity displacement leakage.

The result of the ex-post estimations of carbon stock changes must be reported using the same table formats used in the ex-ante assessment of baseline carbon stock changes in the leakage belt.

Table 22.c.1. Ex post above-ground net carbon stock changes in the leakage belt.

Table 22.c.2. Ex post below-ground net carbon stock changes in the leakage belt.

Table 22.c.6. Ex post net carbon stock changes in the wood products in the leakage belt.

Where strong evidence can be collected that deforestation in the leakage belt is attributable to deforestation agents that are not linked to the Project Area, the detected deforestation will not be attributed to the Project Activity and considered leakage. The operational entity verifying the monitoring data shall determine whether the documentation provided by the project proponent represents sufficient evidence to consider the detected deforestation as not attributable to the Project Activity and therefore not leakage.

To estimate the increased GHG emissions due to forest fires in the leakage belt area the assumption is made that forest clearing is done by burning the forest. The parameter values used to estimate emissions shall be the same used for estimating forest fires in the baseline (table 23), except for the initial carbon stocks (Cab, Cdw) which shall be those of the initial forest classes burned in the leakage belt area.

Report the result of the estimations using the same table formats used in the ex-ante assessment of baseline GHG emissions from forest fires in the project area:

Table 23: Parameters used to calculate emissions from forest fires in the leakage belt area.

Table 24: Ex post estimated non-CO_2 emissions from forest fires in the leakage belt area.

The results of all ex-post estimations of leakage are summarized using the same table format used for the ex-ante assessment:

Table 35. Total ex post estimated leakage.

c) Overview of data collection procedures.

The project area is located within a region that is subject to a monitoring program that is approved or sanctioned by the national government (Mapbiomas). The data generated by such program is used in this project. Mapbiomas data are applicable for use in this project, according to the criteria listed below (Methodology VM0015):

i) Mapbiomas monitoring occurs in the entire project area and leakage belt.

ii) Mapbiomas monitoring occurs in the entire reference region and covers the beginning, middle and end of the fixed baseline period.

iii) Mapbiomas monitors conversion of forest land to non-forest land.

iv) Monitoring occurred during the entire fixed baseline period.

d) Quality control and quality assurance procedures.

The validation of land-use data used for modeling of land use will be performed by using the confusion matrix, in order to calculate the overall index of success by period and by class. Three specific classes will be used: forest, accumulated deforestation and other (hydrography, not forest, clouds, roads, residues, unclassified objects, and others).

The validation will be performed by using the land use mapping Mapbiomas.The satellite images used will be four scenes of satellite Landsat 8 TM (orbits 001/65, 001/66, 233/65, and 233/66) to the total geographic scope of the Project Area and Reference Region.

With the help of the "Create Random Points" tool in ArcGIS 10.0, 100 random points will be generated for each class / year as samples for evaluation, using satellite images as reference, making it possible to generate a confusion matrix for calculation of the accuracy indexes, and the Kappa index (indicators for validation of mapping accuracy).

Land use classes must have higher values than 90% accuracy for the accuracy and Kappa index, as required in VM00015 1.1 methodology.

e) Data archiving.

All maps and records generated during project implementation will be conserved and made available to VCS verifiers at verification for inspection to demonstrate that the AUD project activity has actually been implemented.

All documents and records will be kept in a secure retrievable manner for at least two years after the end of the project crediting period.

f) Organization and responsibilities of the parties involved in all the above.

All satellite imagery assessments will be performed Carbonext, also responsible for reporting and data archiving, according to VM0015, and for providing assistance during verification audits. The Project Proponent is co-responsible for data archiving.

3.3.3.3 Ex post calculation of net anthropogenic GHG emission reduction

a) Technical description of the monitoring tasks.

The calculation of ex post net anthropogenic GHG emission reductions is similar to the ex-ante calculation with the only difference that ex post estimated carbon stock changes and GHG emissions must be used in the case of the project scenario and leakage.

b) Data to be collected.

Report the ex post estimated net anthropogenic GHG emissions and calculation of Verified Carbon Units (VCUt, and VBCt) using the same table format used for the ex-ante assessment:

Table 36: Ex post estimated net anthropogenic GHG emission reductions and VCUs.

c) Overview of data collection procedures.

Data collection procedures are the same as described in previous steps. This step involves compilation of data from previous procedures to calculate ex post net anthropogenic GHG emission reduction.

d) Quality control and quality assurance procedures.

A map showing Cumulative Areas Credited within the project area shall be updated and presented to VCS verifiers at each verification event. The cumulative area cannot generate additional VCUs in future periods.

e) Data archiving.

All maps and records generated during project implementation will be conserved and made available to VCS verifiers at verification for inspection to demonstrate that the AUD project activity has actually been implemented.

All documents and records will be kept in a secure retrievable manner for at least two years after the end of the project crediting period.

f) Organization and responsibilities of the parties involved in all the above.

All satellite imagery assessments will be performed by Carbonext, also responsible for reporting and data archiving, according to VM0015, and for providing assistance during verification audits.

3.3.3.4 Revisiting the baseline projections for future fixed baseline period

According to VM0015, the baseline will be revisited every 6 years. Thus, the first revision of the baseline is scheduled for 2025. For this purpose, the following tasks will be carried out:

- Updating information on agents, drivers and underlying causes of deforestation, which involves the following sub-tasks:
    - Collecting information that is relevant to understand deforestation agents, drivers and underlying causes;
    - Redoing step 3 of the ex-ante methodology, as specified in the methodology;
    - Recalibrating the model for projection of future deforestation, using new “Factor Maps” for the subsequent fixed baseline period.

- Adjusting the land-use and land-cover change component of the baseline, which involves reassessing the following components of the baseline projections:
    - The annual areas of baseline deforestation.
    - The location of baseline deforestation.
    - Adjustment of the annual areas of baseline deforestation.

- Adjustment of the location of the projected baseline deforestation.

Adjusting, as needed, the carbon component of the baseline (this task will only be carried out if more accurate methods for carbon stocks estimates are available in the occasion of baseline revision).

3.3.4 Dissemination of Monitoring Plan and Results (CL4.2)

The dissemination of the results of the monitoring and verification will be published mainly on the internet through the Carbonext's website, and also on the Verra platform page as usual. Considering that some local communities don´t have access to internet, during the onsite visits print versions of the summary results will be made available to community members and provided to any individual or institution, under request. The established frequency is annually or before any new verification, or visitation periods, to enhance the importance and effectiveness of the project, an Operating Procedure on Annual Activities Report is being implemented. Other dissemination ways can be also adopted to give total transparency to the project, such as social networks.

3.4 Optional Criterion: Climate Change Adaptation Benefits

3.4.1 Regional Climate Change Scenarios (GL1.1)

The State of Acre is already facing the impacts from climate change, suffering with two different extremes: severe drought and heavy rain and storms. Cities as Rio Branco have been impacted by intense fires, as well as floods, both happening outside the months that the events used to take place.[122]

Also, it is known that within the conversion from forest to another land use, as pasture, the area is burned. The area where the project is located was mapped as one of the regions in the Amazon that were still to be burned in the last few years.[123] With the increase of deforestation and fires, as shown in the figure below, the impact in the region is projected to increase.

[122] Source: https://g1.globo.com/ac/acre/noticia/2019/09/12/no-ac-gestora-diz-que-mudancas-climaticas-globais-afetam-diretamente-o-clima-na-amazonia.ghtml
[123] Source: https://ipam.org.br/area-desmatada-na-amazonia-a-ser-queimada-em-2020-pode-superar-os-45-mil-km2/

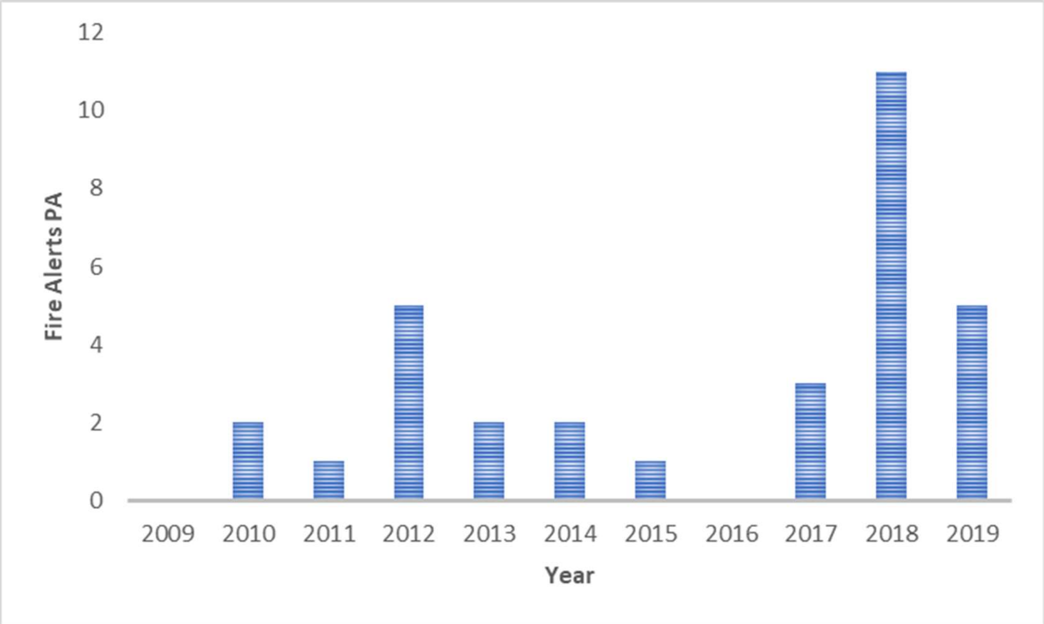


Figure 65: Fire alerts within the project area (PA) over the historical reference period

Deforestation and climate change are expected to increase the risk of heat stress in the Amazon. Studies show that the forest is close to reaching a tipping point, with 25% of deforestation of the forest, where the process of savannization will become irreversible. The deforestation in 2021 was near 20%. The consequences are the decrease of moisture recycling and decrease of rain, which will turn the forest dry and flammable, creating a vicious cycle of fires and degradation, compromising the biotic pump and weakening the flying rivers. The majority of water that feeds the Amazon hydrologic cycle is transported by the flying rivers.[124]

3.4.2 Climate Change Impacts (GL1.2)

Communities near the project area are already facing impacts from the climate change, as heavy rain, drought and fire events[125]. This is affecting, and is expected to affect even more, the quality of life and well-being of the communities. The rainy season prohibit them to exit the community area, which impacts the sale of products in the neighbouring cities. The quality of the roads during this season was one of the problems identified during the community diagnosis. It also puts in risk the housing infrastructure and the crops that are cultivated for their subsistence.

[124] Source: dw.com/pt-br/processo-de-savanização-da-amazônia-já-começou/a-58809139

[125] https://diaadianoticia.com.br/de-enchentes-a-seca-acre-enfrenta-era-dos-extremos-climaticos/ ; https://agenciabrasil.ebc.com.br/geral/noticia/2019-08/acre-decreta-emergencia-por-causa-de-seca-e-incendios-florestais ; https://g1.globo.com/ac/acre/noticia/2022/05/03/acre-tem-aumento-de-120percent-no-numero-de-focos-de-calor-em-um-ano-aponta-inpe.ghtml

On the other hand, the presence of droughts and fires also threatens the community and the biodiversity. Changes in the reproductive cycle of plants and animals may happen, which will lead to a decrease in biodiversity. Droughts are likely to affect the community by impacting the irrigation, the loss of fishing potential, the reducing of agricultural production, which will impact their food security.

3.4.3 Measures Needed and Designed for Adaptation (GL1.3)

In order to assist the communities and the biodiversity on the impacts of the climate change, the community will be trained in fire brigade, which will give them the knowledge and tools needed to combat events of fire in the community area.

Also, the Hiwi REDD+ Project is establishing the Emergency Fund for Adaptation to Extreme Weather Events. This fund will be used in the cases of adverse weather events and its implementation will begin with the emission of carbon credits, after the project verification.

4 COMMUNITY

4.1 Without-Project Community Scenario

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

There are no community, community groups, quilombos or indigenous groups living within PA. The scenario without-project presents socioeconomic indicators[126], which characterize a region with low income and well-being conditions due to limitation of the productive activities, lack of better production techniques, difficulties in the outflow of production, as well as access to the consumer market.

Of the 18 settlements located in the 20-km buffer of the project area, 7 were selected to be the focal group of the project activities, as shown in the map below. The selection of local communities was made giving priority mainly to the neediest communities living closest to the four areas of the project, considering their level of dependence of the project area and access conditions. Of the 7 communities visited, the communities of PA Carão, PA Espinhara II, PA Limoeiro and PA Luz da Vida borders the project area. On the other hand, others such PA Antônio de Holanda and PA Dom Moarcir, have facilitated access via federal road BR-364, expect for the PA Figueira. The activities will take place according to the needs and

[126] https://cidades.ibge.gov.br/brasil/ac/bujari/panorama

characteristics of each community, i.e, activities related to health will be offered in community where the health is precarious.

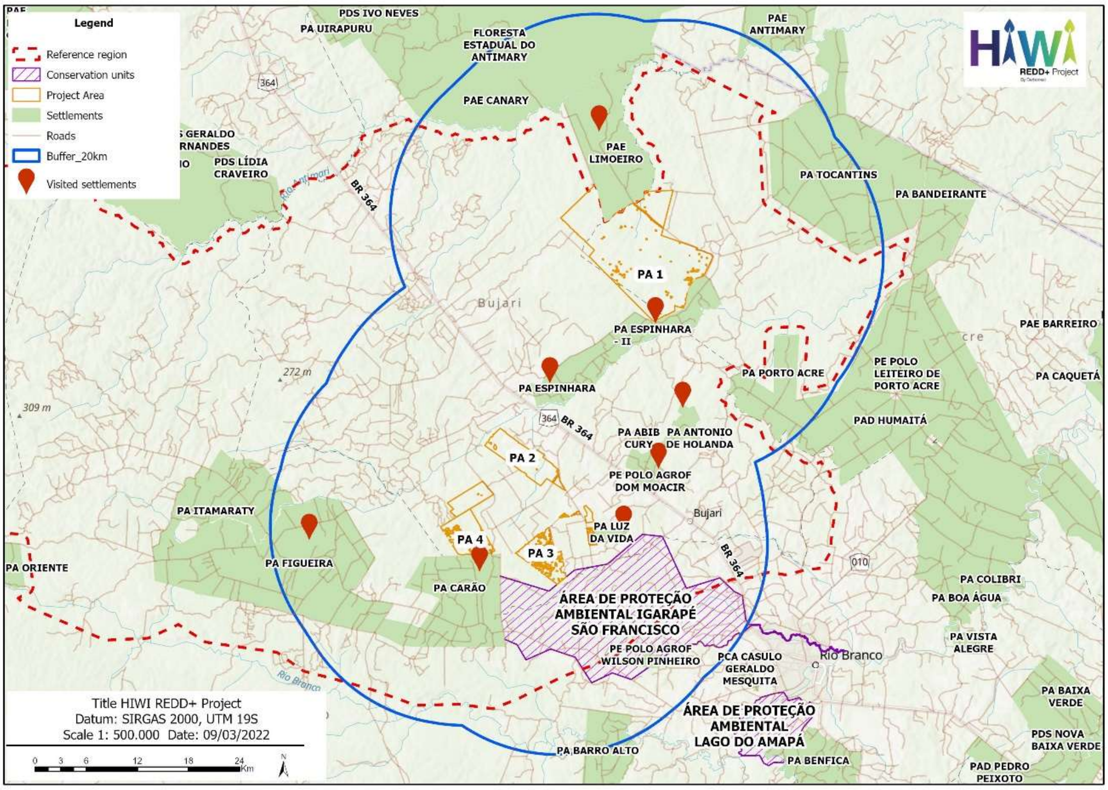


Figure 66: Mapping of Settlements selected for the project activities

According to data based on IBGE (2010)[127], approximately 35% of the population from Bujari lives with no income and 15% with more than half up to one national minimum wage, i.e. ca. 246,34 USD/month, as established by the Brazilian legislation[128].

The population growth in the region is related to the construction of the BR-364 highway, where families were settling along the road in the stretch connecting the municipalities of Rio Branco to Sena Madureira and, in the face of pressure from the population, the government acquired possession of land to reverse in urban lots and distribute among families, and so other communities emerged[129].

127 https://cidades.ibge.gov.br/brasil/ac/bujari/pesquisa/23/22787?detalhes=true
128 MEDIDA PROVISÓRIA Nº 1.091, DE 30 DE DEZEMBRO DE 2021
129 http://www.cnm.org.br

The majority are former by families that practice subsistence agriculture, also small raise cattle and other small animals such as chickens and pigs. Some of the families fish in the near rivers or igarapés. 4WD vehicles are a very important mode of transportation for families living throughout the region, since the secondary roads that allowed access are precarious. The data presented in the figure below shows the rise of deforestation from 2008 to 2021 into the immediate municipalities surrounding the project area. In 2019, year of the project start date, the area faced and increase in deforestations, with an annual increase of 23,05 km^2 in Porto Acre, 26,16 km^2 in Bujari, while Rio Branco the growth was of 80,03 km^2 [130].

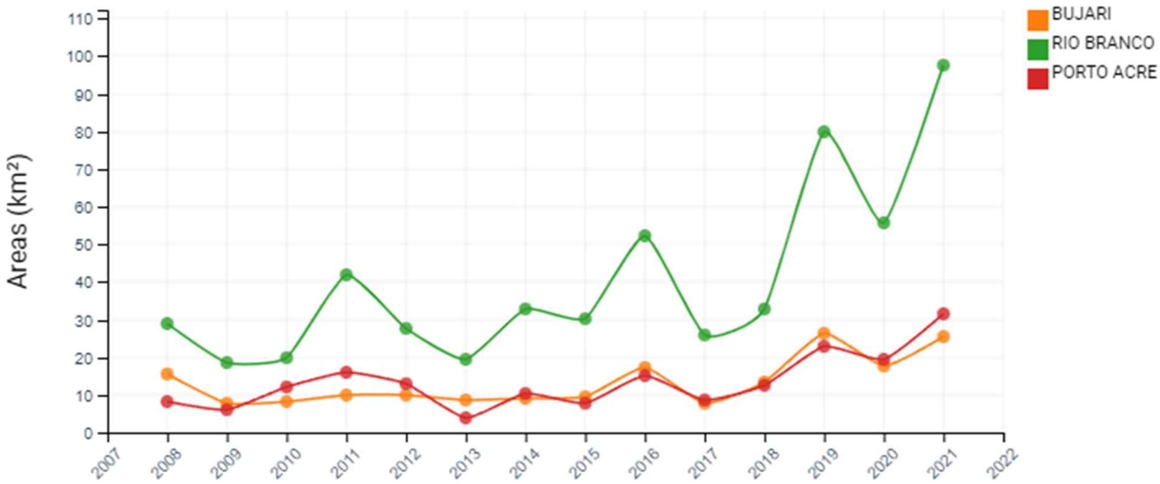


Figure 67: Annual increase of deforestation (km^2) into three municipalities: Porto Acre, Bujari and Rio Branco[131]

Another important observation is the need for access to public policies and the guarantee of exceptional rights in communities, such as access to education, wastewater management system, energy and public health. As reported by local population, mentioned that they need to buy water from water tank truck due to not having access to water supply system.

A significant portion of the families living in settlements (called Agro-extractivist Settlement Project) are not the same as those in the occupation process. This situation has occurred due to the barriers that have been imposed by the State, which simply settled the families in the location, and has not been providing the technical and social assistance to the farmers[132].

[130] http://terrabrasilis.dpi.inpe.br/app/dashboard/deforestation/biomes/amazon/increments
[131] http://terrabrasilis.dpi.inpe.br/app/dashboard/deforestation/biomes/amazon/increments
[132] https://www.scielo.br/j/asoc/a/ThmrGwNdx4PG6gRz6Lq8P6H/?format=pdf&lang=pt

More detailed mapping and identification of local settlement communities was done based on the participation of more than 70 respondents, conducted during the months of February and April of 2022 and collected on 7 different communities living in the 20-km buffer around the PA, located mainly in the municipality of Bujari, as showed in the Table below.

Table 74: Results from the Socioeconomic diagnosis

Main Economic Activities	Small-scale cattle ranching, family agriculture (vegetable garden, cassava, corn, watermelon) and extrativism (nuts, açai). Those that does not perform those activities rely on government assistance.
Religion	Christian and Evangelic Church
Adults Educational Level	Elementary Education
Housing infrastructure	Houses made of wood or masonry. Some houses do not have bathroom, and those that have, do not have any type of sanitation system.
School	Presence of one school per community, with regular quality. It lacks professionals.
Health Quality	Bad quality, not all communities have a health center, one of them does not have access to energy, and in both there are no specialized professionals.
People living below de poverty line	Yes. In some communities, the number reaches up to 80% of the members, in other the number is lower, but present.
Community Infrastructure	No one community has connection to the public water supply system, the water comes from tank trunk for drink or in some cases is collected through small dams or wells. One community does not have access to energy, that is still to be installed by the County. None of the community have sanitation system.

Women	Represents around half the population, and work with agriculture or house works
Motherhood	Average of 75% of women are mothers, with as average of 2 children, and first pregnancy at the age of 15 to 17 years old.
Children	The children go to school and help their family on the farming activities.
Climate Change Impacts	Heat waves and long draughts periods.
Vulnerabilities	Forest fires during the dry season
Traditional Cultural Activities	The main culture identified is the planting that passed from one generation to the next
Health and Safety	There is a lack of health and safety practices on the activities performed. One community reported that the only object used for protection is hats and long-sleeve shirts.
Conflicts	No conflicts were identified.
Leadership	Some communities have an Association, with the presence of a President. Other have the priest as the leadership figure.

4.1.2 Interactions between Communities and Community Groups (CM1.1)

In poor communities, where there is difficulty in accessing services that bring wellbeing to the population, the only places that promote the role to bring information to the population are those that must exist by law, such as health centres and schools. The interaction between communities happens mainly when the population uses public services, in places as those mentioned. For example, one observed situation was children from different communities attending the same school, thus promoting interaction between them, as well as between their respective guardians.

Also, they are organized in their self-managed communities and choose a local leader or representative to represent them as associations or cooperative. At these organizations, periodic meetings are held to address the most diverse topics of interest to the community.

4.1.3 High Conservation Values (CM1.2)

The High Conservation Values, within the context of community well-being, are areas that provide critical ecosystem services; areas that are fundamental for the livelihoods of communities and areas that are critical for the traditional cultural identity of communities.

Within the context of the socio-economic diagnosis performed, some cultural, historical and relevant aspect are raised for local traditional communities, which characterize High Conservation Values area, which must be identified and managed in order to guarantee their maintenance and improvement[133]. Areas and resources that maintain the basic needs of local communities were identified, as well as areas of special culturally, economically and religious importance to local communities, as listed below.

High Conservation Value	Culturally significant area: Association of Rural Producers of the Dom Moacir Agroforestry Polo – PA Dom Moacir
Qualifying Attribute	Provides technical support for small producers living in the community, aiming the commercialization of their products, and enforcing of the public policies for agricultural production.
Focal Area	Protective measures such as signs and monitoring of the maintenance of the structural integrity will be carry out with the aim of reducing possible negative impacts.

High Conservation Value	Food source: Cassava – especially to those living in the surroundings the project area.
Qualifying Attribute	As traditional aspect, cassava is one of the main food source of carbohydrate to all Amazonian communities, most of the families cultivate cassava for manufacture of flour and others products, important in their daily diet.
Focal Area	The Hiwi REDD+ Project seeks to stimulate and improve knowledge about local biodiversity through studies to be carried out, i.e. about flora and fauna, in this case, more specifically of the flora of the region.

133 BROWN et al., 2013. Common Guidance for the Identification of HIGH CONSERVATION VALUES. Proforest. Resource Network. Available at: Common Guidance for the Identification of HCV.pdf

High Conservation Value	Food source: Brazilian nuts (Bertholletia excelsa fruits) - throughout the region, especially on the borders with the Project Area.
Qualifying Attribute	Nuts are widely in traditional Amazonian dishes. In addition, this non-timber forest product represents a great income source to small producers and communities during offseason.
Focal Area	During the fauna inventory all the “Castanheiras” will be mapped and identified, in order to warn surrounding communities to preserve and ensure the continuity of their use as a additional source of income. In addition, Brazil nut tree is protected by Brazilian federal law (DECRETO Nº 5.975 DE 30 DE NOVEMBRO DE 2006), which its total or partial suppression constitute an illegal activity.

High Conservation Value	Religious Significant Area: Monte Shalom – located in PA Antônio Holanda
Qualifying Attribute	It is a place of religious veneration founded on the principles of the Catholic Church present in several places around the world. In the northern region of Brazil, it arrived in 1999 through missionaries with the purpose of taking the Gospel of Jesus Christ to all men and women, especially those far from Christ and the Church.
Focal Area	Religions people in the surroundings of the project area.

High Conservation Value	Economically and socially significant area: Community Associations
Qualifying Attribute	Location of great importance for the livelihood of communities, responsible for maintaining the organization of the settlement and the communication between the members, also has the role of promoting meetings, workshops and celebration of typical festivals.
Focal Area	Community members

4.1.4 Without-Project Scenario: Community (CM1.3)

In the without-project scenario, the communities are expected to continue to maintain the same socioeconomic condition as prior to the project initiation. Most of the communities are characterized by a low social and economical well-being, depending on subsistence farms activities, such as cattle, nuts and crops. Due to the distance from the nearest major city and the poor quality of the roads, especially in the raining season, most of them cannot depend on selling of products. Thus, crops or livestock raised are used mainly to maintain the communities' members.

In addition, as reported by local families, it is very commonly practiced in traditional communities to use fires for clearing up fields to start a new crop, since they do not have the resources use of tractors and large machinery. They remove the grass to initiate other types of small-scale cultivation, such as cassava, corn, rice, bean and among others. On the other hand, non- intentional burning influences on soil structure and composition, affects carbon storage, can result in the reduction of forest cover and a large amount of GHG emission into the atmosphere.

The education offered is of low quality, the schools have a deficient infrastructure, the teaching is multi-serial and offered by a few teachers, as a result, there is a high degree of illiteracy and functional illiteracy. Some communities have low access to the education system, with no presence of schools. Many students live more than 10 km away from the schools, because of this there is a deficit of students to attend the school. Thus, many children and adolescents stop studying due to the precariousness of the roads, the transport conditions are incipient, as well as the long distances from their homes to school. Water comes from tank truck and is used for drinking, preparing food, washing dishes, clothes and bathing. Some schools have no connection to the public water supply system, depending on water tankers trucks to supply a reservoir. There is no water potability analysis and in many situations, the amount of water is not enough. The garbage is either burned or simply thrown away in an open gully. The energy is provided in most cases by batteries systems, where it is only possible to have classes during the day. The activities proposed by the project aim to mitigate the potential agents and vectors of deforestation in the region, where in situation found is caused by the low level of schooling and consequent difficulty in getting jobs, and thus increasing the illegal deforestation. The activities aimed at education will bring to the communities new goals to improve quality of life, in addition to promoting environmental education through the incentive for sustainable practices.

Figure 68: Public School João de Deus Rodrigues located at PA Dom Moacir Community

The access to health care is limited and precarious. The health centre in one of the communities does not have access to energy and, in all the settlements visited, it lacks the presence of specialized professionals. Also, there is no sanitation system, which increases the risk of spreading diseases. In this sense, the project activities aim the articulation with the public authorities to support health programs to enhance the effectiveness of services to benefiting communities within the reference region. Example of services can be given such as, expansion of vaccination coverage and sporadically actions involving visits by a doctor or nurse.

Regarding the employees from the proprieties, the scenario without the project tends to be limited by the absence of people prepared to respond to emergencies such as forest fires, irregular occupations e mechanisms to guarantee the permanence of the forest.

In these cases, the project foresees trainings and instruction on operating procedures for workers involved in the forest management operation, considering fire brakes implementation, formation and equipment of fire brigades, as well as periodic monitoring and surveillance.

Given the scenario identified in the communities, it was design project activities in order to generate positive impact and changes in their well-being. As mentioned in the item 2.1.11, the following changes are expected to happen due to the activities:

Table 75: Project Activities and Expected Impacts

Scope	Project Activity	Expected Impact
Low income	Training on Fire Brigade	Capacitate the community so they can be hired to fight fires when needed.
Health	Health and safety workshops/activities	Improved health and quality of life; Reduction of cases of infectious diseases.
Low income	Activities for the economic development of low carbon production practices	Increase in general knowledge and technical training in economic activities with low carbon emission
Education	Educational workshops on environmental topics	Greater environmental awareness.
Low income	Creation of jobs position, directly or indirectly	Increase in income and quality of life.
Gender equality	Presence of women in the activities	Increase in women's income and empowerment.
Surveillance	Improvements in the infrastructure of the establishments and surveillance bases in the project area	Guarantee good working and wellbeing conditions for the project workers.
Project workers	Provision of personal protective equipment for	Guarantee safety and good working conditions for the project workers.

Scope	Project Activity	Expected Impact
	workers and work safety training.	

4.2 Net Positive Community Impacts

4.2.1 Expected Community Impacts (CM2.1)

The impacts for communities were estimated based on the analysis theory of change proposed by Richards and Panfil (2011)[134] and community stakeholder dialogue, where the first phase was carried out from 27 to 31 January 2022, by interviews and meetings with the participating of seven communities, which had, among their objectives, introduce them to the project, to know the local reality to obtain an accurate socioeconomic diagnosis. In the second phase, the method of participatory appraisal was held in three communities from 11 to 13 April 2022, which allowed to understand their demands for improving the social and economic well-being of families in these regions.

The combination of these two main methods, interviews and participatory appraisal, resulted in the Theory of Change, an evaluation tool that maps out the logical sequence of means-ends linkages underlying a project, and whose purpose is to provide the strengthening of communities in different aspects, besides acting directly and indirectly in the containment and mitigation of the negative impacts generated by the agents and vectors of deforestation present in the region.

The project benefits estimated by the end of project lifetime, described in the section 1.2 – Standardized Benefit Metrics is based on the number of interested people whose approved in advance their participation in the project's actions. In which, invitations were previously sent out to the community in order to present the project. However, these metrics tend to grow as people identify benefits throughout the project.

Where invitations were previously sent to the community in order to present the project.

The following tables below present the impacts to the communities including benefits, costs, and risks, direct and indirect related to social, cultural, environmental, and economic aspects.

[134] Richards, M. and Panfil, S.N. 2011, Social and Biodiversity Impact Assessment (SBIA) Manual for REDD+ Projects: Part 1 – Core Guidance for Project Proponents. Climate, Community & Biodiversity Alliance, Forest Trends, Fauna & Flora International and Rainforest Alliance. Washington, DC.

Community Group	Surrounding Communities from selected settlements
Impact(s)	- Capacity building related to deal with occasional forest fires - Diseases prevention and increase in access to healthcare - Increase in income by the hiring community members to participate in the project activities - Increase in job opportunities by technical capacity development in activities for economic development - Increase in knowledge on environmental topics - Women empowerment
Type of Benefit/Cost/Risk	- Capacity building related to deal with occasional forest fires - *benefit, actual and direct* - Diseases prevention and increase in access to healthcare - *benefit, actual and direct* - Increase in income by the hiring community members to participate in the project activities - *benefit, actual and direct* - Increase in job opportunities by technical capacity development in activities for economic development - *benefit, predicted and direct* - Increase in knowledge on environmental topics - *benefit, predicted and direct* - Women empowerment - *benefit, predicted and indirect*
Change in Well-being	- Capacity building related to deal with occasional forest fires - *positive impact, medium magnitude* - Diseases prevention and increase in access to healthcare - *positive impact, high magnitude* - Increase in income by the hiring community members to participate in the project activities - *positive impact, high magnitude* - Increase in job opportunities by technical capacity development in activities for economic development - *positive impact, medium magnitude* - Increase in knowledge on environmental topics - *positive impact, low magnitude* - Women empowerment - *positive impact, medium magnitude*

Community Group	Farm workers
Impact(s)	- Capacity building related to deal with occasional forest fires - Diseases prevention and increase in access to healthcare - Increase in knowledge on environmental topics - Increase in health and safety working aspects - Improvement of internal procedures and standardization - Guarantee of good working and housing conditions for the project workers, according to the Brazilian Regulatory Norms (NRs). - Women empowerment
Type of Benefit/Cost/Risk	- Capacity building related to deal with occasional forest fires - *benefit, actual and direct* - Diseases prevention and increase in access to healthcare - *benefit, actual and direct* - Increase in knowledge on environmental topics - *benefit, actual and direct* - Increase in health and safety working aspects - *benefit, actual and direct* - Improvement of internal procedures and standardization - *benefit, actual and direct* - Guarantee of good working and housing conditions for the project workers, according to the Brazilian Regulatory Norms (NRs) - *benefit, actual and direct*
Change in Well-being	- Capacity building related to deal with occasional forest fires - *positive impact, medium magnitude* - Diseases prevention and increase in access to healthcare - *positive impact, high magnitude* - Increase in knowledge on environmental topics - *positive impact, low magnitude* - Improvement of internal procedures and standardization - *positive impact, medium magnitude* - Guarantee of good working and housing conditions for the project workers, according to the Brazilian Regulatory Norms (NRs) - *positive impact, medium magnitude*

Community Group	Workers from the local area
Impact(s)	- Increased employment opportunities - Increased in temporary labour, by hiring local professionals for the trainings and other activities.
Type of Benefit/Cost/Risk	- Increased employment opportunities - *benefit, predicted and direct* - Increased in temporary labour, by hiring local professionals for the trainings and other activities. - *benefit, predicted and direct*
Change in Well-being	- Increased employment opportunities - *positive impact, medium magnitude* - Increased in temporary labour, by hiring local professionals for the trainings and other activities - *positive impact, medium magnitude*

4.2.2 Negative Community Impact Mitigation (CM2.2)

As demonstrated in the section 4.2.1 - Expect Community Impacts, the estimated impacts on all communities' groups from Project Area are expected to be positive throughout the Project Lifetime and such positive benefits include socio-economic well-being and benefits for ecosystem services. Therefore, no negative impacts have been identified regarding the community and other stakeholder groups.

For the next community consultations, it is necessary to design tools to enhance the ability of community's articulation to facilitate the identification of impacts and their respective mitigation.

4.2.3 Net Positive Community Well-Being (CM2.3, GL1.4)

Community activities are anticipated to bring only positive impacts for the communities and the environment. As mentioned before, 7 communities were selected to be included in the project activities. The net community impacts predicted to happen are as follows:

Table 76: Net Positive Community Well-Being

Impact	Action designed to reach the impact
Increase in the community's well-being.	Increase the access to health and increase of income.
Increase in the awareness on subjects as climate change, environmental conservation and restoration.	Educational workshops on environmental and sustainability topics.
Increase in the socioeconomic conditions.	Realization of trainings in activities for the economic development of low carbon production practices, such as sustainable cattle ranching, and in fire brigade, which will increase the knowledge, empowerment and, subsequently, the possibilities of new jobs opportunities and income. Improving productive processes with the provision of rural technical assistance with a focus on diversification, increase and production commercialization, associated to their activities.
Increase in climate change adaptation	An Emergency Fund for Adaptation to Extreme Weather Events is being established. This fund will be used in the cases of adverse weather events. The fire brigade training will give the community the knowledge and tools needed to combat events of fire in the community area, which was identified as a reality in the community, especially in the dry season.

4.2.4 High Conservation Values Protected (CM2.4)

The 5 HCV previously identified will not be negatively affected. On the contrary, the project will only bring positive impacts. All the activities related to the Project will only enhance, develop and protect the HCVs identified in the Project description. No negative impacts have been identified regarding the Community and therefore no measures or activities have been developed.

Necessary and designed measures to mitigate any negative impacts on the well-being of community groups and to maintain or improve HCV attributes related to community well-being will be taken in consultation with the community. These measures will be consistent with the precautionary principle and will prioritize the neediest, most vulnerable communities and members with emergency demands.

Then, and according to what is proposed in the PD, the following actions are taken to mitigate possible negative impacts in the identified HCV zones. It should be noted that, to date, no negative impacts have been reported in these areas.

Table 77: Impact Mitigation of the Community HCV

HCV	Negative Impact Mitigation
Cassava	The activity 'Economic development of low carbon production practices' will help increase the production, management and manufacture of products, such as Cassava.
Brazilian nuts (Bertholletia excelsa fruits)	The protection of the forest area will also protect forest products, as is the case for Brazilian nut trees. The activity 'Economic development of low carbon production practices' will help increase the production, management and manufacture of products, such as the Brazilian nuts trees. Also, the flora inventory will monitor the specie, and any changes in the number of individuals will be identified and corrective measures will be taken, which will be suggested by the specialized inventory team.
Monte Shalom – located in PA Antônio Holanda	The project will not affect this HCV, since it is a sacred place identified by the community and no project activity is planned to happen on it or to influence any changes in the population religion.
Community Associations	The project will only stablish positive partnership with the community associations, which is expected to help empower the associations. Thus, no negative impact is expected. During the project

	lifetime, community consultation will happen annually, so, in the event of the identification of a negative impact, corrective measures will be taken. Carbonext has a team of social experts, which has the ability to deal with such situations.

4.3 Other Stakeholder Impacts

4.3.1 Impacts on Other Stakeholders (CM3.1)

The Project is designed to generate only positive impacts on the well-being of other stakeholders, and it won't generate negative impacts during the lifetime. No other stakeholders have been identified to use or depend on the resources in the Project Area or Reference Region. The positive impacts that are projected to occur are:

- Increase of awareness on environmental conservation and REDD+ projects;
- Partnership with universities in research projects;
- Strengthen ties between the communities and other stakeholders.

4.3.2 Mitigation of Negative Impacts on Other Stakeholders (CM3.2)

As mentioned in the previous item, there are not expected negative offsite impacts, thus, no mitigation strategies are required.

4.3.3 Net Impacts on Other Stakeholders (CM3.3)

The project activities are not expected to cause any negative impacts on other stakeholders, only positive impacts. Thus, there is no need for mitigation.

4.4 Community Impact Monitoring

4.4.1 Community Monitoring Plan (CM4.1, CM4.2, GL1.4, GL2.2, GL2.3, GL2.5)

In order to evaluate the effectiveness of the activities in achieving the proposed objectives, the monitoring plan is an important management tool to monitoring the impacts of the project on communities and other stakeholders.

In this sense, the community monitoring plan for the project is based on the targets set for the construction of the indicators initially gathered through the socioeconomic diagnosis realized onsite, which demonstrates the living conditions of the families. Therefore, subsequently, it is intended to communicate the stakeholders with the need to request their evaluation and validation to improve the impact indicators established, as well as to access the effectiveness of the activities. An initial Community Monitoring Plan will be presented for all stakeholders, as described in section *4.4.2.*

Among the proposed activities, the project proponent predicts the organization of trainings focusing on activities for the economic development of low carbon production practices. Furthermore, fire brigade teams will be trained, and new income opportunities are expected to be created. The indicators aim to monitoring the benefits to communities focused on the scope of 6 components, as described in the table below.

Table 78: Social parameters to be monitored

Activity Description		Activity Monitoring Plan							
Activity	**Start**	**Stakeholders**	**Frequency**	**Expected Results**	**Parameter Unit**	**Data Unit**	**Data Source**	**Monitoring Equipment**	**Geographic Scope**
Health and safety workshops/activities	2022	Project Employees; Local Communities; Public health professionals	Annual	At least 30 participants (employees + community)	Number of persons benefiting from the activities implemented	Number of persons per event / Number of events per semester	Supporting documents (i.e. attendance list; photos; social activities report)	N/A	Project Area + Selected Settlements
Fire Brigade Training	2022	Project Employees; Local Communities;	Annual	At least 30 participants (employees + community)	Number of persons trained	Number/year	Questionnaires and attendance list applied to participants	N/A	Project Area + Selected Settlements
Surveillance	Start Date	Proponent; Project Employees involved in the forest management;	Annual	Decrease of deforestation	hectare deforested	hectare	Satellite images	Remote sensing analysis	Project Area + HCV
Operating Procedures Implementation	After the first verification	Proponent; Farm Employees involved in the forest management;	Annual	All personnel trained	Number of persons trained	Number/year	Questionnaires and attendance list applied to participants	N/A	Project Workers

Activity Description		Activity Monitoring Plan							
Activity	**Start**	**Stakeholders**	**Frequency**	**Expected Results**	**Parameter Unit**	**Data Unit**	**Data Source**	**Monitoring Equipment**	**Geographic Scope**
Jobs Position	Start Date	Project Employees; Local Communities;	Annual	10 new jobs, during the project lifetime	Number of persons benefiting from the activities implemented	Number of workers/year	Supporting documents (i.e. employment contract; social activities report; payment receipt and photos)	N/A	Project Area + Selected Settlements
Gender Equality	2022	Project Employees; Local Communities;	Annual	At least 10% presence of women in the activities	Number of women participants	Number of women per event / year	Supporting documents (i.e. attendance list; photos; social activities report)	N/A	Project Area + Selected Settlements
HCV	2022	Local Communities	Annual	HCV protected	N/A	N/A	Remote sensing analysis; Community consultation	Remote sensing analysis; Community consultation	HCV Identified
Technical capacitation on relevant topics	After the first verification	Project Employees; Local Communities;	Annual	At least 30 participants (employees + community)	Number of persons trained	Number/year	Questionnaires and attendance list applied to participants	N/A	Project Area + Selected Settlements
Educational workshops on environmental topics	After the first verification	Project Employees; Local Communities;	Annual	At least 30 participants (employees + community)	Number of persons trained	Number/year	Questionnaires and attendance list applied to participants	N/A	Project Area + Selected Settlements
Infrastructure Improvement	After the first verification	Project Employees	According to the necessity	Accordance with the NRs criteria	Employees satisfaction	N/A	Onsite visit; Community Consultation	N/A	Project Area

The following forms will be applied after any of the trainings or the Health and safety workshops/activities are completed for data collection:

I. **Attendance List**: It contains the name of the participant, type of affiliation with the project and signature.
II. **Reaction Assessment**: participants will be able to register their perceptions regarding the content presented, making it possible to evaluate the content and make suggestions for future training. This assessment can be done anonymously and is not mandatory.

All communication with workers and families will be registered in reports of meeting, which might be signed by all parties involved. Reports should be produced according to the monitoring frequency adopted. These reports should clearly inform the results of variables involved in monitoring, by means of photos, interviews, and documents.

All records generated during project implementation will be conserved and made available to VCS verifiers at verification for inspection to demonstrate that the AUD project activity has actually been implemented.

All documents and records will be kept in a secure retrievable manner for at least two years after the end of the project crediting period.

The Project Proponent is responsible for financing, implementing, and monitoring social aspects within the Project Area.

4.4.2 Monitoring Plan Dissemination (CM4.3)

The dissemination of the results of the monitoring and verification will be published mainly on the internet through the Carbonext’s website, and also on the Verra platform page as usual. Considering that some local communities don´t have access to internet, during the onsite visits print versions of the summary results will be made available to community members and provided to any individual or institution, under request. The established frequency is annually or before any new verification, or visitation periods, to enhance the importance and effectiveness of the project, an Operating Procedure on Annual Activities Report is being implemented. Other dissemination ways can be also adopted to give total transparency to the project, such as social networks.

4.5 Optional Criterion: Exceptional Community Benefits

Based on the requirements of eligibility for the community gold level, in accordance Guidance for the Use of the CCB Standards[135], this project seeks to achieve the Community Gold Level for exceptional community benefits because it is included in a poor region of Brazil, in which more than 43%[136] of the populations live under the national poverty line.

According to the United Nations Development Programme's International Human Development Index (HDI), Brazil is considered a high human development country with 0.765 index[137]. However, it can be demonstrated that the municipalities in the Reference Region (RR), do not take the same correlation, especially in the municipality of Bujari, where the Project Area is located, the index presents a worst-case scenario with 0,589[138], at least 44,6 % of Bujari's population live on ½ minimum salary[139] and therefore below the national poverty line.

Table 79 - Social Indicators of the three Municipalities in the Reference Region

Municipality	Baseline Year				
	2003		2010		
	Poverty Incidence[140]	Ranking Position in Acre State[141]	Human Development Index (HDI)[142]	Census Population[143]	% Population living with monthly per capita income of up to 1/2 minimum wage
Bujari	32.53%	17º	0.589	8,471	44.6%
Porto Acre	19.14%	22º	0.576	14,880	48.3%
Rio Branco	37.21%	15º	0.707	33,604	36.4%
Average between municipalities					**43.1%**

135 Guidance_for_the_Use_of_the_CCB_Standards_May_2013.pdf
136 Average percentage of population living with Monthly per capita income of up to ½ minimum wage between municipalities. Based on offical data from IBGE, according to the year described in the table.
137 https://hdr.undp.org/en/countries/profiles/BRA
138 IBGE | Cidades@ | Acre | Bujari | Pesquisa | Índice de Desenvolvimento Humano | IDH
139 https://cidades.ibge.gov.br/brasil/ac/bujari/panorama
140 IBGE | Cidades@ | Acre | Bujari | Pesquisa | Mapa de pobreza e desigualdade | Incidência da pobreza
141 Ranking based on the total number of municipalities in the State of Acre = 22
142 IBGE | Cidades@ | Acre | Bujari | Pesquisa | Índice de Desenvolvimento Humano | IDH
143 IBGE, Censo Demográfico, 2010.

Considering the official government database, in the table above, it is possible to observe a set of social indicators of living conditions of the three municipalities located in the reference region (RR), especially related to the income and poverty. These data provide solid basement to indicate that the project meets the Community Gold Level requirements.

Brazil does not have an official poverty methodology, but the National Statistical Office (IBGE) has published national poverty rates based on several administrative and international lines. For international comparisons, poverty is calculated using the same methodology across countries, that is, using the same consumption or income aggregate and poverty line. For this purpose, the World Bank publishes poverty rates calculated using three poverty lines: $1.90, $3.20 and $5.50 per person per day[144], in 2011 Purchasing Power Parity - PPP[145] terms, established according to the income level of the countries[146], as show in the table below. In this case, Brazil belongs to the group of upper-middle income countries.

Table 80 - Poverty Line according to the income of the Country

Poverty Rates	Country Class	Poverty Line
$1.90 per person per day	Lower-income countries	International Extreme Poverty Line
$3.20 per person per day	Lower-middle-income countries	Nacional Poverty Line
$5.50 per person per day	Upper-middle-income countries	Nacional Poverty Line

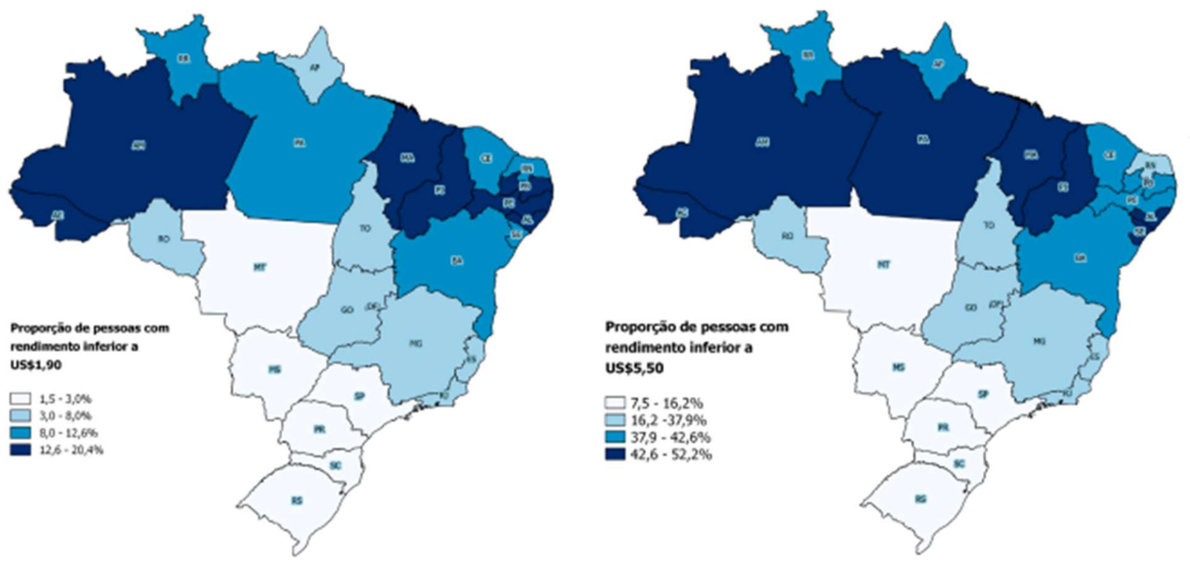
Following the line recommended by the World Bank[147] for upper-middle income countries (U$$5.50 per day), the poverty line per capita per month in Brazil was R$ 450 for 2020 [148]. While the adjusted values for 2022, using the currency exchange rate of R$ 4.96 Real/BRL to US$ 1.00 Dolar/USD[149], and subsequently transformed to monthly values, this would result in an approximate value of R$ 819 monthly income per capita. And in turn, R$ 283 represents the monthly income per capita for people considered in the extreme poverty measured by the line of US$ 1.90 a day.

Complementing the municipal indicators database above, at the geographic level of Unit of the Federation, the State of Acre assumes the proportion of 12.6 - 20.4% of people with daily per capita income below US$ 1.90 and 42.6 – 52.2% of people with daily per capita income below US$ 5.50. In this sense, an estimated

[144] Homepage (worldbank.org)
[145] Conversion rate from PPP-2011 to consumption private, R$1.66 to US$1.00.
[146] https://biblioteca.ibge.gov.br/visualizacao/livros/liv101760.pdf
[147] Measuring Poverty Overview (worldbank.org)
[148] https://biblioteca.ibge.gov.br/visualizacao/livros/liv101892.pdf
[149] Banco Central do Brasil (bcb.gov.br)

12% of people in the State of Acre with an income below US$1.90 per day. Thus, about more than 42% of the people has an income below US$ 5.50 per day [150], as show in image below[151].

Cartograma 1 - Proporção de pessoas com rendimento domiciliar *per capita* inferior a US$ 1,90 e US$ 5,50 PPC, segundo as Unidades da Federação - 2019



4.5.1 Exceptional Community Criteria (GL2.1)

The project is located in the municipalities of Bujari, Porto Acre and Rio Branco, with 32.53%, 19.14% and 37,21% of poverty incidence, according to IBGE (2021) (Table 79). The officially employed population is very low, 15,60%, 5,20% and 25,90% respectively, with average income of 1.3 to 3.2 minimum wages of the country (minimum wage in Brazil is just over USD 244/month[152]). However, the average percentage of workers in the three municipalities who earn less than half of the national minimum wage, i.e. ca. 122 USD/month, is 43,10% according to official data. Therefore, the Project meets to the exceptional community criteria.

In addition, extra measures will be adopted by the Project to benefit community regarding income increase through the activities project such as technical capacitation on relevant topics to the communities, focused on the aspects of associative strengthening, improvement of family farming, provision of technical assistance, such as training on sustainable cattle raising, training on diversification and aggregation of

[150] https://biblioteca.ibge.gov.br/visualizacao/livros/liv101760.pdf
[151] liv101760.pdf (ibge.gov.br)
[152] MEDIDA PROVISÓRIA Nº 1.091, DE 30 DE DEZEMBRO DE 2021. Available at: https://www.in.gov.br/en/web/dou/-/medida-provisoria-n-1.091-de-30-de-dezembro-de-2021-371512885

value to products. Furthermore, new income opportunities are expected to be created by jobs position, directly or indirectly.

At this moment, some activities are already being implemented and other might be during the project lifetime.

4.5.2 Short-term and Long-term Community Benefits (GL2.2)

The Hiwi REDD+ Project is targeting both short-term and long-term net positive benefits for the poor local communities in the Project Zone (the 7 selected on, inside the 20-km buffer). Such benefits will be shared equitably, including amongst the more marginalized or vulnerable households, and local governance structures will be developed to maximize the benefits.

Short-term activities which shall be implemented shortly after the Project achieves validation and verification include the following activities:

1) Social Organization: Increase social women empowerment
2) Training on Health and Safety: Fire Brigade and a series of Operating Procedures
3) Promotion of Technical Assistance and Rural Extension: Training on Sustainable Cattle Raising.

Activities that will have long-term net positive benefits for local communities including the following activities:

1) Improvement of the techniques of forest monitoring and patrimonial surveillance
2) Conducting Environmental Studies with a focus on Monitoring Fauna and Flora

A few of the short-term community benefits that took place on April 2022, included community consultations, hiring local staff as a cook, specialized professional to provide workshop and local nurses.

Indicators of the well-being impacts from these short-term and long-term activities will be incorporated into the community impact monitoring plan's, based on Basic Necessity Survey and Participatory Assessment.

4.5.3 Community Participation Risks (GL2.3)

The eventual risks for the communities participating in the project will be identified by a participatory process, as described in the section 2.3.4. This will be done by regular workshops of the project management by social team with the community representatives. It will be developed strategies and actions to avoid negative impacts, prioritizing communities most in need and dependent on the social actions undertaken by the project. Families and people with the greatest degree of vulnerability will be identified and will be closely followed through the socioeconomic indicators related to livehood conditions.

4.5.4 Marginalized and/or Vulnerable Community Groups (GL2.4)

According to Socioeconomic Diagnosis conducted on February and April 2022, all the visited communities in the Reference Region are relatively marginalized and vulnerable due the difficult in accessing public policies that ensure basic rights such as infrastructure in health, education, transportation, communication, as shown in item 4.1.1. However, the communities involved have a low level of social organization, which weakens the local conditions of search for these fundamental rights.

In this sense, an important measure for access to public policies and the guarantee of exceptional rights in communities, is community empowerment, based on strengthening and consolidating social organizations, aiming at the effective participation of community members in decision-making, contributing to the improvement of socioeconomic aspects by the community members themselves.

The Participatory Assessment – particularly with respect to the gross revenue generated for participants in the project activities after the implementation of the concepts learned after courses and training will serve to measure the benefits of the project for families are considered the most marginalized. In the future, the Basic Necessity Survey monitoring the number of people benefited by the REDD+ Project will be used to monitor whether such families are receiving net positive impacts. Ultimately, the Project is designed and shall be implemented to generate net positive impacts for all families living in the select communities. And subsequently, a communication channel will be established, to registered, debated, and resolved to deal with situations related to the project.

Community Group 1	Selected Settlements
Net positive impacts	The project activities are anticipated to generate net positive impacts on the well-being of all identified marginalized and/or vulnerable community groups, as shown in the items below. The communities have been part in the project activities design, thus, only positive benefits will be generated.
Benefit access	There are no barriers or risks that might prevent benefits going to marginalized and/or vulnerable smallholder/community members, since the decision on the implementation of the activities and generation of benefits will be a responsibility of the project proponents. The community actions is a core of this project and the proponents have shown commitment with the project activities implementation.
Negative impacts	During the project lifetime, the community members, included marginalized and/or vulnerable smallholders/community members, will be consulted on the project. This consultation will have as goal identify any suggestions and complaints on the project activities, as well as a continuous diagnosis of the

	communities and project activities impacts. In the case of the identification of any negative impacts on any community member, including marginalized and/or vulnerable members, Carbonext has a team of social experts capacitated to mitigate the impacts. However, no project activity is expected to generate negative impacts.

4.5.5 Net Impacts on Women (GL2.5)

During the community diagnosis it was identified that the main occupation of the women of the communities is householding and helping the men in the agricultural activities, their work is generally unpaid. Thus, it is demonstrated that the women do not have a big participation in the family income, as well as financial autonomy. The project activities were designed to help improve the women well-being, as seen in the table below, being the main core, the incentive of women participation in all the project activities.

Table 81: Activities Designed for Positive Impact on Women

Activity	Net Impact on Women
Presence of women in the activities	Increase the participation of women in the project activities, generating increase in technical knowledge, in addition to promoting the empowerment, and independence of women.
Activities for the economic development of low carbon production practices	Technical capability in different economic activities, such as the direct participation of women in productive projects making it possible to perform other types of activities rather than householding and agriculture. Also, the increase in knowledge also brings empowerment.
Health and safety workshops/activities	Improvement on the women healthcare, by increasing the access to healthcare and health information.
Training on Fire Brigade	Technical capability of participating in firefighting events, with the possibility of being

	hired by the project to act in fire events, whenever needed.
Creation of jobs position, directly or indirectly	The Hiwi REDD+ Project, intends to hire local community members, preferably women. The participation on the employment opportunities will be offered without any discrimination of gender, age, religion, marital status or ethnicity. The activities will be carried out to include the participation of women and less favored groups as part of the resources. Especially, women will be encouraged to apply for the position.

Also, during the community consultation, 24% of the members consulted were women. This participation was important so that they could participate and influence the project activities design.

4.5.6 Benefit Sharing Mechanisms (GL2.6)

Community members have participated fully and effectively in defining the decision-making process and the distribution mechanism for benefit sharing through a participatory process and meetings with their representatives.

All benefits described in section 4.2.1 will be available according to the frequency described in the monitoring plan (i.e., distributed during onsite visits) to community members throughout the surrounding communities from selected settlements. This includes employment opportunities (e.g., local support staff).

4.5.7 Benefits, Costs, and Risks Communication (GL2.7)

Benefits, costs, and risks of the project were communicated to community during visits. In addition, the Project Proponents or their representatives, and a social team member of the project will be continuously in touch with communities through visits scheduled and consented by the community leaders and representatives. Other communications ways will me also used for this purpose, such as written reports and social networks, when applicable. Furthermore, a communication channel is being implemented to regularly updates the community.

This action already started in the two visits that took place on January and April 2022, a member of social team personally visited families throughout the 7 Communities located in Reference Region to communicate the Project's proposed benefits and the potential costs and risks of participation. The community also shared what benefits they would like to receive and shared their concerns of participating in the Project. In these processes, the mapped communities will be given the chance to discuss the project benefits, costs, and risks, according to their own perspective.

4.5.8 Governance and Implementation Structures (GL2.8)

The project is governed and implemented by the project proponents that will, during the project lifetime, incorporate the communities in the project's decisions making. Operating Procedures on the effectiveness of the communication with the communities is being implemented in order to guarantee full and successful participation in the project. Participatory meetings will be held once a year to collect feedbacks and make any necessary changes in the project design and activities.

For the participation on the project activities, the communities' members will be consulted based on their social representation in order to verify those interested in participating in the project's actions, including the internal community of farm workers. For this purpose, an organogram chart will be defined jointly through the participation of community members and local leaders.

4.5.9 Smallholders/Community Members Capacity Development (GL2.9)

Local leaders and community member will be invited to actively participate of the project's activities in its conception, implementation, management, and monitoring actions. All instances will have the active participation of genuine community representatives selected from themselves, in addition to promoting the empowerment of women and youth.

Among the project's objectives is the improvement income conditions, with an increase in the standard of well-being conditions of community members, a strong involvement in biodiversity and climate issues is planned as well, to support and build local capacity to solve problems, including in particular women and marginalized families.

5 BIODIVERSITY

5.1 Without-Project Biodiversity Scenario

5.1.1 Existing Conditions (B1.1)

To characterize the existing biodiversity conditions of the project area and its surroundings, efforts were made to find academic publications, official government documents, studies and conservation units management plans. The main sources were chosen based on the proximity of and influence on the Project

Area, and the similarity of the vegetation, climate, topography and others. The “Creation Peace for the Environmental Protection Area of Igarapé São Francisco Conservation Unit of Sustainable Use” (2017) directly borders with the Nova Uberada Farm (PA-3), so it was used as biodiversity reference. “Mammals of medium and large size in the Chandless State Park Acre – Brazil”, and the “Ecological Economic Zoning of Acre State” (2006) were also used as main references to de biodiversity research of the HIWI REDD+ Project. The found information represents a first analysis on the biodiversity conditions and further onsite studies will be carried out to complement this diagnosis after the first project verification.

Brazilian biodiversity is one of the richest of the world, due to its positioning in a Neotropical region. It is estimate that around 15 to 20% of world’s biota resides in Brazil, being home for the greatest biodiversity[153]. Of 5,487 species of mammals worldwide[154], around 701 are found in Brazil[155].

Regarding the Amazon Forest, the total area of the Amazon Biome is 6.7 million km² and covers 8 countries: Brazil, Bolivia, Peru, Ecuador, Colombia, Venezuela, Guyana and Suriname, also including the overseas territory of French Guyana. This biome is defined by its predominantly dense tropical rainforest vegetation cover, but with the presence of several other types of vegetation such as savannas, floodplain forests, grasslands, swamps, bamboo and palm forests[41]. The specific vegetation of the HIWI REDD+ Project is detailed in section 5.1.1.1 below.

Within this immense territory lies the largest hydrographic basin in the world: the Amazon basin. It covers about 6 million km², with 1,100 tributaries. Its main river, the Amazon River, crosses the continent flowing into the Atlantic Ocean, discharging into the sea about 175 million liters of water per second[42].

In Brazil, the Amazon biome extends over more than 40% of the national territory, with an immense cultural and biodiversity wealth. It is commonly agreed in the scientific community that the species of fauna and flora have not yet been fully documented and several new species are frequently described[41]. According to the MMA[42], there are more than 2,500 species of trees in the Amazon (which corresponds to one-third of all tropical wood in the world) and more than 30,000 species of plants[41].

According to the Society, Population and Nature Institute (ISPN)[156], the Amazon biome is the most biodiverse biome in Brazil, with more than 73% of the mammal’s species and 80% of the bird species existing in the country. The number of catalogued species is almost 3 million, which 2.3 million are only invertebrates such as arthropods (insects, arachnids, crustaceans, etc.). The ISPN points that there are

[153] https://www.unep.org/news-and-stories/story/megadiverse-brazil-giving-biodiversity-online-boost#:~:text=Brazil%20is%20at%20the%20top,more%20than%204%2C000%20plant%20species.
[154] http://www.felidae.org/KNOWELLPUBL/Schipper%20et%20al.%202008.pdf
[155] https://www.conservation.org/docs/default-source/brasil/annotated_checklist_of_brazilian_mammals_2nd_edition.pdf
[156] ISPN – Instituto Sociedade População e Natureza. Available on : https://ispn.org.br/biomas/amazonia/fauna-e-flora-da-amazonia/

known at least 311 species of mammals, 1.300 of birds, 273 of reptiles, 232 amphibians and 1.800 fishes of fresh water in the Amazonian biome.
Although there is this great abundance present in the Amazon Forest, all that biodiversity is also in great danger: Arround 15,3% of all the endangered species in Brazil are from the Amazon Biome. According to the Portal Amazônia[157], the Red Book of endangered Fauna of Brazil cited 180 species, of which 124 are endemic from the Amazonian Domain.

The main factor of pressure to continental species of the Amazon Forest is result of anthropic activities such as cattle raising, agriculture and large constructions such as hydroelectric dams. Cattle raising and agriculture threatens approximately 94 different species and hydroelectric dams' constructions threatens 95 species[49]. Hunting, fishing, and capture affect 52 important species, ranking third in threats to the fauna of the Amazon. Although hunting and fishing provide food for consumption by local communities, they are also practiced for sport in some locations and in retaliation for the predation of livestock, such as the persecution suffered by big felines that sporadically feed on cattle[158]. The capture of live individuals is practiced to sustain the wild animal trafficking. There are many other legal and, especially, illegal practices that threaten the biodiversity of the Amazon biome, such as logging, road and residential construction, mining, housing development, unorganized tourism and increased urbanization[159].

West Amazon, where Acre state is located, is a region with large richness of species. It can be found in the State 40% of Brazil's mammals and 4.5% of world's mammal[160]. The diverse vegetation type mosaic and the presence of innumerous heterogeneous habitats in that state explains the extraordinary diversity of mammals of that region[161]. Conservation International[162], Dinnerstein et al.[163] and Acre[164] pointed that the Acre state is extremely important for biodiversity protection, indicated as "hot spot" for several groups due to the high diversity and endemism.

The municipalities of the project are Bujari, Rio Branco and Porto Acre, located in the mesoregions Vale do Acre. The HIWI REDD+ Project is located in the microregion of Rio Branco, in the Vale do Acre (as shown in the sector 2.1.5), under influence of the Rio Branco basin. The deforestation rates of the region Vale do

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157. https://portalamazonia.com/amazonia/livro-vermelho-da-fauna-amazonia-tem-180-especies-sob-risco-de-extincao
158 https://portalamazonia.com/amazonia/livro-vermelho-da-fauna-amazonia-tem-180-especies-sob-risco-de-extincao
159 ICMBIO 2018 - Livro Vermelho da Fauna Brasileira Ameaçada de Extinção: Volume I / -- 1. ed. -- Brasília, DF: ICMBio/MMA, 2018.
160 https://www.amazonia.cnptia.embrapa.br/publicacoes_estados/Acre/Fase%202/Livro_Tematico_ZEE_Biodiversidade_Volume_3.pdf
161 https://ppbio.inpa.gov.br/sites/default/files/Dissertacao_BORGES_L_H_M.pdf
162 https://www.researchgate.net/publication/242587870_A_biodiversidade_no_Estado_do_Acre_conhecimento_atual_conservacao_e_perspectivas.
163 https://www.researchgate.net/publication/242587870_A_biodiversidade_no_Estado_do_Acre_conhecimento_atual_conservacao_e_perspectivas.
164 https://www.researchgate.net/publication/242587870_A_biodiversidade_no_Estado_do_Acre_conhecimento_atual_conservacao_e_perspectivas.

Acre is higher than in the other mesoregion (Vale do Juruá), concentrating 64% of deforestation of the state in 2017[165].

Deforestation of large areas of native tropical forest threatens biodiversity in several ways. Whether by decline of quality, fragmentation or habitat loss, the consequences are: loss of genetic variability, insufficient resources, higher intra- and interspecific competition, proximity to the cities and hunting, contamination by pesticides and other agriculture poisons, mining wastes and garbage, and many others. All these factors may lead to great biodiversity lost and even local extinction of species.

There are several different deforestation causes in the state, all of which are associated with anthropic activities. The main cause, as shown in the item 3.1.4, is clean cut of forest to implement pasture for cattle ranching and livestock production. The negative impacts of this activity on the biodiversity are worrisome and can be irreversible if continue to grow without control and sustainable practices.

Furthermore, not only does cattle raising impacts directly the biodiversity, but also have negative impacts on the environment such as erosion of the soil, contamination of soil and water, salinization, pollution, and desertification[166]. The removal of tress and other plants compromises the hydrological cycle, affecting the reduction of water infiltration in the soil, releasing CO_2 to the atmosphere and contributing to climate change[167]. All these impacts have negative influence on the well-being of the biodiversity and local human population as well.

5.1.1.1 Vegetation and Flora

Tropical forests destruction is one of the main threats for biodiversity conservation in a global scale. That is because nearly half of the world's biodiversity is situated in these biomes[168]. It is estimated that Brazil has in its territory between 15% and 20% of the global species biodiversity, a great part of it in the Amazon region[169]. Another aspect of Brazil is that, from 2001 to 2017, its forest cover loss represented 27% of the global total[170].

In 2018, the Brazilian Ministry of Environment has updated the official document that establishes priorities for sustainable land use and biodiversity conservation. In this official document, the regions surrounding

[165] https://www.ihu.unisinos.br/78-noticias/559323-brasil-registra-65-a-mais-de-queimadas-em-2016.
[166] https://www.ibeas.org.br/congresso/Trabalhos2015/V-025.pdf .
[167] https://www.ibeas.org.br/congresso/Trabalhos2015/V-025.pdf .
[168] WHITMORE, 1998. An Introduction to Tropical Rain Forests
[169] https://www.unep.org/news-and-stories/story/megadiverse-brazil-giving-biodiversity-online-boost#:~:text=Brazil%20is%20at%20the%20top,more%20than%204%2C000%20plant%20species.
170 Angelsen A, Martius C, De Sy V, Duchelle AE, Larson AM and Pham TT. 2018. Introduction: REDD+ enters its second decade. In Angelsen A, Martius C, De Sy V, Duchelle AE, Larson AM and Pham TT, eds. Transforming REDD+: Lessons and new directions. p. 4. Bogor, Indonesia: CIFOR

the Project Area, near Bujari city has been pointed as being of “extremely high biological importance” and of “extremely high action priority”[171].

Near the Project Area there are two Conservancy Units: Igarapé São Francisco APA and the Antimary State Forest, both created due to threats of increasing illegal deforestation and fire occurrences. The Antimary State Forest phytophysiognomy is composed by Dense Ombrophilous Forest (55,29%) and Open Lowland Ombrophilous Forest (44,71%), with more than 77% of its territory located in Bujari city[172]. The Igarapé São Francisco APA phytophysiognomy is composed 100% by Open Lowland Ombrophilous Forest, with 11,52% of its territory in Bujari city[173].

In the second edition of Ecological Economic Zoning of Acre State, elaborated in 2010, Bujari city is listed as one of the most critical municipalities when considering an indicator that relates deforestation area, forest area and the population size, due to the high intensity of natural land cover alteration[174]. Of this same study, secondary data was used to compose the fauna and flora biodiversity inventory. Further onsite studies will be carried to complement the existing information.

There a few forest types found in Acre, which cover nearly 72% of the state, as listed below[175] and showed in the following map:

- Open forest with bamboo: 9,40%
- Open forest with bamboo + open forest with palm trees: 26,20%
- Open forest with palm trees in alluvial areas: 5,48%
- Open forest with palm trees: 7,77%
- Open forest with palm trees + dense forest: 12,12%
- Dense forest + open forest with palm trees: 7,20%
- Open forest with palm trees + open forest with bamboos: 21,02%
- Open forest with bamboos in alluvial areas: 2,04%
- Dense forest: 0,53%
- Forest with bamboo + dense forest: 0,36%
- Submountain dense forest: 0,47%
- Deforested areas: 7%

171 Ministry of Environment. Use of priority areas. Available at http://areasprioritarias.mma.gov.br/2-atualizacao-das-areas-prioritarias. Accessed on February 11th, 2022.
172 https://uc.socioambiental.org/pt-br/arp/1160
173 https://uc.socioambiental.org/pt-br/arp/4900
174 Ecological Economic Zoning of Acre State, phase II, 2010.
175 Mapping and Classification of Land Cover and Use – Technical Report - Forestal Potential of Acre State – IBGE (2005).

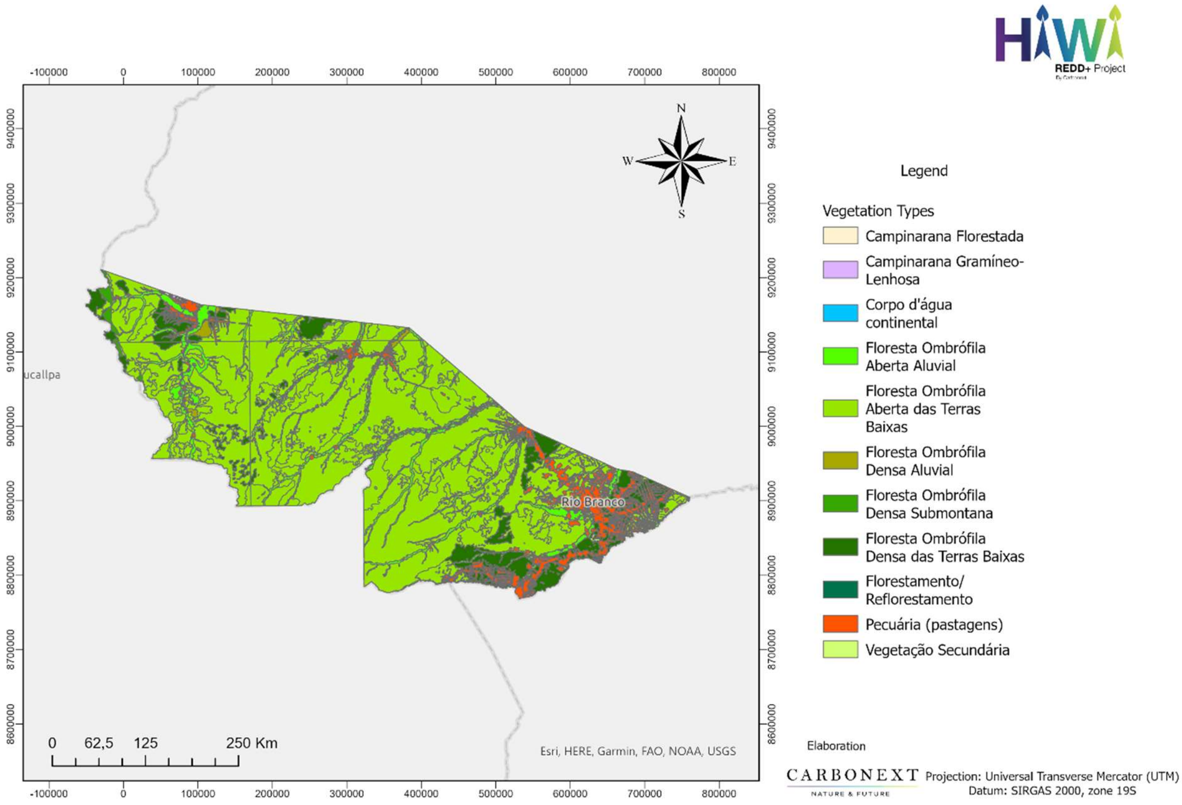


Figure 69 - Acre state vegetation types and its spatial distribution.

In Acre state region, there are the predominance of two types of forests: the Lowland Dense Ombrophilous Forest, the Lowland Open Ombrophilous Forest, and in smaller area the Alluvial Open Ombrophilous Forest. The last one is characterized by palm trees, bamboos, or vines abundancy, with a normally open dossel (Veloso et al. 1991). In both, coexist a wide diversity of vegetation formation, which are differentiate by the soil quality. There is also the presence of a fourth formation, called Campinarana, existing in a little extension of land in the northwest of the state. These domains are generally classified by physiognomic aspects, rather them by floristic aspects. In the region of Bujari city, the most common forestall sub-typology found is the Open Lowlands with Bamboos[176].

The 20,505.00 ha of the HIWI Project Area are in totally in a Lowland Open Ombrophilous Forest. This type of forest represents 9.72% of the forest types presents in the Amazon Forest[177]. In the State of Acre, it is the forest type with the highest occurrence. It occupies most of the morpho-structural unit defined as the

176 Ecological Economic Zoning of Acre State, phase II, 2010.
177 Source: [1 - Programas Relacionados com o Desenvolvimento Sustentável (mma.gov.br)](#)

Sub-Region of the Low Plateaus of the Amazon, corresponding to the depression of the Rio Acre - Rio Javari[178].

For the classification of the threat status of the observed species in the consulted studies, research was conducted on the Red List of Threatened Species of the International Union for Conservation of Nature (IUCN Red List[179]), according to the following table.

Table 82 - Red List categories for the classification of species according to their risk of extinction.

Category	Acronyms
Data Deficient	DD
Least Concern	LC
Near Threatened	NT
Vulnerable	VU
Endengered	EN
Critically Endengered	CR

The Floristic Survey was based on the secondary data from the Araújo[180] and Hechenderger[181], indicating possible occurrence in the project region. Considering these studies and the IUCN Red List of Threatened Species, 7 species were identified as threatened in some degree (table 51).

Table 83 - List of plant species and their threat category according to IUCN.

Group	Scientific name	Common name	Threat level
Palm trees	*Astrocaryum urostachys*	Murumuru	LC
	Aiphanes ulei	Cariota-espinhenta	LC
	Attalea butyracea	Jaci	LC
	Attalea excelsa	Uricuri	LC
	Attalea phalerata	Bacuri	LC
	Bactris turbinocarpa	Marajá	LC

[178] Source: https://biblioteca.ibge.gov.br/visualizacao/livros/liv95899.pdfv
[179] Red List of Threatened Species of the International Union for Conservation of Nature. 2022. IUCN Red List. Available on: https://www.iucnredlist.org/ . Accessed on 09/04/2022.
[180]Araujo, H. J. B. Tradition species of timber trees considered as in disappearance in Acre State. 2014. Available at: https://ainfo.cnptia.embrapa.br/digital/bitstream/item/112091/1/25314.pdf. Accessed: 09/04/2022.
[181] HECHENDERGER, S. FERREIRA, E. Floristic and Phytosociological comparison between palm trees communities of primary and secondary forests the Environmental Protection Area of Igarapé São Francisco, Acre, Brazil. Centro Científico Conhecer - Goiânia, v.14 n.25; p. 350, 2017.

Group	Scientific name	Common name	Threat level
	Bactris dahlgreniana	Pupunha brava	LC
	Desmoncus mitis	Jacitara	LC
	Euterpe precatoria	Açaí	LC
	Geonoma acaulis	Cocão	LC
	Geonoma deversa	Ubim	LC
	Iriartea deltoidea	Paxiubão	LC
	Oenocarpus bataua	Patauá	LC
	Oenocarpus mapora	Bacaí	LC
	Phytelephas macrocarpa	Jarina	LC
Nut trees	***Bertholletia excelsa***	**Castanheira**	**VU**
	Hevea brasiliensis	Seringueira	LC
Bamboo trees	*Guadua spp.*	Bambu	LC
Timber trees	***Amburana acreana***	**Cerejeira**	**VU**
	Apuleia molari	Cumaru cetim	LC
	Aspidosperma macrocarpon	Pereiro	LC
	Astronium lecointei	Aroeira	LC
	Calycophyllum megistocaulum	Mulateiro	LC
	Cedrela odorata	**Cedro**	**VU**
	Ceiba pentandra	Samaúma	LC
	Copaifera multijuga	Copaíba	LC
	Cordia alliodora	Freijó	LC
	Couratari macrosperma	Tauari	LC
	Diplotropis brasiliensis	Sucupira	LC
	Dipteryx odorata	Cumaru de ferro	DD
	Enterolobium maximum	Timbaúba	LC
	Hymenaea courbaril	Jatobá	LC
	Manilkara inundata	Maçaranduba	LC
	Mezilaurus itauba	**Itaúba**	**VU**
	Minquartia guianensi	**Acariquara**	**NT**
	Ormosia arborea	Angelim	LC
	Peltogyne densiflora	Roxinho	LC
	Platymiscium pinnatum	Violeta	LC
	Swietenia macrophylla	**Mogno**	**VU**
	Handroanthus serratifolius	**Ipê**	**EN**

The first ten species in terms of percentual of total processed log volume in Acre in 2005 was estimated in 198.014 m^3, corresponding to the following species[182]:

1st - Cumaru-ferro - 29,0%;
2nd - Cumaru-cetim (*Apuleia molaris* Spruce ex Benth.) - 11,0%;
3rd - Tauari (*Couratari macrosperma* A. C. Sm.) - 10,0%;
4th - Mulateiro (*Calycophyllum spruceanum* Hook.f. ex K.Schum.) – 9,0%;
5th – Samaúma (*Ceiba pentandra*) – 7,0%;
6th - Cedro (*Cedrela odorata*) – 7,0%;
7th - Jatobá (*Hymenaea courbaril*) - 6,0%;
8th - Cerejeira (*Amburana acreana* (Ducke) A. C. Sm.) – 4,0%;
9th – Angelim (*Ormosia arborea* (Vell.) Harms) – 3,0%
10th - Ipê (*Tabebuia serratifolia* (Vahl) G. Nicholson) – 2,0%.

In a preliminary EMBRAPA study about these traditional timber species of Acre state, results showed that they are in a disappearance process and in population decline, proven by the lack of these trees' timber in local log markets and by its prohibitively high prices. This scenario states out the necessity and urgency to stablish policies of sustainable practices and protection processes for the Amazonian logging resources[183]. It also supports the evidence of economic interest on these resources, which is a threatening risk for local biodiversity due to deforestation, fragmentation and habitat loss.

5.1.1.2 Fauna

The fauna of the Acre state is extremely rich due to the fact that there is a great diversity of soils and vegetal physionomies. In the state can be found more than 3,581 species of vertebrates, especially birds, anurofauna and mammals. It is possible to find 30% of amphibians of Brazil, 45% of Brazilian birds and 40% of mammals[184]. But at the same time, all Acre´s and Amazon´s biodiversity is endangered, mainly due to habitat loss, consequence of deforestation for expansion of cattle production in the region.

Other activities such as hunting and fishing threaten the biodiversity as well. The most hunted species are generally: deaers, wild pigs, armadillos, small rodents, tapir, tortoise, capybara and birds like jacu.

[182] https://ainfo.cnptia.embrapa.br/digital/bitstream/item/99025/1/24929.PDF
[183] Tradition species of timber trees considered as in disappearance in Acre State – available at: https://ainfo.cnptia.embrapa.br/digital/bitstream/item/112091/1/25314.pdf
[184] Plano de Manejo Florestal Sustentável - PMFS da Floresta Estadual do Antimary. Rio Branco: SEF, 2005.

Although the fauna of the Acre state is pointed as of extreme richness, there is a lack of scientific studies of all this biodiversity. The list of species presented cannot be consider complete, since it does not reflect on the real number of species due to the lack of data, low distribution of sample collections, deficiencies in taxonomic identification, lack of investments, and many other factors. For example, the ichthyofauna of Acre state is poorly known, there is no information about the geographic distribution of most fish species. The lack of studies also difficult the identification of endemic species of fishes and there are not enough registries to make viable the detection of robust levels of threat[185].

The list of number and fauna species of possible occurrence in the region of the project according to secondary research is presented in the tables below.

Table 84 - Vertebrate species richness in Acre State and in the world[186].

Group	Observed Individuals in Acre	Observed individuals in Brazil	Observed individuals worldwide
Osteichthyes	578	3,000	24,000
Chondrichthyes	7	20	850
Birds	1,521	1,677	9,050
Reptiles	185	468	6,400
Mammals	412	524	4,500
Amphibians	230	517	4,500

[185] http://semapi.acre.gov.br/wp-content/uploads/sites/20/2020/11/Volume_I_Diagnostico_socioeconomico_fea_2012_revisado_final.pdf#page=43&zoom=100,109,326
[186] LEWINSOHN & PRADO (2002) and (BRASIL, 1998).

Table 85 - List of priority fauna species found in Igarapé PA, Antimary State Forest, Chandless State Park[187,188,189], and their threat category according to the national[190] and international[191] Red Lists

Group	Scientific name	Common name	IUCN threat level	ICMBIO threat level
Avifauna	*Amazilia lactea*	Beija-flor-de-peito-azul	LC	LC
	Aratinga weddellii	Periquito-de-cabeça-suja	LC	LC
	Brachygalba albogularis	Agulha-de-garganta-branca	LC	
	Catharus ustulatus	Sabiazinho-de-óculos	LC	LC
	Cnipodectes subbrunneus	Flautim-pardo	LC	LC
	Coendou prehensilis	Cuandu	LC	LC
	Cymbilaimus sanctaemariae	Choca-do-bambu	LC	LC
	Cyphorhinus arada modulator	Papagaio-Galego	LC	
	Gallinago paraguaiae	Atim	LC	
	Galbula cyanescens	Ariramba-da-capoeira	LC	LC
	Galbula tombacea	Ariramba-de-barba-branca	LC	LC
	Gymnopithys salvini	Mãe-de-taoca	LC	
	Hemitriccus flammulatus	Maria-de-peito-marchetado	LC	LC
	Lophotriccus eulophotes	Maria topetuda	LC	LC
	Malacoptila semicincta	Barbudo-de-coleira	LC	LC
	Myrmeciza fortis	Formigueiro-de-taoca	LC	
	Myrmeciza hyperythra	Formigueiro-chumbo	LC	
	Odontophorus stellatus	Uru de topete	LC	LC

187 State Government of Acre. Secretary of Environment and Natural Resources. Creation Peace for the Environmental Protection Area of Igarapé São Francisco – Conservation Unit of Sustainable Use, 2005, page 20.
188 http://semapi.acre.gov.br/wp-content/uploads/sites/20/2020/11/Volume_I_Diagnostico_socioeconomico_fea_2012_revisado_final.pdf#page=43&zoom=100,109,326
189 https://ppbio.inpa.gov.br/sites/default/files/Dissertacao_BORGES_L_H_M.pdf
190 ICMBIO 2018 - Livro Vermelho da Fauna Brasileira Ameaçada de Extinção: Volume I / -- 1. ed. -- Brasília, DF: ICMBio/MMA, 2018. Available on: https://www.icmbio.gov.br/portal/images/stories/comunicacao/publicacoes/publicacoes-diversas/livro_vermelho_2018_vol1.pdf. Accessed in 09/04/2022.
191 IUCN. 2022. The IUCN Red List of Threatened Species. Version 2021-3. https://www.iucnredlist.org. Accessed in: 15/02/2022.

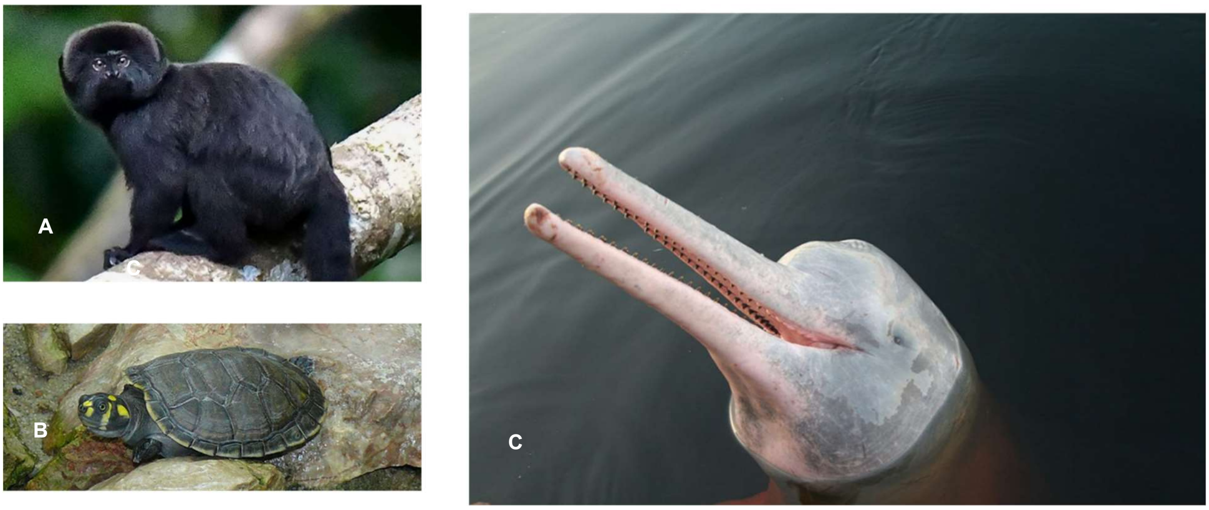
Group	Scientific name	Common name	IUCN threat level	ICMBIO threat level
	Ortalis guttata	Aracuã-pintado	LC	LC
	Picumnus rufiventris	Picapauzinho-vermelho	LC	LC
	Podager nacunda	Corucão	LC	LC
	Pteroglossus mariae	Araçari-de-bico-marrom	LC	LC
	Pyrocephalus rubinus	Barão-do-melgaço	LC	LC
	Tangara callophrys	Saíra-opala	LC	LC
	Thamnomanes schistogynus	Uirapuru-azul	LC	LC
	Tringa solitria	Maçarico-solitário	LC	
	Tyrannus savana	Tesoureiro	LC	LC
Ichthyofauna	*Ctenobrycon hauxwellianus*	Sardinha matupiri		
	Geophagus brasiliensis	Cará	LC	LC
	Hoplias malabaricus	Traíra	LC	LC
	Leporinus elongatus	Piau	LC	
	Phenacogaster carteri	Lambari	DD	
	Pseudoplatystoma corruscans	**Pintado**		**NT**
	Thoracocharax stellatus	Peixe borboleta papuda	LC	LC
Herpetofauna	*Bothrops sp.*	Jararaca	LC	
	Caiman crocodilus	Jacaré tinga	LC	LC
	Colostethus marchesianus		LC	
	Corallus caninus	Cobra papagaio	LC	LC
	Dactylomis dactylinus	Rato-coró	DD	
	Dasyprocta azarae	Cutia	DD	LC
	Eleutherodactylus buccinator	Rã bugio	LC	
	Eleutherodactylus conspicillatus		LC	
	Eleutherodactylus fenestratus	Sapo-pulga	LC	
	Epipedobates hahneli	Sapo-flecha-de-veneno	LC	
	Geochelonoids denticulat	Jabuti		
	Lachesis muta	Surucucu pico de jaca	LC	LC
	Leptodactylus pentadactylus	Rã-manteiga	LC	LC
	Micrurus sp.	Cobra Coral		
	Philodryas nattereri	Surradeira	LC	LC

Group	Scientific name	Common name	IUCN threat level	ICMBIO threat level
	Phyllomedusa bicolor	Rã-kambo	LC	LC
	Pithecopus palliatus	Perereca-macaco	LC	
	Phyllomedusa vaillantii	Perereca-Das-Folhagens	LC	LC
	Podocnemis unifilis	**Tracajá**	**VU**	**NT**
	Spilotes pullatus	Caninana	LC	LC
	Trachycephalus typhonius	Sapo-de-chifre	LC	LC
Mammal	***Alouatta belzebul***	**Guariba**	**VU**	**VU**
	Aotus nigriceps	Macaco-da-noite	LC	
	Ateles chamek	**Macaco-aranha**	**EN**	**VU**
	Atelocynus microtis	**Cachorro do mato**	**NT**	**VU**
	Bradypus variegatus	Preguiça-comum	LC	LC
	Cabassous unicinctus	Tatú-rabo-de-couro	LC	LC
	Callimico goeldii	**Sagui-de-Goeldi**	**VU**	**LC**
	Cebuella pygmaea	**Sagui-pigmeu**	**VU**	
	Cebus unicolor	**Cairara**	**VU**	**LC**
	Choloepus spp.	Preguiça	LC	
	Cuniculus paca	Paca	LC	LC
	Cyclopes didactylus	Tamanduaí	DD	LC
	Dasyprocta ssp	Cutia	LC	
	Dasypus kappleri	Tatú	LC	LC
	Dasypus novemcinctus	Tatú galinha	LC	
	Didelphis marsupialis	Mucura	LC	
	Dinomys branickii	Paca-de-rabo	LC	DD
	Eira barbara	Irara	LC	LC
	Hydrochoerus hydrochaeris	Capivara	LC	LC
	Hypocnemis hypoxantha	Cantador-amarelo	LC	LC
	Inia geoffrensis	**Boto-vermelho**	**EN**	**EN**
	Lagothrix lagotricha	**Macaco-barrigudo**	**VU**	**VU**
	Leopardus sp	Gato-do-mato-pequeno		
	Lontra longicaudis	**Lontra**	**NT**	**NT**

Group	Scientific name	Common name	IUCN threat level	ICMBIO threat level
	Mazama americana	Veado capoeira	DD	DD
	Mazama gouazoubira	Veado-branco	LC	LC
	Marmosa regina	Cuíca	LC	
	Microsciurus flaviventer	Quatipuru roxo	LC	LC
	Myoprocta pratti	Cutiara	LC	LC
	Myrmeciza goeldii	Formigueiro-de-goeldi	LC	
	Myrmecophaga tridactyla	**Tamanduaí bandeira**	**VU**	**VU**
	Nasua nasua	Quati	LC	LC
	Panthera onca	**Onça pintada**	**NT**	**VU**
	Pecari tajacu	Porquinho do mato	LC	LC
	Plecturocebus cupreus	Zogue-zogue	LC	
	Priodontes maximus	**Tatú canastra**	**VU**	**VU**
	Procyon cancrivorus	Mão-pelada	LC	LC
	Pteronura brasiliensis	**Ariranha**	**EN**	**VU**
	Puma concolor	Onça parda	LC	VU
	Puma yagouaroundi	Gato-mourisco	LC	VU
	Saguinus imperator	Bigodeiro	LC	
	Saguinus weddelli	Soim	LC	
	Saimiri boliviensis	Macaco-de-cheiro	LC	LC
	Sapajus apella	Macaco-prego	LC	LC
	Sciurus ignitus	Quatipuru roxo	LC	
	Sciurus spadiceus	Quatipuro vermelho	LC	
	Sotalia fluviatilis	**Boto-cinza**	**EN**	**NT**
	Speothos venaticus	**Cachorro vinagre**	**NT**	**VU**
	Sylvilagus brasiliensis	**Tapeti**	**EN**	**LC**
	Tamandua tetradactyla	Tamanduá mirin	LC	LC
	Tapirus terrestris	**Anta**	**VU**	**VU**
	Tayassu pecari	**Queixada**	**VU**	**VU**

All species mentioned in the lists of threatened species, both globally and nationally, should always be a point of attention and priority in preservation projects. On the list of vertebrates, 21 species were identified as threatened in some level (in bold in the table above).

The birds are very threatened by the habitat loss, but the hunting for sports and for food are also contributing to the decline of the populations[192]. Regarding the mammals, this group is fundamental to the maintenance of ecosystems[193] and, consequently, to the generation of associated ecosystem services. Small mammals, for example, play an important role at the base of the food chains of many other creatures. Furthermore, together with primates (such as *Alouatta belzebul, Ateles chamek, Atelocynus microtis, Callimico goeldii, Lagothrix lagotricha* and Cebus unicolor), big herbivores such as the tapirs (*Tapirus terrestris*), are essential in the maintenance of the ecosystems because of seed dispersal[61] [194]. The dolphins control aquatic species and also their presence signalize to fishers the presence of fish shoals. Terrestrial carnivores on the top of the food chain (like *Panthera onca*, *Puma concolor*) play a fundamental role in the conservation of biodiversity. They regulate and structure the communities through predation and are therefore considered key species. Carnivores also function as "umbrella species", since efforts to conserve their populations end up also preserving other species in the community and are therefore essential targets for conservation projects[61].



[192] Parque das Aves, 2022. Available on: https://www.parquedasaves.com.br/nosso-trabalho/o-problema/caca/. Accessed in 23/03/2022.
[193]ICMBIO - Mamíferos Ameaçados de Extinção no Brasil, in Livro Vermelho da fauna brasileira Ameaçada de extinção. VOLL II, Pag, 687. Available on: https://www.icmbio.gov.br/portal/images/stories/biodiversidade/fauna-brasileira/livro-vermelho/volumeII/Mamiferos.pdf. Accessed in 11/04/2022.
[194] Barcelos, A. R. C. W. Dieta frugívora e potencial de dispersão de sementes de Tapirus terrestris (Mammalia, Perissodactyla) em um mosaico de floresta. Manaus. 2011. Dissertação (Biologia (Ecologia)) - Instituto Nacional de Pesquisas da Amazônia. Available on: https://bdtd.inpa.gov.br/handle/tede/1813 . Accessed in 11/04/2022.

Figure 70: Fauna species identified in the secondary surveys that may occur in the project region A) *Callimico goeldii* (Source: Marc Faucher); **B) *Podocnemis unifilis*** (Source: Haplochromis via Wikimedia Commons); ***C) Ignia geoffrensis*** (Source: José Martins)

5.1.2 High Conservation Values (B1.2)

As defined by the HCV Resource Network, the high value attributes for conservation numbers 1 – Species Diversity and 3 – Ecosystems & Habitats were considered for the present work, since they are criteria related to biodiversity[195]. Within this context, to guide the following items in this document, the guidelines for identification, management and monitoring of high values were considered, as stated in the "General Guide for the Identification of High Conservation Values" (BROWN et al., 2013).

High Conservation Value	HCV 1 –Diversity of Species – The project zone contains significant concentrations of biodiversity values, protected areas (conservancy units), threatened fauna and flora species and areas that support significant concentrations of species during any time in their lifecycle
Qualifying Attribute	The project area is located near remaining Amazon Forest that are under deforestation threat and near important conservancy units. The conservancy unit Environmental Protection Area of Igarapé São Francisco[196] borders directly with the Fazenda Nova Uberada. The conservancy unit Antimary State Forest[197] , is located within the 20km buffer from the PA- 1. Both of them have great influence in the project region that function as habitat to threatened, endemic and endangered species, specially of mammals.
Focal Area	It is necessary to conserve and protect in totality the current vegetation in the project area (20,505.00 hectares), maintaining biodiversity monitoring and carrying out educational activities for create awareness on the importance of biodiversity and conservation. The result will be the maintenance or enhancement of this HCV.

High Conservation Value	HCV 3 – Ecosystems & Habitats - The Project's Areas correspond to reminiscent areas of the Amazon Rainforest Ecosystem near Bujari

[195] https://hcvnetwork.org/hcv-approach/

[196] http://semapi.acre.gov.br/apa-igarape-sao-francisco/ ; http://semapi.acre.gov.br/
[197] http://semapi.acre.gov.br/fe-antimary/

	City, Acre state, considered a threatened/rare ecosystem The Southwestern Amazon Lowland Humid Forest is considered "vulnerable" (VU) in the IUCN Red List of Ecosystems[198].
Qualifying Attribute	The Amazon is the largest tropical forest in the world, being very important and responsible for the provision of ecosystem services (such as water production and climate regulation), it is habitat for threatened and key species of biodiversity, it provides medicinal substances and local medicinal knowledge, the forest is home to traditional communities and promotes genetic variability of species, and many others. There are more than 24 million people living in the Amazon Forest region, and they are dependent on the forest for shelter, water, food, source of income, recreation and tourism[199], with a unique cultural value. The Southwestern Amazon Lowland Humid Forest is considered "vulnerable" (VU) in the IUCN Red List of Ecosystems[200].
Focal Area	It is necessary to conserve and protect in totality the current vegetation in the project area (20,505.00 ha), maintaining constant monitoring to protect it from illegal exploration and degradation and carrying out restoration activities if needed in the future. The result will be the maintenance or enhancement of this HCV.

5.1.3 Without-project Scenario: Biodiversity (B1.3)

The without-project scenario should consider two most threatening land use activities to the biodiversity in the area: cattle production (and its consequent soil management) and timber exploration, that are presented in the Baseline Scenario, in sector 3.1.4.

Between 1990 and 2003, cattle herd grew 140% and went from 26.6 million heads to 64 million heads. During this time, the annual growth in the region (6.9%) was ten times greater than in the rest of the country (0,67%). Acre State presented one of the highest indexes (12.6%/year) since cattle raising tends to be

[198] The IUCN Red List of Ecossystems, 2022. https://assessments.iucnrle.org/assessments/296is. Accessed 11/04/2022.

[199] Greenpeace, 2022. Available on https://www.greenpeace.org/usa/issues/brazil-and-the-amazon-forest/. Accessed in 18/03/2022.

[200] The IUCN Red List of Ecossystems, 2022. https://assessments.iucnrle.org/assessments/296is. Accessed 11/04/2022.

more lucrative in that region than in others. This happens due to low land prices and the better productivity of pastures in the major ranchers[201].

In the Amazon region, whenever cattle production or any other type of land use that requires land space is detected, it is usual for managers to prepare the land by tackling fire to clear the area and prepare it for use. This common practice, besides being unsustainable, can become very dangerous during droughts seasons, because flames can go out of control and spread quickly to the nearest forest areas. In the state of Acre, specifically the Bujari and Sena Madureira cities, around 1,115 fire spots were identified in 2019. The most endangered Conservation Unit in this case is the Antimary State Forest, located within the 20km buffer from the PA-1. This Conservancy Unit is one of the richest in vegetal species of the state , becoming target for invaders and squatters looking for timber exploration[202].

Between August 2019 and July 2020, 27.455 acres of forest suffered timber extractions. In this period, 76% of the total exploration happened in only 10 rural properties. The timber exploration is concentrated in the registered rural properties (97,13%), while the remaining 3% are divided among Conservation Units of Sustainable Use (0,01%), Cartographic voids (0,31%), Rural settlements (2,52%) and Undesignated lands (0,02%). Lack of available information leaves it unclear about how much of this timber is legally or illegally extracted. The municipality of Bujari, with 2.587 acres (9% of the state territory) is the third biggest timber exploration area of the state[203].

Selective logging in Amazonian forests cannot provide enough timber to meet even the current regional demand over the long term. The low intensity and long cutting cycles do not provide enough timber and the intensive scenarios are not sustainable, insofar as they do not allow volume recovery during a cutting cycle. In addition, future deforestation, forest degradation and climate change will likely worsen the picture[204]. In this scenario, actions on timber exploration control are fundamental, as well as sustainable forestry production incentives[205].

There are other factors that threatens the local biodiversity such as pollution, uncontrolled hunting, diseases and other unsustainable practices in the without-project scenario.

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[201] https://imazon.org.br/pecuaria-na-amazonia-tendencias-e-implicacoes-para-a-conservacao-ambiental/
[202] WWF – Forest Fires. Available at: https://www.wwf.org.br/natureza_brasileira/areas_prioritarias/amazonia1/emergencia_amazonica/parceria_contra_queimadas/
[203] IMAFLORA. Log exploitation in Acre. Available at: https://www.imaflora.org/noticia/exploracao-madeireira-no-acre-esta-concentrada-em-apenas-10-imoveis-rurais
[204] Camille Piponiot et al 2019 Environ. Res. Lett. 14 064014
[205] IMAFLORA. Log exploitation in Acre. Available at: https://www.imaflora.org/noticia/exploracao-madeireira-no-acre-esta-concentrada-em-apenas-10-imoveis-rurais

Considering all these factors that impact negatively the biodiversity, the HIWI REDD+ Project will protect 20,505.00 acres of Amazon Forest, an essential area for biodiversity and environmental integrity, avoiding fragmentation, destruction and conversion of native forest into other land use activities presented above, which would likely happen in the next few years without the project. The project intents to prevent 5160,69 acres deforestation until 2049, stopping the removal of plant and animal individuals, biodiversity loss, soil degradation, the loss of genetic diversity, habitat loss, local extinctions, evasion and death of fauna and flora.

Other actions aimed at health, environmental education, professionalization and sustainable practices are being developed to be implemented with the communities in the region. These activities and actions aim to benefit social and environmental aspects, directed, for example, to reduce hunting, build knowledge of ecosystem services arising from the influence of biodiversity on nature, training to prevent fires that would also benefit the local fauna and flora, activities related to conservation of priorities species of fauna and flora, zoonoses, among others activities that will indirectly benefit the biodiversity and the environment as well. In the without-project scenario, these actions would not happen and there would be no benefit to biodiversity nor to the community.

The monitoring of biodiversity that will be implemented with the HIWI Project will be essential to evaluate the biodiversity of the region. Data will be gathered within 30 years of project quantifying and analyzing the species that suffered impacts with deforestation before the project. These data are important to direct the design of project activities in the most effective way, resulting in maintenance or enhancement of the biodiversity parameters.

5.2 Net Positive Biodiversity Impacts

5.2.1 Expected Biodiversity Changes (B2.1)

In the project area, the following beneficial changes to biodiversity are expected:

Biodiversity Element	Fauna
Estimated Change	Habitat / Biodiversity Conservation (positive)
Justification of Change	The activities of the Project aim at to reduce deforestation and forest degradation, consequences of the change of soil usage by other activities such as agriculture, cattle raising, logging, and many others. The focus will be in practices of deforestation monitoring, patrimonial surveillance, and technical assistance service. Thus, generating a positive impact on habitat preservation, climate regulation and on biodiversity conservation. The maintenance of the vegetation cover allows adequate living conditions for the countless Amazonian species present in the

	region. This project also aims on monitoring birds, mammals, amphibians, reptiles, other animal groups and plant species with different status of threat and endemism, producing good data for scientific studies and mitigation measures proposition, for an example. Partnerships with universities and science centres are being consider to produce conservation articles and science, in general. The presence of the HIWI REDD+ project prevents the expansion of new pasture or logging areas, which may lead to soil contamination, enhanced climate change, suppression of ecosystem services such as water provision, pollination, climate regulation and others, which affects entire consuming trophic chain, including local populations[206].

Biodiversity Element	Fauna and Flora
Estimated Change	Encouraging conservation through building Environmental Awareness, developing sustainable practices and changing habits
Justification of Change	The HIWI REDD+ project will promote environmental education and sustainable development activities with local communities (detailed in item 4.4.1 of this PD). The development and implementation of these actions aim to build an environmental awareness and consequent change of habit in the population, in medium and long-term on the importance of biodiversity and "live native forests". In the long term along the generations, these actions aim to create a feeling of belonging and proximity to nature and to the living beings that depend on the preserved environment. Thus, the project will stimulate the conservation of biodiversity, and in general, of the Amazon ecosystem and its communities.

Biodiversity Element	Flora
Estimated Change	Habitat/Biodiversity Conservation (positive)
Justification of Change	The REDD+ HIWI Project consists of preventing deforestation and degradation of Lowland Open Ombrophilous Forest in the Amazonian Forest and implementing sustainable land use management activities. The presence of the project prevents

[206] https://www.e-publicacoes.uerj.br/index.php/rdc/article/view/50980

	probable vegetation removal and deforestation of 5160,69 acres in 30 years, that is predicted to happen without the project with the expansion of cattle raising, avoiding threat to flora species. These species have an essential role on the provision of ecosystem services as well as provision of resources and habitat for the local fauna biodiversity.

5.2.2 Mitigation Measures (B2.3)

The HIWI REDD+ Project intends to preserve part of the Amazon Forest, maintaining the habitat of the species present in the project area, preventing deforestation through actions to reduce and control the threats suffered by the biotic community, such as: periodic monitoring of fauna and flora, data for further analysis, surveillance and security of the project area. In addition, the project's activities linked to climate, community and biodiversity aspects will strengthen the local community in terms of environmental education and awareness, and on sustainable development. Many other actions and mitigation measures will be proposed as local demands and impacts are identified during the project. Thus, the proposals made will be more effective and significant, resulting in more robust, relevant and beneficial changes on the region, its surroundings and on biodiversity.

The most likely activities that could negatively impact the region's biodiversity include the economic interest and expansion of grazing stock and logging. Hunting was also reported by local community for subsistence consumption, mainly on wild porks, ducks, dears, and tortoises. Table 86 highlights the activities to be implemented in the 30 year project lifetime to conserve or enhance the HCVs identified, that are the great presence of endangered and threatened species, and the Amazon Forest itself (Southwestern Amazon Lowland Humid Forest specifically present in the project area), identified by the IUCN Red List of Ecosystems, classified as "vulnerable"., Besides the conservancy of the forest, the activities also aim to avoid and , if necessary, mitigate negative impacts on biodiversity, as mentioned before in section 2.1.11. Thus, all the activities are directed and aim to protect and enhance them.

Further propositions of actions and activities directed to the biodiversity will be analyzed, evaluated and implemented as the project and the sale of carbon credits advance. During the project period more details and onsite analysis of the biodiversity's and community's potential and characteristics will be gathered, guaranteeing suitable activities and rapid response if mitigation measures are needed.

Table 86 – Mitigation measures proposed by the HIWI Project, through analysis and assessment carried out by Carbonext's technical and social team.

Strategic lines	Main activities to be implemented

Illegal Logging Prevention	• Maintain and reinforce the surveillance and security of the project area; • Environmental education activities to raise sustainable practices and awareness in the community; • Professional training, upon demand from the community/economy/local commerce and other factors that will be evaluated;
Fire Prevention	• Orientations to prevent and fight fires; • Capacitation for fire free soil management techniques • Possibility of fire brigades training with the population; • Equip communities with necessary tools and infrastructure to deal with fire events.
Biodiversity loss prevention	• Maintain and reinforce the surveillance and security of the project area; • Promote environmental education to raise awareness about the importance of conservation of nature and local species/ biodiversity, sustainable practices, deforestation, waste products and pollution, nutrition. • Activities focused on priority species and with economic value. • Periodic monitoring of species and assessment of the environment; • Generate data for further studies and other conservation projects, gathering substantial data for analysis of impacts of the project during 30 years;
Deforestation prevention	• Implementation of Carbonext´s deforestation and monitoring Alert System in the project region; • Promote the education of future generations about the importance of the forest on ecosystem services, bioeconomy principles and valuation. • Building of environmental awareness; • Trainings in sustainable practices and capacitation directed to avoid deforestation of forest areas
Others	• Periodic environmental education activities and actions will be directed to different topics over the 30 years of the project, according to local assessments and proposals, local needs,

	identification of negative impacts, feedbacks from the communities and other stakeholders involved and other analysis on the project activities. These can be directed to: professional courses/workshops, preparation of a vegetable garden, composter, recycling and reuse of materials, nutrition, gastronomy, health and zoonoses, among many others. • Periodic events over the 30 years, such as: medical visits, nutritionist visits, solidarity actions, among others, which are foreseen to be implemented during the project.

5.2.3 Net Positive Biodiversity Impacts (B2.2, GL1.4)

Without the project, as seen in the item 5.1.3, the reminiscent forest near Bujari city and its biodiversity would probably be affected by land use transformation and degradation in the next years, largely due to a tendency of increase in cattle raising and logging, which are economically attractive activities in that region and in constant search for new areas for expansion. It would also be threatened by urbanization, since there is a population growth trend and Bujari is located near the capital of the state.

The HIWI REDD+ Project intent to conserve 5,160.69 hectare until 2049 of Lowland Open Ombrophilous Forest in the Amazon Forest. The protection of 20,505.00 of the project area is essential because it is habitat for several species of birds, amphibians, invertebrates, flora and more specifically for five mammal species with probable occurrence listed as endangered of extinction by the IUCN Red List (*Ateles chamek, Inia geoffrensis, Pteronura brasiliensis, Sotolia fluviatilis* and *Sylvilagus brasiliensis*). The Project Area PA-3, composed by Fazenda Nova Uberada, borders with Environmental Protection Area of Igarapé São Francisco (figure below). This is an area of extremely important for biodiversity conservation, with approximately 300,000 acres of native Amazon Forest, created for the preservation and recovery of the remnants of the local biota, as well as promoting environmental education, scientific research, and the conservation of environmental, cultural, and historical values. The location of the project area near the Environmental Protection Area and its protection are actions against the fragmentation of the local vegetation and habitat loss.

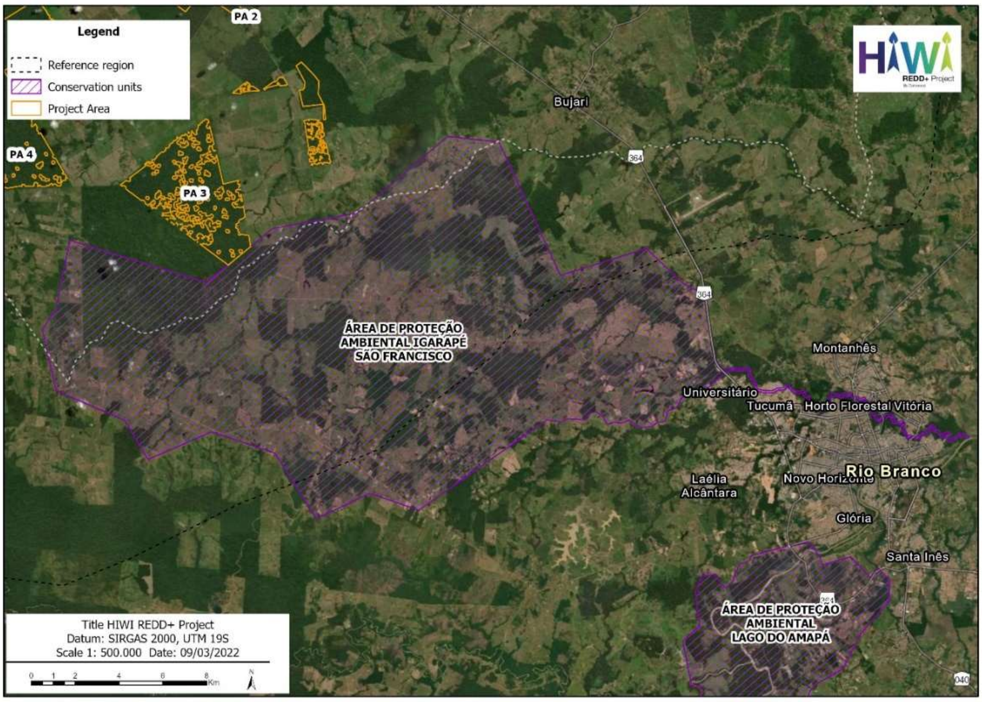

Figure 71: Map showing the PA-3 proximity with the with Environmental Protection Area of Igarapé São Francisco.

Considering that the project only makes beneficial propositions for preservation and conservation of biodiversity, its net impact will be positive, enabling the survival and coexistence of biotic communities in the region. The project aims to promote sustainable development of the local community, reaching 7 of them, providing better economic opportunities and implementing control activities to quickly minimize and mitigate any possible negative impact that may eventually occur during the period of operation. All the environmental education actions that will be carried out will be essential for the long-term maintenance of the Amazon Forest in the region, as it is expected that environmental awareness will be built and carried in the next generations, also influencing other people to preserve the environment and to develop conservation projects as well.

5.2.4 High Conservation Values Protected (B2.4)

The project activities aim to avoid deforestation and maintain Amazon Forest cover by creating environmental awareness, stimulating sustainable economic activities, and preparing local communities and landowners to deal with eventual episodes of degradation and other events that threaten the conservation of the project area. The HCV 1 – Diversity of Species and presence of endangered species, and the HCV 3 - Ecosystems & Habitats (both detailed in sector 5.1.2.) are not going to be negatively affected by the project, since there are no negative impacts on the environment and biodiversity anticipated.

5.2.5 Species Used (B2.5)

This item is not applicable as no restoration activities are planned in the project.

5.2.6 Invasive Species (B2.5)

This item is not applicable as no restoration activities are planned in the project.

5.2.7 Impacts of Non-native Species (B2.6)

This item is not applicable as no restoration activities are planned in the project.

5.2.8 GMO Exclusion (B2.7)

This item is not applicable as no restoration activities are planned in the project.

5.2.9 Inputs Justification (B2.8)

This item is not applicable as no restoration activities are planned in the project.

5.2.10 Waste Products (B2.9)

Initially, most activities proposed by the project will be of educational aspect, like trainings and lectures, which means that the waste products may consist of paper material and disposable utensils used during coffee-breaks. This type of residue, according to the normative ABNT NBR 10004, is classified as class solid residue II A and B – non-hazardous and A) non-inert (for materials as rubber, aluminum, glass and polystyrene), and B) inert (organic material and plastic).

Any residue produced will be separated to recycling or composter, whenever possible. If these are not possible, the residue will be disposed as common waste. As new activities are selected to compose the project, the identification, classification, and management of their waste products will be properly conducted.

For the health activities, for the management of any hazardous waste generated, specialized storage and collection will be provided.

5.3 Offsite Biodiversity Impacts

5.3.1 Negative Offsite Biodiversity Impacts (B3.1) and Mitigation Measures (B3.2)

There is no expectation of potential negative impacts on biodiversity outside the project zone with the implementation of activities. In addition, the proposed actions were developed to minimize and mitigate any possible leakage or other negative effects.

The proposed actions are intended to develop sustainable practices and promote approximation of the population with environmental causes and biodiversity also in the next generations of the communities involved. Thus, mitigation measures are related to environmental education activities and soil improvement training, for example, to prevent and minimize degradation, deforestation, hunting, and other threats to biodiversity and its habitat.

If any negative impacts on biodiversity, both locally and outside the project zone, are observed as a result of project actions, propositions will be made and implemented as soon as possible to avoid and mitigate it.

5.3.2 Net Offsite Biodiversity Benefits (B3.3)

The impacts on biodiversity outside the HIWI REDD+ Project zone are positive. The project will protect 20,505.00 ha Lowland Open Ombrophilous Forest in the Amazon and proposes activities that will bring substantial benefits to the fauna and flora of the project area, such as fire brigade trainings, biodiversity monitoring and assessment, and many other activities. There are no anticipated negative impacts beyond the project boundaries. In the long term, the development of environmental awareness with environmental education and sustainability actions with communities also aims to bring benefits to the entire biodiversity of the region.

In case any negative impact is observed both for biodiversity inside and outside the project zone, the proponents are prepared to mitigate and solve any unforeseen event, after analysis by technical professionals carried out by Carbonext.

5.4 Biodiversity Impact Monitoring

The biodiversity impact monitoring tasks aim to assess the level of awareness on conservation importance, as well as to keep mechanisms to avoid forest fires and illegal practices inside the Project Area, guaranteeing that the project's activities will strengthen fauna and flora protection and even promote other biodiversity benefits.

5.4.1 Biodiversity Monitoring Plan (B4.1, B4.2, GL1.4, GL3.4)

The maintenance of standing forest as well as the conservation of Amazonian species of fauna and flora are extremely necessary to ensure the prosperity of the ecosystem and improvement of biodiversity, thus allowing ecosystem services to be generated and benefit the communities involved in the project. The expansion of deforestation reduces the remaining forest areas in this biome, however, the mechanisms of REDD+ projects and their resources generated by the sale of carbon credits contribute to preventing deforestation, fragmentation, loss of habitat and biodiversity. (FEARNSIDE, 2006). To guarantee the effectiveness of the Project, biodiversity monitoring of local fauna and flora is as a fundamental tool, allowing the measurement of the positive and, if any, negative impacts arising from the project's activities. It provides data for evaluating the actions implemented, which may indicate the need for adjustments, adaptation, creation of new activities or other mitigation measures. For the HIWI REDD+ Project, monitoring of the managed areas will be systematically carried out by third party, hired local corporations and eventually by partnerships with universities or other interested entities. The biodiversity will be evaluated through periodic forest inventories and following the criteria of certification standards, aiming at the short- and long-term monitoring. According to the results of the assessment made from the monitoring data, improvements and new actions to promote biodiversity during the project execution time will be constantly evaluated and implemented.

The general monitoring of the conservancy state, as well as the climate, social and biodiversity project activities are designed by the Carbonext's team, but the parameters, methods, periodicity and areas to be monitored will be indicated by the company specialized in biodiversity monitoring, that is going to be defined, hired and will act in the area of the project after the first carbon credit sale.

In addition to the monitoring strategies described the possibility of implementing a participatory monitoring program is being evaluated, in which some community residents are selected and trained to gather information in the region. Information on the presence of endemic species and included in lists of endangered species, and the presence of invasive species, as well as increased or reduced observations can be produced by the community. This possibility is still being evaluated by the Carbonext team regarding its feasibility and, if it is feasible, this participatory monitoring program will be presented and discussed with the communities to hear their opinion during meetings and onsite visits.

The fauna and flora parameters to be monitored are displayed in the Table 87 below. This assessment depends on the carbon credit sales.

Table 87 – Biodiversity Monitoring plan activities

Monitoring Plan Activities

Variables	Area	Aspect	Unity	Frequency	Indicator	Assessments
Fauna, inventory	Project Area	Total fauna species; Endangered fauna species	Nº of total fauna species; Nº of endangered fauna species	Every 2 years	Maintenance of number of total fauna species; Maintenance of number of endangered species or it decrease	Increase in surveillance mechanism; Develop conservation practices; Consult specialists.
Flora Inventory	Project Area	Project Area; Endangered flora species	Nº of total flora species; Nº of endangered flora species	Every 5 years	Maintenance of number of total flora species; Maintenance of number of endangered species or it decrease	Increase in surveillance mechanism; Develop conservation practices; Consult specialists.
Biomass Inventory	Project Area	Carbon Stock	tCO2 per hectare	Every 10 years	Maintenance of carbon stock	Increase in surveillance mechanism; Develop conservation practices; Consult specialists.

5.4.2 Biodiversity Monitoring Plan Dissemination (B4.3)

The results of monitoring undertaken will be made publicly available on the internet and through the web site of Carbonext (www.carbonext.com.br). All documents and information about the results of the monitoring and verification of this project will be published in the platforms of the VCS and CCB standards as usual. Additionally, the obtained monitored project's results will be shared with local stakeholders at the most convenient moments, such as training, verification, or visitation periods, to enhance the importance and effectiveness of the project to the communities.

5.5 Optional Criterion: Exceptional Biodiversity Benefits

5.5.1 High Biodiversity Conservation Priority Status (GL3.1)

The HIWI REDD+ project zone is very abundant and rich in terms of biodiversity species, due to its Phyto physiognomy of Lowland Open Ombrophilous Forest of the Amazon Biome and the proximity with preserved areas such as the Environmental Protected Area of The Igarapé São Francisco, which borders with the Fazenda Nova Uberada. In the Project region, the presence of threatened fauna species was verified according to the IUCN Red List of Threatened Species[207] and the Brazilian Red List by ICMBIO[208].

As already described in Section "5.1.1 Existing Conditions" , the fauna species considered to be threatened according to the secondary data collection[209] [210] [211,212,213] of the region of the project, and the national (ICMBIO) and international (IUCN) criteria are listed below. Further primary data collection will be conducted until end of 2023 to deepen the knowledge of this species, their occurrence and status in the project region.

- Endangered (EN)

- **Flora:** *Handroanthus serratifolius*
- **Fauna:** *Ateles chamek, Inia geoffrensis, Pteronura brasiliensis, Sotalia fluviatilis, Sylvilagus brasiliensi*

- Vulnerable (VU)

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[207] Red List of Threatened Species of the International Union for Conservation of Nature. 2022. IUCN Red List. Available on: https://www.iucnredlist.org/ . Accessed on 09/04/2022

[208] Livro Vermelho da Fauna Brasileira Ameaçada de Extinção. ICMBIO. 2018. Available on: https://www.icmbio.gov.br/portal/images/stories/comunicacao/publicacoes/publicacoes-diversas/livro_vermelho_2018_vol1.pdf. Accessed in 09/04/2022/

[209]Araujo, H. J. B. Tradition species of timber trees considered as in disappearance in Acre State. 2014. Available at: https://ainfo.cnptia.embrapa.br/digital/bitstream/item/112091/1/25314.pdf. Accessed: 09/04/2022.

[210] HECHENDERGER, S. FERREIRA, E. Floristic and Phytosociological comparison between palm trees communities of primary and secondary forests the Environmental Protection Area of Igarapé São Francisco, Acre, Brazil. Centro Científico Conhecer - Goiânia, v.14 n.25; p. 350, 2017.

211 State Government of Acre. Secretary of Environment and Natural Resources. Creation Peace for the Environmental Protection Area of Igarapé São Francisco – Conservation Unit of Sustainable Use, 2005, page 20.

212 http://semapi.acre.gov.br/wp-content/uploads/sites/20/2020/11/Volume_I_Diagnostico_socioeconomico_fea_2012_revisado_final.pdf#page=43&zoom=100,109,326

213 https://ppbio.inpa.gov.br/sites/default/files/Dissertacao_BORGES_L_H_M.pdf

- **Flora:** *Amburana acreana, Cedrela odorata, Mezilaurus itauba, Swietenia macrophylla, Bertholletia excelsa*
- **Fauna:** *Dinomys branickii, Myrmecophaga tridactyla, Priodontes maximus, Tapirus terrestris, Tayassu pecari, Podocnemis unifilis, Geochelonoids denticulat, Chelonoidis denticulata, Lagothrix lagothricha, Callimico goeldii, Cebuella pygmae, Cebus unicolor, Alouatta belzebul Panthera onca and Puma concolor.*

5.5.2 Trigger Species Population Trends (GL3.2, GL3.3)

According to the list of endangered (EN) species, consider in the HIWI REDD+ Project as trigger species (figure below) (presented above in sector 5.5.1.), the trends on their populations, the threats on these species and the activities to address them are presented in this sector below (Table 56).

Figure 72: Endangered species, which the HIWI Project will focuses on conservation[214].

Table 88 - Identification and description of the trigger species and the tendency of the populations for the scenarios without and with the HIWI REDD+ Project

Trigger Species	*Ateles chamek*
Population Trend at Start of Project	*Ateles chamek* is an endangered (EN) species with decreasing population. Inferred population decline of at least 50% in the

[214] A) Pteronura brasiliensis – Ariranha (Source: Eric Gaba); B) Sylvilagus brasiliensis – Tapiti (Source: Onçafari); C) Sotalia fluviatilis – Tucuxi (Source: : https://www.researchgate.net/figure/Sotalia-fluviatilis-adult-individual-of-typical-habitus-jumping-in-the-lower-Rio-Tigre_fig2_328839181); D) Handroanthus serratifolius – Ipê amarelo (Source: https://ac24horas.com/2021/05/14/concessao-de-tres-florestas-preve-receita-de-r-10-milhoes-anuais-ao-governo-do-acre/); E) Ignia geoffrensis – Boto cor-de-rosa (Source: José Martins); F) Ateles chamek – Macaco-aranha (Source: P. Bertner).

	past 45 years (IUCN, 2022). The population decline and local extinction of Ateles in most areas with human activity are the result of hunting pressure that is often associated with habitat destruction and degradation (van Roosmalen and Klein 1988, Peres 1997, Parry et al. 2007). The species of the genus are present in altered/fragmented areas but generally do not persist for long periods (Peres 1990, 1997).
Without-project Scenario	Its extent of occurrence (EOO) was calculated as 3,052,182 km², and the estimated area of occupancy as 927,754 km², 28% of the extent of occurrence needed (IUCN, 2022). Around 15% of forest cover was lost within its predicted area of occupancy (Rabelo et al., 2018). Without the HIWI REDD+ Project, this species would not be stimulated to be preserved, as well as the protection of the 20494,94 acres of forest. The population trend of this species would decrease more in the region mainly due to the loss of habitat caused by deforestation and forest degradation. Another aggravating factor is predatory hunting for subsistence, that would not be discouraged with the environmental education actions.
With-project Scenario	The HIWI REDD+ Project, which projects mitigation and reduction of deforestation and forest degradation, aims at minimizing habitat loss and consequent improvement in biodiversity conservation. In addition, the project provides periodic monitoring of fauna and flora with a focus on priority and threatened species, which helps to combat conversion of forest into other land use activities, responsible for deforestation.. The data obtained from the monitoring are important for evaluations and scientific studies on population trends, taxa, natural history, species behavior, mitigation measures, among others, contributing even more to their conservation. With the environmental education actions, the target species will be presented to the communities as well as their role in the ecosystem, the relation with other species, etc., which encourages and engages the preservation and prevention of unsustainable practices that lead to uncontrolled deforestation, such as logging and cattle raising.

	Sustainable development activities and professional training workshops can provide new perspectives for obtaining resources and income for the communities that extract this wood, for example. Therefore, it is expected with the Project, that there will be improvements in population trend of *Ateles chamek*.

Trigger Species	*Sylvilagus brasiliensis*
Population Trend at Start of Project	*Sylvilagus brasiliensis* is an endangered (EN) species with decreasing population. According to IUCN[215], a study determined that the density of the Tapeti's population was extremly low, that sighting rates fell below a detectable level.
Without-project Scenario	The main causes of the Tapetis popullation decline is deforestation due to anthropic activities that lead to habitat loss. Without the HIWI REDD+ Project, this species would not be estimulated to be preserved, as well as the protection of the 20494,94 acres of forest. The population trend of this species would decrease more in the region mainly due to the loss of habitat caused by deforestation and forest degradation.
With-project Scenario	The HIWI REDD+ Project, which projects mitigation and reduction of deforestation and forest degradation, aims at minimizing habitat loss and consequent improvement in biodiversity conservation. In addition, the project provides periodic monitoring of fauna and flora with a focus on priority and threatened species, which helps to combat conversion of forest into other land use activities, responsible for deforestation. The data obtained from the monitoring are important for evaluations and scientific studies on population trends, taxa, natural history, species behavior, mitigation measures, among others, contributing even more to their conservation. With the environmental education actions, the target species will be presented to the communities as well as their role in the

[215] https://www.iucnredlist.org/species/87491102/45191186

	ecosystem, the relation with other species, etc., which encourages and engages community on the preservation and prevention of unsustainable practices that lead to uncontrolled deforestations as logging and cattle raising. Sustainable development activities and professional training workshops can provide new perspectives for obtaining resources and income for the communities that extract this wood, for example. Therefore, it is expected with the Project, that there will be improvements in population trend of *Ateles chamek*.

Trigger Species	*Sotalia fluviatilis*
Population Trend at Start of Project	*Sotalia fluviatilis* is an endangered (EN) species with decreasing population. IUCN[216] indicates that there are no estimates of total population size for the Tucuxi range-wide, as in some regions it appears to be relatively abundant and in others, localy rare. A study conducted monthly since 1994 until 2017 in the Brazilian Amazon (in Mamirauá Sustainable Development Reserve) revealed that the Tucuxi population in that area was estimated to have declined by 7.4% per year over the study period (da Silva et al. 2018)[217]. According Taylor et al.[218] ,projecting the decline forward for a three-generation period including the surveyed years (1994-2041), the prediction of population reduction in this study area would be of 97%.
Without-project Scenario	The threats to this Amazonian dolphin species include incidental mortality in fishing gear, deliberate killing for fish bait or predator control, damming of rivers, and environmental pollution (Best and da Silva 1989a,b; da Silva 2009, IWC 2007, Trujillo et

[216] https://www.iucnredlist.org/species/10831/50358152
[217] Da Silva, V.M.F., and Martin, A.R. 2017. A note on the continuing hunt for botos (Inia geoffrensis) in the Brazilian Amazon and the continuing rapid decline of this dolphin. International Whaling Commission Scientific Committee Report 67A/SM/13.
[218] Taylor, B.L., Chivers, S.J., Larese, J. and Perrin, W.F. 2007. Generation length and percent mature estimates for IUCN assessments of Cetaceans. NOAA Southwest Fisheries Science Center, La Jolla, California. Administrative Report LJ-07-01

	al. 2010b)[219]. Its survival depends on the quality of the water to eat healthy fish, live all its life cycle, create their young and so on, becaming a very sensible species to ecossystem stresses and disturbances like pollution, typical of communities arround rivers and inland water. Without the HIWI REDD+ Project, this species would not be estimulated to be preserved. The population trend of this species would decrease more in the region with the continuing of unsustaiable fishing practices, expansion of housing and pollution. Cattle also pollutes inland waters[220], as well as agriculture.
With-project Scenario	The HIWI REDD+ Project, which projects mitigation and reduction of deforestation and forest degradation, aims at minimizing habitat loss in the forest areas and consequent improvement in biodiversity conservation. In addition, the project provides periodic monitoring of fauna and flora with a focus on priority and threatened species, which helps to combat conversion of forest into other land use activities, responsible for deforestation. The data obtained from the monitoring are important for evaluations and scientific studies on population trends, taxa, natural history, species behavior, mitigation measures, among others, contributing even more to their conservation. With the environmental education actions, targeted on pollution of inland waters and the conservancy of Ignia, its role in the ecosystem, the relation with other species, etc., the environmental awareness and engagement will be encouraged in the local communities, preserving this species. Sustainable development activities on fishing can provide new perspectives for obtaining resources and income for the communities that kill for bate or is not concern with accidental fishing, for example.

[219] Best, R.C. and da Silva, V.M.F. 1989. Biology, status and conservation of *Inia geoffrensis* in the Amazon and Orinoco basins. In: W.F. Perrin, R.L. Brownell Jr., Zhou Kaiya and Liu Jiankang (eds) *Biology and Conservation of the River Dolphins*, pp. 23-34. IUCN/SSC Occasional Paper No. 3, Gland, Switzerland.; International Whaling Commission. 2007. Report of the Sub-Committee on Small Cetaceans. *Journal of Cetacean Research and Management* 9: 297-325.; Trujillo, F., Crespo, E., Van Damme, P.A., and Usma, J.S. (Eds). 2010a. The Action Plan for South American River Dolphins 2010 - 2020. WWF, Fundación Omacha, WDS, WDCS, Solamac. Bogotá, D.C., Colombia.

[220] https://www.fao.org/3/a0701e/a0701e04.pdf

	Therefore, it is expected with the Project, that there will be improvements in population trend of *Sotalia fluviatilis*.

Trigger Species	*Inia geoffrensis*
Population Trend at Start of Project	*Inia geoffrensis* is an endangered (EN) species with decreasing population. IUCN[221] indicates lack of data and information on the population structure of this species throughout their range. A study conducted monthly since 1994 in the Brazilian Amazon (in Mamirauá Sustainable Development Reserve) revealed that the use of carcasses of dolphin for fishing of a Piracatinga (*Calophysus macropterus*), between 2000 and 2017 there was an annual average rate of decline in Inia encounters of 6.7% (in the area of study(da Silva et al. 2018)[222].
Without-project Scenario	The threats to this Amazonian dolphin species include incidental mortality in fishing gear, deliberate killing for fish bait or predator control, damming of rivers, and environmental pollution (Best and da Silva 1989a,b; da Silva 2009, IWC 2007, Trujillo et al. 2010b[223].). Its survival depends on the quality of the water to eat healthy fish, live all its life cycle, create their young, becoming a very sensible species to ecosystem stresses and disturbances like pollution, typical of communities around rivers and inland water. Without the HIWI REDD+ Project, this species would not be stimulated to be preserved. The population trend of this species would decrease more in the region with the continuing of unsustainable fishing practices, expansion of housing and

[221] https://www.iucnredlist.org/species/10831/50358152
[222] Da Silva, V.M.F., and Martin, A.R. 2017. A note on the continuing hunt for botos (Inia geoffrensis) in the Brazilian Amazon and the continuing rapid decline of this dolphin. International Whaling Commission Scientific Committee Report 67A/SM/13.
[223] Best, R.C. and da Silva, V.M.F. 1989. Biology, status and conservation of *Inia geoffrensis* in the Amazon and Orinoco basins. In: W.F. Perrin, R.L. Brownell Jr., Zhou Kaiya and Liu Jiankang (eds) *Biology and Conservation of the River Dolphins*, pp. 23–34. IUCN/SSC Occasional Paper No. 3, Gland, Switzerland.; International Whaling Commission. 2007. Report of the Sub-Committee on Small Cetaceans. *Journal of Cetacean Research and Management* 9: 297-325.; Trujillo, F., Crespo, E., Van Damme, P.A., and Usma, J.S. (Eds). 2010a. The Action Plan for South American River Dolphins 2010 – 2020. WWF, Fundación Omacha, WDS, WDCS, Solamac. Bogotá, D.C., Colombia.

	pollution. Cattle also pollutes inland waters[224], as well as agriculture.
With-project Scenario	The HIWI REDD+ Project, which projects mitigation and reduction of deforestation and forest degradation, aims at minimizing habitat loss in the forest areas and consequent improvement in biodiversity conservation. In addition, the project provides periodic monitoring of fauna and flora with a focus on priority and threatened species, which helps to combat conversion of forest into other land use activities, responsible for deforestation. The data obtained from the monitoring are important for evaluations and scientific studies on population trends, taxa, natural history, species behavior, mitigation measures, among others, contributing even more to their conservation. With the environmental education actions, targeted on pollution of inland waters and the conservancy of Ignia, its role in the ecosystem, the relation with other species, etc., the environmental awareness and engagement will be encouraged in the local communities, preserving this species. Sustainable development activities on fishing can provide new perspectives for obtaining resources and income for the communities that kill for bate or is not concern with accidental fishing, for example. Therefore, it is expected with the Project, that there will be improvements in population trend of *Ignia geoffrensis*.

Trigger Species	*Pteronura brasiliensis*
Population Trend at Start of Project	*Pteronura brasiliensis* is an endangered (EN) species with decreasing population, according to IUCN[225]. There is a decreasing trend for this species in areas where habitat loss and degradation occur. In Brazil, it is estimated a population of at least

224 https://www.fao.org/3/a0701e/a0701e04.pdf
225 https://www.iucnredlist.org/species/18711/164580466

	1,296 breeding individuals, and a total population size of 4,659 (IUCN, 2022). There is no specific information to determine the population size in the project zone.
Without-project Scenario	The tendency in habitat destruction, degradation, and exploitation in consequence of logging and cattle raising represents the greatest threat to this species, which is suspected to have lost more than 50% of its population size in the past 25 years (Pacifici et al. 2013) and is suspected to lead to a future reduction of more than 50% in population size over the next 25 years (IUCN, 2022). Without the HIWI REDD+ Project, this species would not be estimulated to be preserved, as well as the protection of the 20494,94 acres of forest. The population trend of this species would decrease more in the region.
With-project Scenario	The HIWI REDD+ Project, which projects mitigation and reduction of deforestation and forest degradation, aims at minimizing habitat loss and consequent improvement in biodiversity conservation. In addition, the project provides periodic monitoring of fauna and flora with a focus on priority and threatened species, which helps to combat conversion of forest into other land use activities, responsible for deforestation. The data obtained from the monitoring are important for evaluations and scientific studies on population trends, taxa, natural history, species behavior, mitigation measures, among others, contributing even more to their conservation. With the environmental education actions, the target species will be presented to the communities as well as their role in the ecosystem, the relation with other species, etc., which encourages and engages the preservation and prevention of logging. Activities directed to inland water pollution will also be implemented, since the “Ariranha” depends on the water for food and other activities for survival. Sustainable development activities and professional training workshops can provide new perspectives for obtaining resources and income for the communities that extract this wood, for example.

	Therefore, it is expected with the Project, that there will be improvements in population trend of *Pteronura brasiliensis*.

Trigger Species	*Handroanthus serratifolius* (Bignoniaceae)
Population Trend at Start of Project	*Handroanthus serratifolius* is an endangered species (endangerd – EN) with a decreasing population trend (IUCN 2022). According to data from the IUCN Red List website, this species is the most exploited by the timber industry, under the name of “Ipê-amarelo”. Brazil is its largest exporter. Ipê is exploited only in native forests since there are no plantation/culture of *H. serratifolius*. This fact encourages illegal exploitation, directly affecting this species. According to IUCN/TRAFFIC (2019), the demand for Ipê wood and its value increased more than 500% from 1998 to 2004. Additionally, this species has slow growth and cutting cicles of 30-year, which does not allow its population regeneration due to over-exploitation, considered unsustainable. Deforestation caused by settlements, agriculture, expansion of roads, mining, logging, among other factors, are responsible for the decline of its population.
Without-project Scenario	With the increase in demand and value of *Handroanthus serratifolius* wood on the market, in addition to the expansion of pasture activities in the project municipalities, the forest present in the 20494,94 ha of the project area would, over time, be explored, deforested and converted into other land use activities. Consequently, this species, along with many others, would decline rapidly. According to data presented by the IUCN (2022), it is assumed that in 100 years, the decline of H. *serratifolius* population will be of 50%.
With-project Scenario	The Hiwi REDD+ Project aims to mitigate and reduce deforestation and forest degradation, minimizing habitat loss and improving biodiversity conservation. In addition, the project provides periodic monitoring of fauna and flora with a focus on priority and threatened species, which helps to combat conversion of forest into other land use activities, responsible for deforestation. The data obtained from the monitoring are

	important for evaluations and scientific studies on population trends, taxa, natural history, species behavior, mitigation measures, among others, contributing even more to their conservation. With the environmental education actions, the target species will be presented to the communities as well as their role in the ecosystem, their relation with other species, etc., which encourages the preservation and prevention of logging. Sustainable development activities and professional training workshops can provide new perspectives for obtaining resources and income for the communities that extract this wood, for example. Thus, it is expected that there will be greater conservation of *Handroanthus serratifolius* in the project area, maintaining or increasing the population trend.